TpaCAD

2.2.0

Workings

Tecnologie e Prodotti per l'Automazione

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DRILLING

Drilling working

It inserts a hole with x, y coordinates assigned to a Cartesian reference system; the coordinates represent the point of application of the same operation. If the axis is not set, the coordinate of the previous working is propagated.

The parameters to define the working are:

GEOMETRIC PARAMETERS

[X] Qx [Y] Qy	Coordinate of application on XY plane of the face.
[Z] Qz	Coordinate of depth, perpendicular to the face plane. Z coordinate is set as positive or negative at face entry, according toTpaCAD configuration.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"** before the same coordinate. For instance, if a hole with Y coordinate concerning the previous point but with absolute X coordinate = 50 must be programmed, the flag of *Relative* will be enabled and X coordinate will be set = a;50.

TECHNOLOGICAL PARAMETERS

[TD] Diameter	Tool diameter. The values of machine and group can be forced. The assignment of the Tool field prevails on the Diameter assignment.
[TMC] Machine	Machine number. It can be assigned even in case of Programming by diameter.
[TR] Group	Group number on the machine. It can be assigned even in case of Programming by diameter
[T] Tool	Tool number. If set, it prevails on the Diameter assignment.
[TP] Tool typology	Tool typology
[RI] Qri	Slowdown coordinate on entry
[RO] Qro	Slowdown coordinate on exit
[F] Entry speed	Tool entry speed
[S] Rotation value	Tool rotation speed

If the **Tool** and the **Diameter** fields are not assigned, TpaCAD checks if a default tool was set in the parameter programming.

POLAR DRILLING

Polar Drilling Working

It inserts a hole to a polar reference system. The coordinates of the application point are assigned in an indirect way. In the event of undefined pole coordinates, the previous absolute dimension is propagated.

The parameters used to define the drilling are:

GEOMETRICAL PARAMETERS

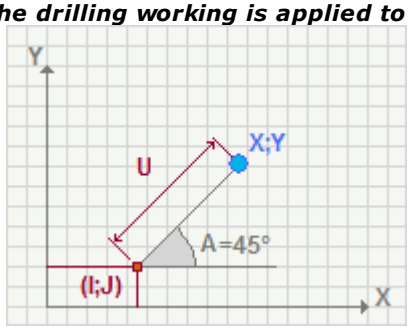
[I] X Centre [J] Y Centre	Pole coordinates.
[Z] Qz	Depth coordinates. Z coordinate is set as positive or negative at the face entry according to the TpaCAD configuration.
[A] Angle	Angle on xy plane against X axis (in degrees).
[U] Module	Distance of the application point from the pole centre.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"** before the same coordinate. For instance, if a hole with Y centre coordinate concerning the previous point but with absolute X coordinate = 50 must be programmed, the flag of *Relative* will be enabled and X coordinate will be set = a;50.

TECHNOLOGICAL PARAMETERS

[TD] Diameter	Tool diameter. The values of machine and group can be forced. The assignment of the Tool field prevails on the Diameter prevails of the Diameter assignment.
[TMC] Machine	Machine number. It can be assigned even in case of Programming by diameter.
[TR] Group	Group number on the machine. It can be assigned even in the event of Programming by diameter.
[T] Tool	Tool number. If set, it prevails on the Diameter assignment.
[TP] Tool typology	Tool typology
[RI] Qri	Slowdown coordinate on entry
[RO] Qro	Slowdown coordinate on exit
[F] Entry speed	Tool entry speed
[S] Rotation value	Tool rotation speed

If the **Tool** and the **Diameter** fields are not assigned, TpaCAD checks if a default tool was set in the parameter programming.

EXAMPLE:
The drilling working is applied to the position with the indicated (X;Y) coordinates



MULTIPLE DRILLING

Multiple drilling working

It inserts one or more drilling workings in a Cartesian reference system. The assigned dimensions become the application point of the first drilling. The dimensions of the other drilling workings are calculated according to the remaining tools with respect of the first tool that is indicated and assigned in the first drilling working. If the axis is not set, the coordinate of the previous working is propagated.

The parameters to define the working are:

GEOMETRIC PARAMETERS

[X] Qx [Y] Qy	Coordinates of application on XY plane of the face.
[Z] Zp	Coordinate of depth (perpendicular to the face plane). Z coordinate is set as positive or negative at the face entry according to the TpaCAD configuration.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values with respect to the corresponding coordinates of the previous working. A coordinate can be forced as absolute by entering **"a;"** before the same coordinate. For example, if a hole with Y coordinate concerning the previous point but with absolute X coordinate = 50 must be programmed, the flag of *Relative* will be enabled and X coordinate will be set = a;50.

TECHNOLOGICAL PARAMETERS

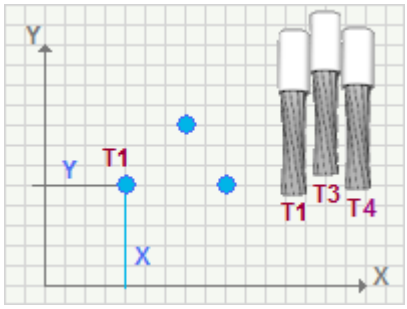
[T] Tool	List of the tools. The value of machine and group can be forced. **t1,t2,t3,t4,t5:** specifies the number of each tool that must be used: (ex:"1,5,12") **t1|t5**: uses the tools from t1 to t5 (ex: "5|12") The use of a mixed syntax is possible too: **t1,t3|t5**: uses the t1 tool and all the tool from t3 to t5 (ex: "1,5|12")
[TMC] Machine	Machine number
[TR] Group	Group number of the machine
[RI] Qri	Slowdown coordinate on entry
[RO] Qro	Slowdown coordinate on exit
[F] Entry speed	Tool entry speed.
[S] Rotation speed	Tool rotation speed

While confirming the data, some custom errors may be displayed.

Custom errors

Custom error 19: Invalid geometry	The geometry of faces in transparency is not assigned for the piece .
Custom error 27: Invalid application face	The application face is fictive (or automatic) and does not verify a condition of equality with a real face of the piece: the condition verifies that the faces coincide with a simple translation to one or more coordinated axes.
Custom Error 22: Invalid technology	In the **[T] Tool** field the tools with invalid syntax are set.
Custom Error 22: Invalid technology	In the **[T] Tool** field invalid tools for the face in which the working is applied are set.

EXAMPLE:
[X, Y] position of the first hole, to which the first tool is assigned, is set. The position of the other holes are calculated according to the offset of other tools with respect to the first one (parameter of [T]Tool=1; 3; 4)


Y
T1
Y
X
T1
T3
T4
X

X FITTING

X Fitting Working

It inserts a set of constant-step holes along the X axis. The application point is defined by the x, y coordinates of the first hole. In the case that an axis is not set, the coordinate of the previous working is propagated.
The parameters to define the working are:

GEOMETRIC PARAMETERS

[X] Starting X	X coordinate of the first hole. This is the X coordinate of the application.
[XF] Final X	X coordinate as drilling limit. It is not necessarily a drilling coordinate.
[ST] Step	Spacing of subsequent holes.
[Y] Qy	Y coordinate of application
[Z] Zp	Depth coordinates (perpendicular to the face plane). Z coordinate is set as positive or negative at the face entry according to the TpaCAD configuration.

TECHNOLOGICAL PARAMETERS

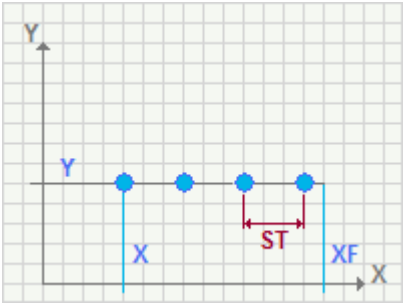
[TD] Diameter	Tool diameter. The values of machine and group can be forced.
[TMC] Machine	Machine number
[TR] Group	Group number of the machine
[TP] Tool typology	Tool typology
[RI] Qri	Slowdown coordinate on entry
[RO] Qro	Slowdown coordinate on exit
[F] Speed entry	Tool entry speed
[S] Rotation value	Tool rotation speed

While confirming the data, some custom errors may be displayed.

Custom errors

Custom error 1: null x step	The module of the **[ST]Step** field is less than 1 mm

EXAMPLE:
The row of holes is developed in the horizontal direction from the point programmed in (X, Y); they are at a constant step (ST) toward a coordinate that is at most XF. The mutual position of the two coordinates X and XF determines the development direction of the fitting. As in the figure below, the end point is not a coordinate of drilling.



X REPEAT

X Repeat Working

It inserts a defined number of holes, with constant step along the X axis. The dimensions of the application point are defined by the [X, Y] positions of the first hole. If the axis is not set, the dimension of the previous working is propagated.

The parameters to define the working are:

GEOMETRIC PARAMETERS

[X] Starting X	X coordinate of the first point. It is the X coordinate of the application
[N] Number of holes	Total number of holes. It is not necessarily a drilling coordinate.
[ST] Step	Distance between successive holes.
[Y] Qy	Y coordinate of the application
[Z] Zp	Depth coordinate to the face plane. The Z coordinate is set positive or negative at the face entry according to the TpaCAD configuration.

TECHNOLOGICAL PARAMETERS

[TD] Diameter	Tool diameter. The values of machine and group can be forced. The assignment of the Tool field prevails on the Diameter prevails of the Diameter assignment.
[TMC] Machine	Machine number. It can be assigned even in case of Programming by diameter
[TR] Group	Machine group number It can be assigned also in case of Programming by diameter
[T] Tool	Tool number. If set, it prevails on the Diameter assignment.
[TP] Tool typology	Tool typology
[RI] Qri	Slowdown coordinate on entry
[RO] Qro	Slowdown coordinate on exit
[F] Speed entry	Tool entry speed
[S] Rotation value	Tool rotation speed

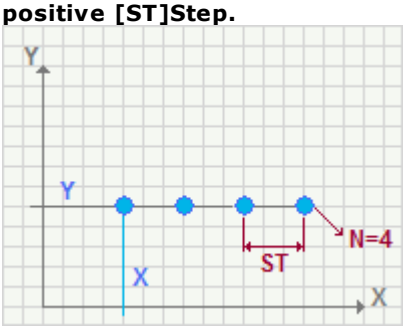
While confirming the data some custom errors, related to the working, can be displayed:

Custom errors

Custom Errors 1: null x step	**[ST]Step** field module is less than 1 mm
Custom Error 3: null number of strokes	The number of holes defined in the **[N] Number of holes** field is less than 1

EXAMPLE:

The row of holes is developed in a horizontal direction from the programmed point in (X,Y), for a total number of holes defined by the parameter Number of holes[N] =4 and with positive [ST]Step.



Y FITTING

[Y] Y Fitting working

It inserts a set of constant-step holes along the Y axis. The coordinates of the application point are defined by the x,y positions of the first hole. If the axis is not set, the dimension of the previous working is propagated

The parameters to define the working are:

GEOMETRIC PARAMETERS

[Y] Starting Y	Y coordinate of the first hole. It is the Y coordinate of the application.
[YF] Final Y	Y coordinate as drilling limit (if it is not set, it assumes the value of the initial Y). It is not necessarily a drilling coordinate.
[ST] Step	Distance between successive holes. The sign of the step is not significant.
[X] Qx	X coordinate of the application
[Z] Zp	Depth coordinate to the face plane. The Z coordinate is set positive or negative at the face entry according to the TpaCAD configuration.

TECHNOLOGICAL PARAMETERS

[TD] Diameter	Tool diameter. The values of machine and group can be forced.
[TMC] Machine	Machine number
[TR] Group	Machine group number
[TP] Tool typology	Tool typology
[RI] Qri	Slowdown dimension on entry
[RO] Qro	Slowdown coordinate on exit
[F] Speed entry	Tool entry speed
[S] Rotation speed	Tool rotation speed

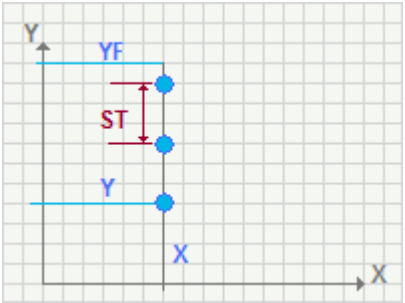
While confirming the data some custom errors may be displayed.

Custom errors

Custom Error 2: null y step	**[ST]Step** field module is less than 1 mm

EXAMPLE:

The row of holes is developed in a horizontal direction from the programmed point in (X,Y), at a fixed distance of the (ST) step and up to a Y position which may be equal to YF. The reciprocal position of the two Y and YF coordinates and YF determine the direction of the development of the fitting. As in the figure below, the final point is not a drilling coordinate.



Y REPEAT

Y Repeat Working

It inserts a defined number of constant-step holes along the Y axis The coordinates of the application points are defined by the x,y position of the first hole. If the axis is not set, the coordinate of the previous working is propagated.

The parameters to define the working are:

GEOMETRIC PARAMETERS

[Y] Starting Y	Y coordinate of the first hole. This is the Y coordinate of the application.
[N] Number of holes	Total number of holes
[ST] Step	Distance between two subsequent holes. The assigned value can be positive or negative.
[X] Qx	X coordinate of application
[Z] Zp	Dimension of depth (perpendicular to the face plane). The Z coordinate is set as positive or negative at the face entry according to the TpaCAD configuration.

TECHNOLOGICAL PARAMETERS

[TD] Diameter	Tool diameter. The values of machine and group can be forced. The assignment of the Tool field prevails on the Diameter assignment.
[TMC] Machine	Machine number. It can be assigned even in case of Programming by diameter.
[TR] Group	Group number of the machine It can be assigned even in case of Programming by diameter.
[T] Tool	Tool number. If set, it prevails on the Diameter assignment.
[TP] Tool typology	Tool typology
[RI] Qri	Slowdown dimension on entry
[RO] Qro	Slowdown coordinate on exit
[F] Speed entry	Tool entry speed
[S] Speed rotation	Tool rotation speed

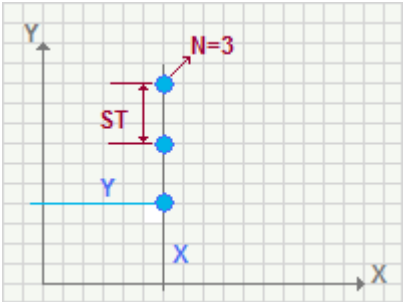
While confirming the data, some custom errors may be displayed.

Custom errors

Custom error 2: null y step	The module of the **[ST]Step** field is less than 1 mm
Custom error 3: Strokes null number	The number of the holes defined in the **[N]Number of Holes** field is less than 1

EXAMPLE:

The row of holes is developed in a horizontal direction from the programmed point in (X,Y), for a total number of holes defined by the parameter Number of holes[N] =3 and with positive [ST]Step.



FITTING XY

XY Fitting Working

It inserts a set of constant-step holes along a generic direction. The coordinates of the application points are defined by the x,y position of the first hole. If the axis is not set, the coordinate of the previous working is propagated.

The parameters to define the working are:

GEOMETRIC PARAMETERS

[X] Starting X	X coordinate of the first hole. This is the X coordinate of the application.
[Y] Starting Y	Y coordinate of the first hole. This is the Y coordinate of the application.
[ST] Step	Distance between two subsequent holes. The step sign is not significant.
[XF] Final X	X coordinate as drilling limit. It is not necessarily a drilling coordinate. The field is disabled, if the polar mode is selected.
[YF] Final Y	Y coordinate as drilling limit. It is not necessarily a drilling coordinate. The field is disabled, if the polar mode is selected.
[Z] Zp	Dimension of depth (perpendicular to the face plane). The Z coordinate is set as positive or negative at the face entry according to the TpaCAD configuration.
[P] Polar	If selected, it enables the programming of the final x and y coordinates in polar mode. The values set in the **X final** and **Y final** parameters are disabled.
[TD] Diameter	Tool diameter. In this case the final X field and the final Y field are disabled and their values are ignored.
[A] Angle	Angle (in degrees and tenths of degree) on xy plane with respect to the X axis in polar mode.
[U] Module	Distance of the final position calculated from the center (in polar mode).

TECHNOLOGICAL PARAMETERS

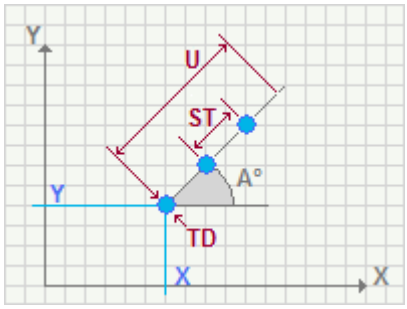
[TD] Diameter	Tool diameter. The values of machine and group can be forced.
[TMC] Machine	Machine number
[TR] Group	Group number of the machine
[TP] Tool typology	Tool typology
[RI] Qri	Slowdown dimension on entry
[RO] Qro	Slowdown coordinate on exit
[F] Speed Entry	Tool entry speed
[S] Rotation value	Tool rotation speed

While confirming the data, some custom errors may be displayed.

Custom errors

Custom error 21:null step	The module of the **[ST]Step** field is less than 1 mm

EXAMPLE:
XY Fitting with polar programming.
The row of holes is developed in a horizontal direction from the programmed point in (X,Y), in the direction assigned by the (A) angle, at a fixed distance of the (ST) step and up to a xy position which may be equal to (U) module.


Y
U
ST
A°
Y
TD
X
X

XY REPEAT

XY Repeat working

It inserts an assigned number of constant-step holes along a generic direction. The coordinates of the application points are defined by the [X, Y] position of the first hole.

The parameters to define the working are:

GEOMETRIC PARAMETERS

[X] Starting X	X coordinate of the first hole. This is the X coordinate of the application.
[Y] Starting Y	Y coordinate of the first hole. This is the Y coordinate of the application.
[ST] Step	Spacing of subsequent holes. The sign of the assigned value is not significant
[N] Number of holes	Total number of holes
[Z] Zp	Dimension of depth (perpendicular to the face plane). The Z coordinate is set as positive or negative at the face entry according to how TpaCAD is configured.
[A] Angle	Angle (in degrees and tenths of degree) on xy plane with respect to the X axis.

TECHNOLOGICAL PARAMETERS

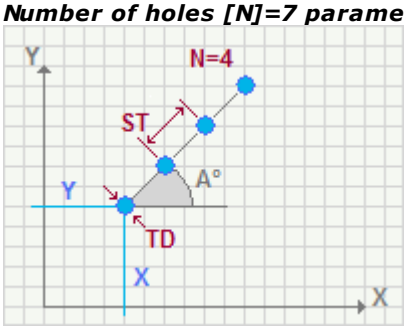
[TD] Diameter	Tool diameter. The values of machine and group can be forced. The assignment of the Tool field prevails on the Diameter assignment.
[TMC] Machine	Machine number It can be assigned even in case of Programming by diameter
[TR] Group	Group number of the machine It can be assigned even in case of Programming by diameter
[T] Tool	Tool number If set, it prevails on the Diameter assignment.
[TP] Tool typology	Tool typology
[RI] Qri	Slowdown dimension on entry
[RO] Qro	Slowdown coordinate on exit
[F] Speed entry	Tool entry speed
[S] Rotation value	Tool rotation speed

While confirming the data, some custom errors may be displayed.

Custom errors

Custom error 21:null step	The module of the **[ST]Step** field is less than 1 mm
Custom error 3: Strokes null number	The module of the **[N]Number of holes** field is less than 1

EXAMPLE:
It inputs a drilling working from the [X,Y] coordinates for a number of times defined by the Number of holes [N]=7 parameter and with [A] programmed angle.



DRILLING ALONG A CIRCLE

Drilling working along a circle

It inserts an assigned number of holes along a circle. The coordinates of the application point are assigned in an indirect way. If the axis is not set, the coordinate of the previous working is propagated.

GEOMETRIC PARAMETERS

[X] X Centre [Y] Y Centre	X, Y coordinates of the circle center
[Z] Zp	Depth coordinates (perpendicular to the face plane). The Z coordinate is set as positive or negative at the face entry according to the TpaCAD configuration.
[U] Radius	Radius of the circle.
[N] Number of holes	Total number of holes to distribute along the circle
[A0] A0	First hole angle. The position of the following holes is determined by the **Distribution** parameter.
[EW] Direction	Direction of the circle: • **Clockwise**= it puts the holes along the circle following a clockwise direction • **Counterclockwise** = it puts the holes along the circle following a counterclock direction.
[MA] Distribution	It allows the choice of the distribution mode of the holes after the first one: • **Automatic=** The position of the first hole is calculated according to the value of the A0 parameter. The following holes are distributed along the whole circle. The **Delta A** parameter is disabled. • **Manual=** The position of the first hole is calculated according to the value of the A0 parameter. The following holes are set by means of the **Delta A** parameter.
[AN] Delta A (°)	Angular distance of the subsequent holes, used in *Manual* distribution mode.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values with respect to the coordinate of the previous working.

TECHNOLOGICAL PARAMETERS

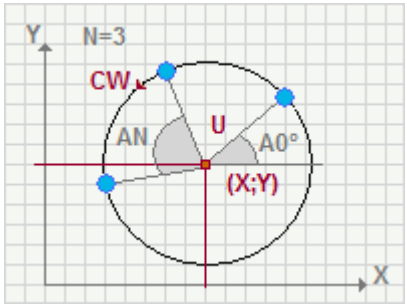
[TD] Diameter	Tool diameter. The values of machine and group can be forced. The assignment of the Tool field prevails on the Diameter assignment.
[TMC] Machine	Machine number. It can be assigned even in case of Programming by diameter.
[TR] Group	Group number of the machine. It can be assigned even in case of Programming by diameter.
[T] Tool	Tool number. If set, it prevails on the Diameter assignment.
[TP] Tool typology	Tool typology
[RI] Qri	Slowdown dimension on entry
[RO] Qro	Slowdown coordinate on exit
[F] Speed entry	Tool entry speed
[S] Rotation value	Tool rotation speed

While confirming the data, some custom errors may be displayed.

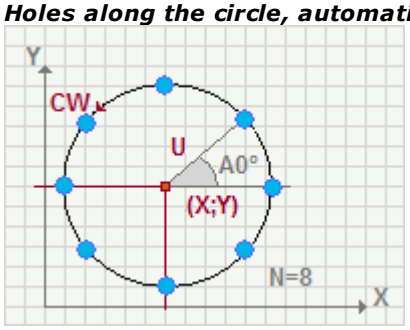
Custom errors

Custom error 3: Strokes null number	The number of the holes defined in the **[N] Number of Holes** field is less than 1
Custom error 4: too many strokes	The number of the holes defined in the **[N] Number of Holes** field is more than 100
Custom Error 7: invalid radius	The radius of the circle is less than 1 mm

EXAMPLE:
Holes along the circle, manually distributed and with Counterclockwise rotation:



Holes along the circle, automatically distributed and with Counterclockwise rotation:



DRILLING ON POLYGON VERTICES

Drilling working on a polygon vertices

It inserts a defined number of holes on the vertices of a polygon. The coordinates of the application point are assigned in an indirect way. If the axis is not set, the coordinate of the previous working is propagated.

The parameters to define the working are:

GEOMETRIC PARAMETERS

[X] X Centre [Y] Y Centre	X,Y coordinates of the polygon center
[Z] Zp	Dimension of depth perpendicular to the face plane Z coordinate is set as positive or negative at face entry according to how TpaCAD is configured.
[PL] Polygon	It allows to decide if an inscribed or circumscribed polygon has to be carried out.
[EW] Direction	Direction of the polygon
[U] Radius	Circle radius
[N] Sides	Polygon sides. The minimum value is 3
[A0] A0	First hole angle
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values with respect to the coordinate of the previous working.

TECHNOLOGICAL PARAMETERS

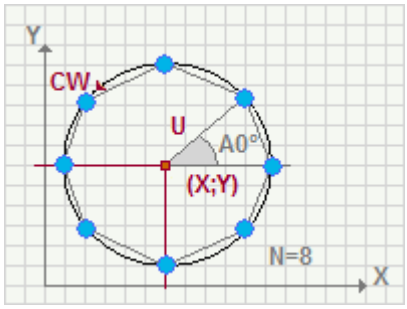
[TD] Diameter	Tool diameter. The values of machine and group can be forced. The assignment of the Tool field prevails on the Diameter prevails of the Diameter assignment.
[TMC] Machine	Machine number. It can be assigned even in case of Programming by diameter
[TR] Group	Number of machine group. It can be assigned even in case of Programming by diameter
[T] Tool	Tool number. If set, it prevails on the Diameter assignment.
[TP] Tool typology	Tool typology
[RI] Qri	Slowdown dimension on entry
[RO] Qro	Slowdown coordinate on exit
[F] Speed entry	Tool entry speed
[S] Speed rotation	Tool rotation speed

While confirming the data, some custom errors may be displayed.

Custom errors

Custom error 18: insufficient sides	The number of the sides defined in the **[N] Sides** field is less than 3
Custom error 17: too many sides required	The number of the sides, defined in the **[N] Sides** field is higher than 100
Custom error 7: invalid radius	the value assigned to the **[U] Radius** field is less than 1 mm

EXAMPLE:
It inputs 8 holes on the vertices of an hexagon, inscribed in a circle with (U) radius. The first hole is positioned at 45°


Y
CW
U
A0°
(X;Y)
N=8
X

MILL SETUP

Mill setup working

It programs a mill setup working with [X, Y] coordinates assigned in a Cartesian reference system; these coordinates represent the point of application of the working itself. The direction of the tool is perpendicular to the plane of the face. If the axis is not set, the coordinate of the previous working is propagated.
The parameters to define the working are:

GEOMETRIC PARAMETERS

[Qx] X [Qy] Y	X, Y coordinates of application
[Qz] Z	Depth coordinates perpendicular to the face plane. Z coordinate is set as positive or negative at the face entry according to how TpaCAD is configured.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values with respect to the coordinate of the previous working. A dimension can be forced as absolute by entering **"a;"**before the same coordinate. For example, if a hole with Y dimension relative to the previous point but with absolute X coordinate = 50 has to be programmed, the flag of *Relative* will be enabled and X coordinate will be set = a;50.
[TZ] Tangent tracking	If selected, it requires to keep the axis of the tool perpendicular to the face during the machining of the whole profile. The field is significant in case of programming in a curved face or in a surface. For further details, please read the manual of TpaCAD, chapter **Workings->Kind of workings->The Technology.**
[TX] Interpolate to a 5 axes	If selected, requires the execution of the path while interpolating on both the rotary axes; the selection is significant only if also the **Tangent tracking** option is active. For further details, please read the manual of TpaCAD, chapter **Workings->Kind of workings->The Technology.**

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number of the machine
[EM] Electric spindle	Number of the electric spindle
[T] Tool	Tool number
[TP] Tool typology	Tool typology
[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed

ADVANCED TECHNOLOGY DATA

[EGL] Point hook	If selected, it hooks the setup to the previous point and it validates the continuity between profiles. A hooking to a point • always applies null deviations to the relative value; • If the previous working permits the point hooking (setup, line, arc, subroutine ending with a profile element) the current setup is not carried out and the previous profile carries on the profile that was possibly assigned after the setup. In this case a **hooking between profiles** occurs**.**
[MTL] Multiple setup	If selected, it means that the *Apply multiple setups* tool has been applied to the profile in order to define a *Multiple profile,* while in the following setups also the parameter **Point Hook** is selected**,** making these setups as transparents, while executing the profile in editor. For further details reference is made to the manual of TpaCAD chapter **Tools->Profile tools->Apply multiple setups .**
[EMP] Emptying profile	If selected, it means that the profile has been generated or it must be interpreted as a profile generated by an emptying procedure. No

	subsequent emptying processes are applied to this profile and the direction arrows and the limit points of the profile are not shown in the graphic representation. For further details, please read the manual of TpaCAD **TpaCAD customization ->Views ->Customize graphics .**
[GEO] Geometric profile	If selected, it can exclude the graphic representation of the elements such as arrows, extreme points, 3D overall dimensions. For further details, please read the manual of TpaCAD, chapter **TpaCAD customization ->Views ->Customize graphics.**
[NEXT] Nesting type	It defines the characterization of the profile that will be used in a nesting process to be applied later: • **None**=the profile is excluded by a nesting • **Nesting geometry**= nesting profile • **Enclose scraps** = characterizes a scraps hole (can be used for a nesting positioning). For nesting, consider the closed profiles only.
[DN] Compensation	It enables the compensation with side selection: • **Off**=no compensation; • **Left**= left side; • **Right**= right side.
[D] Compensation radius	Compensation radius It has to be set when a compensation is required that differs from the tool radius
[DNC] Contouring	It selects the solution mode in external edge compensation: • **Default**= it applies as defined in the configuration of TpaCAD; • **Fillets**= it inputs the fillets as correction; • **Edges**= it reduces the intersection fillets
[DNR] Reduce the profile	It enables the removal of segments in the correct profile, as respects the original one, as a consequence of geometrical overall conditions exceeding the same correction. For further details reference is made to the TpaCAD manual, chapter **Compensation tool**
[DNI] Step by step compensation startup	It gradually enables the compensation start on the first profile segment. The compensation is calculated from the second segment of the profile; the movement on the first segment is linear: from the setup programmed point to the correct starting point of the second segment. The gradual compensation start is not applied, if one of the following conditions is applied: • the first segment of the profile is not linear • the profile is defined by only one segment • The first segment of the profile requires an interruption of the compensation For further details reference is made to the TpaCAD manual, chapter ***Workings-> Profile->Compensation tool*.**
[DNO] Step by step compensation end	It enables the gradual closure of the compensation on the last profile segment. It is applied only if the last segment is linear. Compensation is calculated up to the last-but-one segment of the profile; movement on the last segment is linear from the correct end point of the last-but-one segment to the programmed end point of the profile. In any case, Step-by-step compensation closure is not applied, if one of the following conditions is verified: • the last segment of the profile is not linear; • the profile is assigned by only one segment; • the last profile segment requires or continues with a interruption of the compensation. For further details reference is made to the TpaCAD manual, chapter ***Workings-> Profile->Compensation tool*.**
[DNZ] Start compensation from setup	It enables the compensation starting from the programmed point for the setup. The listed items are three: • **Default=**it enables the assigned default mode (in configuration of TpaCAD); • **Off=**it disables the compensation mode; • **Apply=**it enables the compensation mode. If the item is enabled, the correct profile starts from the setup programmed point to the starting compensation point on the first segment with linear movement. In any case, Start compensation from setup is not applied if one of the following conditions is verified:

- Step-by-step compensation startup is required and applied;
- The first segment of the profile requires an interruption of the compensation

For further details reference is made to the TpaCAD manual, chapter ***Workings-> Profile->Compensation tool*.**

ENTRY AND EXIT SEGMENTS

[INEN] Incoming line	It enables or disables management of the entry segment in a profile
[INTP] Typology	It sets the kind of segment to be inserted at profile entry: • **Line:** linear segment, calculated in continuity of tangency • **Left Arc:** arc on the left of the profile, calculated in continuity of tangency • **Right arc:** arc on the left of the profile, calculated in continuity of tangency • **3dArc:** arc of the oriented plane, calculated in continuity of tangency • **Approach:** two linear segments on which the movement along the depth axis and the movement in the plane of the face are distributed. The movement along the depth axis is executed first, then the movement in the XY plane of the face. The development in continuity of tangency is not guaranteed: if the condition of continuity of tangency is not verifies, the selection of the typology is not applied, if the tool compensation is requested.
[INLL] Length/Radius	If the selected segment typology a Line, this option sets the length of the segment in the plane of the face, otherwise it sets the radius of the arc. If the selected typology of segment is **Approach,**this option set the length or the segment inthe plane of the face (if both **X Offset** and **Y Offset** have a null value with respect of 10* epsilon). In this case, the segment is calculated in continuity of tangency. • If the typology of the segment is **Arc**, it sets the radius of the arc. The programmable minimum value is 10*epsilon.
[INA] A Path (°)	If the typology of the segment is **Arc**, this option sets the angular width of the arc. If the value is not set, the default value is 45°. The minimum value is 1°, the maximum value is 270°.
[INLX] X Offset [INLY] Y Offset	If the typology of the selected segment is **Approach,** they set the movement for both the coordinated axes. The values set are summed to their respective setup coordinates.
[INZ] Starting Z	It sets the initial depth of the segment. The initial depth of the segment is the assigned depth for the setup. Its programming is absolute and, if the value is not set, the default value is the value assigned to the **Qz** field (depth assigned to setup). The field is ignored, if *Arc 3D* is selected.
[INHOOK] Exclude tangent tracking	If selected, it requires not to apply the selection indicated before the **Tangent tracking**, with regard to the entry segments to profile: the execution of the segments keeps unchanged the orientation for the tool on the setup programmed point. The field is significant in the event of programming in curved face or surface.
[INF] Speed movement	It sets the interpolation speed on the segments If on the entry segment no value is set, the assigned speed on the first segment of the profile is used.
[OUEN] Outgoing line	It enables or disable the management of the exit segment in a profile.

[OUTP] Typology	It sets the kind of a segment to be inserted in a profile exit: • **Line:** linear segment, calculated in continuity of tangency • **Left arc:** arc on the left of the profile, calculated continuity of tangency • **Right arc:** arc on the right of the profile, calculated continuity of tangency • **3dArc:** arc in the oriented plane, calculated continuity of tangency • **Removal:** two linear segments on which the movement along the depth axis and the movement in the plane of the face are distributed. The movement in the XY plane is executed first, then the movement along the depth axis. The development in continuity of tangency is not guaranteed: if the condition of continuity of tangency is not verified, the selection of the typology is not applied, if the tool compensation is required. • **Coverage:** it can be used only if the case of the profile that ends in the same setup point (closed profile). It covers a portion of the first profile segment. The development in continuity of tangency is not guaranteed: if the condition of continuity of tangency is not verifies, the selection of the typology is not applied, if the tool compensation is required.
[OULL] Length/Radius	If the selected segment typology is a Line, this option sets the length of the segment in the plane of the face, otherwise it sets the radius of the arc. The programmable minimum value is 10*epsilon. The value set, if both the entry segment and the exit segment are enabled, but for this last one no value has been assigned, is propagated from the entry segment to the exit one.
[OUA] A Path (°)	If the arc typology is an arc, this option sets the angular width of the arc. If the value is not set, the default value is 45°. If the previous working permits the point hooking (setup, line, arc, subroutine ending with a profile element) the present setup is not carried out and the previous profile carries on the profile that was possibly assigned after the setup. In this case a hooking between profiles occurs.
[OUX] X Offset [OUY] Y Offset	If the typology of the selected segment is **Approach**, they set the movement for both the coordinated axes. The values set are summed to their respective coordinates of the final point.
[OUZ] Final Z	It sets the finale depth of the segment. The initial depth of the closing segment is the final depth assigned for the profile. Its programming is absolute and, if the value is not set, the default value is the value of the final depth of the profile. The field is ignored, if *Arc 3D* is selected.
[OUTHOOK] Exclude tangent tracking	If selected, it requires not to apply the selection indicated before the **Tangent tracking**, with regard to the exit segments to profile: the execution of the segmants keeps unchanged the orientation for the tool on the setup programmed point. The field is significant in the event of programming in curved face or surface.
[OUTF] Speed movement	It sets the interpolation speed on the segments For the entry segment:If on the exit segment any value is not set, the assigned speed on the final segment of the profile is used.

For further details on the programming of the Entry/Exit segments please read the manual of TpaCAD, chapter **Workings-> Profile ->Opening and closing the profile.**

POLAR MILL SETUP

Polar mill setup working

It programs a setup working with [X, Y] assigned coordinates in a polar reference system. The coordinate of the application point are assigned in an indirect way. The direction of the axis is perpendicular to the plane of the face. In case of absolute programming and undefined coordinate of the pole, the previous coordinate is propagated.

The parameters to define the working are:

GEOMETRIC PARAMETERS

[I] X centre [J] Y centre	Pole coordinates.
[Z] Qz	Depth coordinate Z coordinate is set as positive or negative at the face entry according to how TpaCAD is configured.
[A] Angle	Angle on xy plane against X axis (in degrees)
[U] Module	Distance of the application point from the pole.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"** before the same coordinate. For instance, if a setup with J coordinate relative to the previous point but with absolute I coordinate of the centre = 50 has to be programmed, the flag of *Relative* will be enabled and the I coordinate will be set = a;50.
[TZ] Tangent tracking	If selected, it requires to keep the axis of the tool perpendicular to the face during the machining of the whole profile. The field is significant in case of programming in a curved face or in a surface. For further details, please read the manual of TpaCAD, chapter **Workings->Kind of workings->The Technology.**
[TX] Interpolate to 5 axes	If selected, it requires the execution of the path while interpolating on both the rotary axes; the selection is significant only if also the option of **Tangent tracking** is active. For further details, please read the manual of TpaCAD, chapter **Workings->Kind of workings->The Technology.**

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number of the machine
[EM] Electric spindle	Number of the electric spindle
[T] Tool	Tool number.
[TP] Tool typology	Tool typology.
[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed

ADVANCED TECHNOLOGY DATA

[EGL] Point hook	If selected, it hooks the setup to the previous point and validates the continuity between profiles. A hooking to a point: • always applies null deviations to the relative value; • If the previous working permits the point hooking (setup, line, arc, subroutine ending with a profile element) the setup is not carried out and the previous profile carries on the profile that was possibly assigned downstream of the setup itself. In this case an ***hooking between profiles*** occurs***.***
[MTL] Multiple setup	If selected, it means that the *Apply multiple setups* tool has been applied to the profile in order to define a *Multiple profile* . For further details reference is made to the manual of TpaCAD chapter **Tools->Profile->Apply multiple setups** while in the following setups also the parameter Point Hook is selected, making the setups itself as transparent, while executing the profile in editor. For further details,

	reference is made to the TpaCAD manual, chapter ***Tools->Profile Tools-> Apply multiple setups***
[EMP] Emptying profile	If selected, it means that the profile has been generated or it must be interpreted as a profile generated by an emptying procedure. No subsequent emptying processes are applied to this profile and the direction arrows and the limit points of the profile are not shown in the graphic representation. For further details, please read the manual of TpaCAD, chapter **TpaCAD customization ->Views ->Customize graphics.**
[GEO] Geometric profile	If selected, it can exclude the graphic representation of the elements such as arrows, extreme points, 3D overall dimensions. For further details, please read the manual of TpaCAD, chapter **TpaCAD customization ->Views ->Customize graphics.**
[NEXT] Nesting type	It defines the characterization of the profile that will be used in a nesting process to be applied later: • **None**=the profile is excluded by a nesting • **Nesting geometry**= nesting profile • **Enclose scraps** = characterizes a scraps hole (can be used for a nesting positioning). For nesting, consider the closed profiles only
[DN] Compensation	It enables the compensation with side selection: • **Off**=no compensation; • **Left**= left side; • **Right**= right side
[D] Compensation radius	Compensation radius It has to be set when a compensation is required that differs from the tool radius. The programming with a sign can be interpreted as a variation of the compensation to apply to the tool radius. Example: Tool radius: 5 mm Compensation radius: -1 It can interpret a value compensation: (5-1) = 4 mm
[DNC] Contouring	It enables the compensation by entering fillets or intersections. • **Default**= it applies as defined configuration of TpaCAD; • **Fillets**= it enters the fillets as correction; • **Edges**= it applies contouring and brings the fillets to intersections.
[DNR] Reduce the profile	It It enables the removal of segments in the correct profile, against the original one, as a consequence of geometrical overall conditions exceeding the same compensation. For further details reference is made to the TpaCAD manual, chapter **Tool compensation.**
[DNI] Step by step compensation startup	It gradually enables the compensation startup on the first profile segment. The compensation is calculated from the second segment of the profile; the movement on the first segment is linear: from the setup programmed point to the correct starting point of the second segment. In any case, Step-by-step compensation startup is not applied if one of the following conditions is verified: • the first segment of the profile is not linear • the profile is defined by only one segment • [OUEN] Exit segment For further details reference is made to the TpaCAD manual, chapter **Tool compensation.**
[DNO] Step by step compensation end	It gradually enables the compensation end on the last profile segment. It is applied only if the last segment is linear. Compensation is calculated up to the last-but-one segment of the profile; movement on the last segment is linear from the correct end point of the last-but-one segment to the programmed end point of the profile. In any case, Step-by-step compensation closure is not applied, if one of the following conditions is verified: • the last segment of the profile is not linear; • the profile is assigned by only one segment; • the last profile segment requires or continues with a compensation break. For further details reference is made to the TpaCAD manual, chapter **Tool compensation.**

[DNZ] Start compensation from setup	It enables the compensation starting from the programmed point for the setup. The listed items are three: • **Default=**it enables the assigned default mode (in configuration of TpaCAD); • **Off=**it disables the compensation mode; • **Apply=**it enables the compensation mode. If the item is enabled the correct profile starts from the setup programmed point to the starting compensation point on the first segment with linear movement. In any case, Start compensation from setup is not applied if one of the following conditions is verified: • Step-by-step compensation startup is required and applied; • The first segment of the profile requires an interruption of the compensation For further details reference is made to the TpaCAD manual, chapter **Tool compensation.**
ENTRY AND EXIT SEGMENTS	
[INEN] Incoming line	It enables or disables the management of the profile segment on entry.
[INTP] Typology	It inputs the segment type to be inserted at the entry profile. • **Line:** linear segment, calculated in continuity of tangency • **Left Arc:** arc on the left of the profile, calculated in continuity of tangency • **Right arc:** arc on the right of the profile, calculated in continuity of tangency • **3d Arc:** arc of the oriented plane, calculated in continuity of tangency • **Approach:** two linear segments on which the movement along the depth axis and the movement in the plane of the face are distributed. The movement along the depth axis is executed first, then the movement in the XY plane of the face. The development in continuity of tangency is not guaranteed: if the condition of continuity of tangency is not verified, the selection of the typology is not applied, if the tool compensation is requested.
[INLL] Length/Radius	If the selected segment typology is a **Line**, this option sets the length of the segment in the plane of the face. • If the selected typology of segment is **Approach,**this option set the length or the segment in the plane of the face (if both **X Offset** and **Y Offsetl** have a null value with respect of 10* epsilon). In this case, the segment is calculated in continuity of tangency. • If the typology of the segment is **Arc**, it sets the radius of the arc. The programmable minimum value is 10*epsilon.
[INA] A Path (°)	If the typology of the segment is an **Arc**, this option sets the angular width of the arc. If the value is not set, the default value is 45°. The minimum value is 1°, the minimum value is 270°.
[INLX] X Offset [INLY] Y Offset	If the typology of the selected segment is **Approach,**they set the movement for both the coordinated axes. The values set are summed to their respective coordinates of the setup.
[INZ] Initial Z	It sets the initial depth of the segment. The initial depth of the segment is the assigned depth for the setup. Its programming is absolute and, if the value is not set, the default value is the value assigned to the **Qz** field (depth assigned to setup). The field is ignored, if 3D Arc is selected.
[INHOOK] Exclude tangent tracking	If selected, it requires not to apply the selection indicated before the **Tangent tracking**, with regard to the entry segments to profile: the execution of the segments keeps unchanged the orientation for the tool on the setup programmed point. The field is significant in the event of programming in curved face or surface.
[INF] Speed movement	it sets the interpolation speed on the segments. If on the entry segment no value is set, the assigned speed on the first segment of the profile is used.
[OUEN] Outgoing line	It enables or disable the management of the exit segment in a profile.
[OUTP] Typology	It sets the kind of a segment to be inserted in a profile exit:

	• **Line:** linear segment, calculated in continuity of tangency • **Left Arc:** arc on the left of the profile, calculated in continuity of tangency • **Right arc:** arc on the right of the profile, calculated in continuity of tangency • **3d Arc:** arc of the oriented plane, calculated in continuity of tangency • **Removal:** two linear segments on which the movement along the depth axis and the movement in the plane of the face are distributed. The movement in the XY plane is executed first, then the movement along the depth axis. The development in continuity of tangency is not guaranteed: if the condition of continuity of tangency is not verifies, the selection of the typology is not applied, if the tool compensation is requested. • **Coverage:** it can be used only if the case of the profile that ends in the same setup point (closed profile). It covers a portion of the first profile segment. The development in continuity of tangency is not guaranteed: if the condition of continuity of tangency is not verified, the selection of the typology is not applied, if the tool compensation is required.
[OULL] Length/Radius	If the selected segment typology is a Line, this option sets the length of the segment in the plane of the face. • If the selected typology of segment is **Removal,**this option set the length or the segment in the plane of the face (if both **X Offset** and **Y Offset** have a null value with respect of 10* epsilon). In this case, the segment is calculated in continuity of tangency. • If the typology of the segment is **Arc**, it sets the radius of the arc. • If the typology of the segment is **Coverage,** it sets the coverage length of the initial profile segment, in the plane of the face. If the value is not set, it uses the length of the initial profile segment. The minimum value that can be set is 10*epsilon. In the event that both the entry and the exit segments are enabled, but to this last one no value has been assigned, the value set is propagated from the entry segment to the exit segment.
[OUA] A Path (°)	If the arc typology is an arc, this option sets the angular width of the arc. If the value is not set, the default value is 45°. The minimum value is 1°, the minimum value is 270°. In the event that both the entry segment and the exit segment are enabled, but for this last one no value has been assigned, the value set is propagated from the entry segment to the exit segment.
[OUX] X Offset [OUY] Y Offset	If the typology of the selected segment is **Approach,**they set the movement for both the coordinated axes. The values set are summed to their respective coordinates of the final point.
[OUZ] Final Z	It sets the finale depth of the segment. The initial depth of the closing segment is the final depth assigned for the profile. Its programming is absolute and, if the value is not set, the default value is the value of the final depth of the profile. The field is ignored, if 3D Arc is selected.
[OUTHOOK] Exclude tangent tracking	If selected, it requires not to apply the selection indicated before the **Tangent tracking**, with regard to the exit segments to profile: the execution of the segmants keeps unchanged the orientation for the tool on the setup programmed point. The field is significant in the event of programming in curved face or surface.
[OUTF] Speed movement	it sets the interpolation speed on the segments. If on the exit segment no value is set, the assigned speed on the final segment of the profile is used.

For further details on the programming of the Entry/Exit segments please read the manual of TpaCAD, chapter **Workings-> Profile ->Opening and closing the profile.**

MILL SETUP (ORIENTED)

Oriented mill setup working

It programs a mill setup working in which a working tool direction is assigned, with x,y coordinates assigned in a Cartesian reference system; these coordinates represent the point of application of the same working. If the axis is not set, the coordinate of the previous working is propagated.
The orientation of the tool is programmed through two absolute rotary axes (B, A) in the machine:

- B rotates around the T axis
- A rotates around the Z or X axis (according the configuration of TpaCAD).

The parameters to define the working are:

GEOMETRIC PARAMETERS

[Qx] X [Qy] Y	X,Y coordinates of application.
[Z] Qz	Depth coordinate Z coordinate is set as positive or negative at the face entry according to how TpaCAD is configured.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values with respect to the coordinate of the previous working. A dimension can be forced as absolute by entering **"a;"** before the same coordinate. For example, if a hole with Y coordinate relative to the previous point but with absolute X coordinate = 50 has to be programmed, the flag of *Relative* will be enabled and X coordinate will be set = a;50.
[TZ] Tangent tracking	If selected, it requires to keep the axis of the tool perpendicular to the profile to execute. For further details, please read the manual of TpaCAD, chapter **Workings->Kind of workings->The Technology.**
[TD] Orthogonal Z reference to the plane	It selects the programming mode of the application point of the setup and, therefore, of the whole profile. For further details, please read the manual of TpaCAD, chapter **Workings->Kind of workings->The Technology**.
[TX] Interpolate to 5 axes	If selected, it requires the execution of the path while interpolating on both the rotary axes; the selection is significant only if also the option of **Tangent tracking** is active. For further details, please read the manual of TpaCAD, chapter **Workings->Kind of workings->The Technology.**

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number of the machine
[EM] Electric spindle	Number of the electric spindle
[T] Tool	Tool number
[TP] Tool typology	Tool typology
[VR] Vertical Direction	If selected, it requires to assign the direction vertical to the face regardless the assignment: plane, curved or surface. I valori impostati per gli angoli (alfa, beta) sono ignorati. For further details, please read the manual of TpaCAD, chapter **Workings->Kind of workings->The Technology**.
[B] Beta angle (°)	Swing angle
[A] Alfa angle (°)	Rotation angle If the parameter is not available or if no value is assigned (the field is empty), the value matching the direction of the starting segment of the profile +90.0° is automatically calculated and the tool is orthogonally positioned to the profile. However, this automatic calculation of the angle is subject to some restrictions: in the case of programming in curved face or surface or in a face which is almost parallel to the absolute Z axis (with a window size of 5.0°), the value of the A angle

	adds 90.0° to the value that corresponds to the vertical direction to the face.
[F] Entry speed	Tool entry speed
[S]Rotation speed	Tool rotation speed
ADVANCED TECHNOLOGY DATA	
[EGL] Point Hook	If selected, it hooks the setup to the previous point and validates the continuity between profiles. A hooking to a point: • always applies null deviations to the relative value; • If the previous working permits the point hooking (setup, line, arc, subroutine ending with a profile element) the setup is not carried out and the previous profile carries on the profile that was possibly assigned after the setup itself. In this case an **hooking between profiles** occurs.
[MTL] Multiple setup	If selected, it means that the *Apply multiple setups* tool has been applied to the profile in order to define a *Multiple profile* . For further details reference is made to the manual of TpaCAD chapter **Tools->Profile->Apply multiple setups,** while in the following setups also the parameter Point Hook is selected, making the setups itself as transparent, while executing the profile in editor. For further details, reference is made to the TpaCAD manual, chapter ***Tools->Profile Tools-> Apply multiple setups***
[EMP] Emptying profile	If selected, it means that the profile has been generated or it must be interpreted as a profile generated by an emptying procedure. No subsequent emptying processes are applied to this profile and the direction arrows and the limit points of the profile are not shown in the graphic representation. For further details, please read the manual of TpaCAD, chapter **TpaCAD customization ->Views ->Customize graphics.**
[GEO] Geometric profile	If selected, it excludes from the profile itself the graphic display of elements such as arrows, extreme points, overall dimension in 3D. For further details, please read the manual of TpaCAD, chapter **TpaCAD customization ->Views ->Customize graphics**.
[NEXT] Nesting type	It defines the characterization of the profile that will be used in a nesting process to be applied later: • **None**=the profile is excluded by a nesting • **Nesting geometry**= nesting profile • **Enclose scraps** = characterizes a scraps hole (can be used for a nesting positioning). For nesting, consider the closed profiles only
ENTRY AND EXIT SEGMENTS	
[INEN] Incoming line	It enables or disables the management of the profile segment on entry.
[INTP] Typology	It inputs the segment type to be inserted at the entry profile. • **Line:** linear segment, calculated in continuity of tangency • **Left Arc:** arc on the left of the profile, calculated in continuity of tangency • **Right arc:** arc on the right of the profile, calculated in continuity of tangency • **3d Arc:** arc of the oriented plane, calculated in continuity of tangency • **Approach:** two linear segments on which the movement along the depth axis and the movement in the plane of the face are distributed. The movement along the depth axis is executed first, then the movement in the XY plane of the face. The development in continuity of tangency is not guaranteed: if the condition is not verified, the selection of the typology is not applied, if the tool compensation is required.
[INLL] Length/Radius	If the selected segment typology is a Line, this option sets the length of the segment in the plane of the face, otherwise it sets the radius of the arc. • If the selected typology of segment is **Approach,**this option set the length or the segment in the plane of the face (if both **X Removal** and **Y Removal** have a null value with respect of 10* epsilon). In this case, the segment is calculated in continuity of tangency. • If the typology of the segment is **Arc**, it sets the radius of the arc.

	The programmable minimum value is 10*epsilon.
[INA] A Path (°)	If the arc typology is an arc, this option sets the angular width of the arc. If the value is not set, the default value is 45°. The minimum value is 1°, the minimum value is 270°.
[INLX] X Offset [INLY] Y Offset	If the typology of the selected segment is **Approach,** they set the movement for both the coordinated axes. The values set are summed to their respective coordinates of the final point.
[INZ] Initial Z	It sets the initial depth of the segment. The initial depth of the segment is the depth assigned for setup. Its programming is absolute and, if the value is not set, the default value is the value assigned to the **Qz** field (depth assigned to setup). The field is ignored, if 3D Arc is selected.
[INHOOK] Exclude tangent tracking	If selected, it requires not to apply the selection indicated before the **Tangent tracking**, with regard to the entry segments to profile: the execution of the segments keeps unchanged the orientation for the tool on the setup programmed point.
[INF] Speed movement	it sets the interpolation speed on the segments. If on the entry segment no value is set, the assigned speed on the first segment of the profile is used.
[OUEN] Outgoing line	It enables or disable the management of the exit segment in a profile.
[OUTP] Typology	It sets the kind of a segment to be inserted in a profile exit: • **Line:** linear segment, calculated in continuity of tangency • **Left Arc:** arc on the left of the profile, calculated in continuity of tangency • **Right arc:** arc on the right of the profile, calculated in continuity of tangency • **3d Arc:** arc of the oriented plane, calculated in continuity of tangency • **Removal:** two linear segments on which the movement along the depth axis and the movement in the plane of the face are distributed. The movement in the XY plane is executed first, then the movement along the depth axis. The development in continuity of tangency is not guaranteed: if the condition of continuity of tangency is not verifies, the selection of the typology is not applied, if the tool compensation is requested. • **Coverage:** it can be used only if the case of the profile that ends in the same setup point (closed profile). It covers a portion of the first profile segment. The development in continuity of tangency is not guaranteed: if the condition of continuity of tangency is not verified, the selection of the typology is not applied, if the tool compensation is required.
[OULL] Length/Radius	• If the selected segment typology is a Line, this option sets the length of the segment in the plane of the face, otherwise it sets the radius of the arc. • If the selected typology of segment is **Removal,**this option set the length or the segment in the plane of the face (if both **X Offset** and **Y Offset** have a null value with respect of 10* epsilon). In this case, the segment is calculated in continuity of tangency. • If the typology of the segment is **Arc**, it sets the radius of the arc. • If the typology of the segment is **Coverage,** it sets the coverage length of the initial profile segment, in the plane of the face. If the value is not set, it uses the length of the initial profile segment.
[OUA] A Path (°)	If the arc typology is an arc, this option sets the angular width of the arc. If the value is not set, the default value is 45°. The minimum value is 1°, the minimum value is 270°. If both the entry segment and the exit segment are enabled, but for this last one no value has been assigned, the value set is propagated from the entry segment to the exit one.
[OUX] X Offset [OUY] Y Offset	If the typology of the selected segment is **Approach,** they set the movement for both the coordinated axes. The values set are summed to their respective coordinates of the final point.
[OUZ] Final Z	It sets the finale depth of the segment. The initial depth of the closing segment is the final depth assigned for the profile. Its programming is

	absolute and, if the value is not set, the default value is the value of the final depth of the profile. The field is ignored, if 3D Arc is selected.
[OUTHOOK] Exclude tangent tracking	If selected, it requires not to apply the selection indicated before the **Tangent tracking**, with regard to the exit segments to profile: the execution of the segmants keeps unchanged the orientation for the tool on the setup programmed point.
[OUTF] Speed movement	it sets the interpolation speed on the segments. If on the exit segment no value is not set, the assigned speed on the final segment of the profile is used.

For further details on the programming of the Entry/Exit segments please read the manual of TpaCAD, chapter **Workings-> Profile ->Opening and closing the profile.**

SETUP ISO (5X ORIENTED)

Mill setup working with path orientation of the tool

It programs a mill setup working with an assigned work direction of the tool, x,y coordinates assigned in a Cartesian reference system; these coordinates represent the point of application of the working itself. If the linear axis is not set, the coordinate of the previous working is propagated.
The orientation of the tool is programmed with two rotary axes (B,A) of the trajectory and of the application point of the setup.

- B revolves around the plan identified by the direction of the start profile and by the direction perpendicular (normal) to the face, in the application point of the setup.
- A revolves around the face normal to the face.

The figure below illustrates the meaning of the rotations.
The parameters to define the working are:

GEOMETRIC PARAMETERS

[Qx] X [Qy] Y	X,Y coordinates of the application.
[Z] Qz	Depth coordinate. Z dimension is set as positive or negative at the face entry according to the TpaCAD.configuration.
[EG] Relative	If selected, it shows that the positions of the axes are assigned in relative. A coordinate can be forced as absolute by entering **"a;"**before the same dimension. For example, if a hole with Y dimension relative to the previous point but with absolute X dimension = 50 has to be programmed, the flag of Relative shall be enabled and X dimension shall be set = a;50.
[TZ] Tangent tracking	If it is selected, it requires to keep the axis of the tool perpendicular to the profile to execute. For further details, please read the manual of TpaCAD, chapter **Workings->Kind of workings->The Technology**.

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[EM] Electrospindel	Number of the electric spindle
[T] Tool	Tool number.
[TP] Tool typology	Tool typology.
[VR] Vertical Direction	If it is selected, it requires to assign the direction vertical to the face regardless the assignment: plane, curved or surface. The values set for the angles (alpha, beta) are ignored. For further details, please read the manual of TpaCAD, chapter **Workings->Kind of workings->The Technology.**
[B] Beta Angle (°)	Beta angle
[A] Alfa Angle (°)	Rotation angle (see below)
[F] Entry speed	Tool entry speed.
[S] Rotation speed	Tool rotation speed

ADVANCED TECHNOLOGY DATA

[EGL] Point hook	If selected, it hooks the new point to the previous point and it validates the continuity between profiles. A hooking to a point always applies null deviations to the relative value. If the previous working permits the point hooking (setup, line, arc, subroutine ending with a profile element) the setup is not carried out and the previous profile carries on the profile that was possibly assigned after the setup. In this case an **hooking between profiles** occurs.
[MTL] Multiple setup	If selected, it means that the Apply multiple setups tool has been applied to the profile. For the first setup the **Multiple Setup** parameter only is selected, while for the following setups also the **Point hook,**parameter is selected that makes the setups themselves transparent during the execution of a profile in editor. For further details reference is made to the manual of **TpaCAD, *chapter Tools->Profile Tool->Apply multiple setups***
[EMP] Emptying profile	If selected, it means that the profile has been generated or it must be interpreted as a profile generated by an emptying procedure. No subsequent emptying processes are applied to this profile and it may

exclude the graphic representation of the elements such as direction arrows, edge points of the profile, 3D overall dimensions. For further details, please read the manual of TpaCAD, chapter **TpaCAD customization ->Views ->Customize graphics.**

[GEO] Geometric profile — If selected, it can exclude the graphic representation of the elements such as arrows, extreme points, 3D overall dimensions. For further details, please read the manual of TpaCAD **TpaCAD customization ->Views ->Customize graphics**.

[NEXT] Nesting type — defines the characterization of the profile that will be used in a nesting process to be applied later:

- **None** =the profile is excluded by a nesting
- **Nesting geometry**= nesting profile;
- **Enclose scraps** = characterizes a scraps hole (can be used for a nesting positioning).

For the purpose of a nesting, the only closed profiles are useful.

ENTRY AND EXIT SEGMENTS

[INEN] Incoming line — It enables or disables the management of the profile segment on entry.

[INTP] Typology — It inputs the segment type to be inserted at the entry profile.

- **Line:** linear segmente, calculated in tangency continuity;
- **Left Arc:** arc on the left side of the profile, calculated in tangency continuity;
- **Right Arc:** arc on the right side of the profile, calculated in tangency continuity;
- **3D Arc:** arc in the oriented plane, calculated in tangency continuity;
- **Approach:**two linear segments on which the movement along the depth axis and the movement in the plane of the face are executed The movement along the depth axis is executed first, then the movement in the XY plane of the face. The development in continuity of tangency is not guaranteed: if the condition is not verified, the selection of the typology is not applied, if the tool compensation is required.

[INLL] Length/Radius — If the selected segment typology is a **Line**, this option sets the length of the segment in the plane of the face .
If the selected typology of segment is **Approach,** this option sets the length or the segment in the plane of the face (if both **X Removal** and **Y Removal** have a null value with respect of 10* epsilon). In this case, the segment is calculated in continuity of tangency.

- If the typology of the segment is **Arc**, the radius of the arc is set.

The minimum value that can be set is 10*epsilon.

[INA] A Path (°) — If the arc typology is an **Arc,**this option sets the angular width of the arc. If the value is not set, the default value is 45°. The minimum value is 1°, the minimum value is 270°.

[INLX] X Offset
[INLY] Y Offset — If the typology of the selected segment is **Approach,**they set the movement for both the coordinated axes. The values set are summed to their respective coordinates of the setup.

[INZ] Initial Z — It sets the initial depth of the segment. The initial depth of the segment is the depth assigned to the setup. Its programming is absolute and, if the value is not set, the default value is the value assigned to the **Qz** field (depth assigned to setup).

[INHOOK] This option excludes the tangent tracking — If selected, it requires not to apply the selection indicated before the **Tangent tracking**, with regard to the segments entering the profiles: the execution of the segments keeps unchanged the orientation determined for the tool on the setup programmed tool.

[INF] Movement speed — it sets the interpolation speed on the segments. If on the entry segment no value is set, the assigned speed on the first segment of the profile is used.

[OUEN] Outgoing line — It enables or disable the management of the exit segment in a profile.

[OUTP] Typology — It sets the kind of a segment to be inserted in a profile exit:

- **Line:** linear segment, calculated in tangency continuity;
- **Left Arc:** arc on the left side of the profile, calculated in tangency continuity;
- **Right Arc:** arc on the right side of the profile, calculated in tangency continuity;
- **3D Arc:** arc in the oriented plane, calculated in tangency continuity;
- **Removal:**two linear segments on which the movement along the depth axis and the movement in the plane of the face are distributed. The

	movement in the XY plane is executed first, then the movement along the depth axis. The development in continuity of tangency is not guaranteed: if the condition of continuity of tangency is not verified, the selection of the typology is not applied, if the tool compensation is requested. • **Coverage:** it can be used only if the case of the profile that ends in the same setup point (closed profile). It covers a portion of the first profile segment. The development in continuity of tangency is not guaranteed: if the condition of continuity of tangency is not verified, the selection of the typology is not applied, if the tool compensation is requested.
[OULL] Length/Radius	• If the selected segment typology is a **Line**, this option sets the length of the segment in the plane of the face . • If the selected typology of segment is **Removal,**this option sets the length or the segment in the plane of the face (if both **X Offset** and **Y Offset** have a null value with respect of 10* epsilon). In this case, the segment is calculated in continuity of tangency. • If the typology of the segment is **Arc**, it sets the radius of the arc. • If the typology of the segment is **Coverage,** it sets the coverage length of the initial profile segment, in the plane of the face. If the value is not set, it uses the length of the initial profile segment. The minimum value that can be set is 10*epsilon. If both the entry and exit segments are enabled, but for this last one no value has been assigned, the value set is propagated from the entry segment to the exit one.
[OUA] A Path (°)	If the arc typology is an arc, this option sets the angular width of the arc. If the value is not set, the default value is 45°. The minimum value is 1°, the minimum value is 270°. If both the entry segment and the exit segment are enabled, but for this last one no value has been assigned, the value set is propagated from the entry segment to the exit one.
[OUX] X Offset [OUY] Y Offset	If the typology of the selected segment is **Approach,**they set the movement for both the coordinated axes. The values set are summed to their respective coordinates of the final point.
[OUZ] Final Z	This value sets the finale depth of the segment. The initial depth of the closing segment is the final depth assigned to the setup. It has an absolute programming and, if the value is not set, the value assigned to the final depth of the profile is taken.
[INHOOK] Exclude the tangent tracking	If selected, it requires not to apply the selection indicated before the **Tangent tracking**, with regard to the segments exiting the profiles: the execution of the segments keeps unchanged the orientation determined for the tool on the programmed point of the end of profile.
[OUTF] Movement speed	it sets the interpolation speed on the segments. If on the exit segment no value is not set, the assigned speed on the final segment of the profile is used.

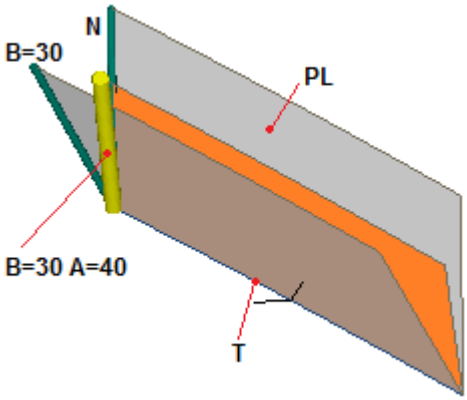
For further details on the programming of the Entry/Exit segments please read the manual of TpaCAD, chapter **Workings-> Profile ->Opening and closing the profile.**

As already told, the orientation of the tool is programmed with two rotary axes (B,A) of the trajectory and of the application point of the setup.

- **B**rotates around the plan identified by the direction of the start profile and by the direction perpendicular (normal) to the face, in the application point of the setup.
- **A** revolves around the face normal to the face.

The figure illustrates the meaning of the rotations:

- **T** is the starting trajectory of the profile;
- **N** is the normal to the face (to the programmed position for the setup [*note 1*]);
- **PL** is the plane determined by the two directions (T, N).



Let us see now some programmings:

(B=0; A=any value) corresponds to the orientation of the tool on **N**. It is such as to leave the fields not assigned.

(B=30; A=0) is such as to revolve **N** around the **T** trajectory, moving the tool to the right of **T** (as shown in the figure).

(B=30; A=40) starting from the result of the previous case (position corresponding to: B=30), the tool now revolves around **N**, with counterclockwise rotation. As shown in the figure, the tool has now moved *forward*, along the direction of **T.**

(B=-30; A=0) is such as to revolve **N** around the **T** trajectory, moving the tool to the left of **T**: the change of side is determined by the sign of the angle.

(B=30; A=-40) starting from the result of the case **(B=30; A=40.0)**, the tool now revolves around **N**, with clockwise rotation: *backward*, from the direction of **T.**

When **Tangent tracking** is selected, while executing the profile the tool is positioned so as to keep each segment in the same relative positioning with respect to the direction of the segment.

[*note 1*] the position programmed for the setup affects the determination of the normal to the face in the case of curved face or surface.

X BLADE

Blade working

It programs a blade working along the X axis.

The parameters to be used are as follows:

GEOMETRIC PARAMETERS

[X] Starting X	X Coordinate of working start
[XF] Final X	X Coordinate of working end
[Y] Qy	Y Coordinate of sawing
[Z] Zp	Z Coordinate of depth
[D] Groove width	Set a significant value, if the groove to perform is larger than that of the working tool (assessment for an absolute value greater than 0.1 mm). In this case the working generates multiple parallel passes spaced from each other so as to obtain the required width and with a minimum coverage equal to 20% of the tool digging width. The side of the groove development, with respect to the programmed Y position is given by the parameter ***Compensation*** (in the node: ***ADVANCED TECHNOLOGY DATA),*** that does not interpret the side correction, but the groove development side • **Off**=distributes the development on both sides • **Left**= left side • **Right**= right side.

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[T] Tool	Tool number
[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed
[FI] Movement speed	Interpolation speed

ADVANCED TECHNOLOGY DATA

[BETA] Beta angle	Pivoting angle
[CORD] Chord calculation	It calculates the chord value on blade entry
[DN] Compensation	It enables the compensation with side selection • **Off**=no compensation • **Left**= left side • **Right**= right side
[Z2EN] Enable Z2	It enables the double passage of the blade
[Z2] Z2	Depth coordinate of the intermediate passage
[FZ] Z2 Speed	Interpolation speed of the intermediate passage

While confirming the data, some custom errors may be displayed:

Custom errors

Custom Error 522: Invalid technology	If you set a Groove width and if width of the digging tool is greater than the value required

Custom Error 524: Null tool diameter	If you set a Groove width and if the width of the digging tool is width is less than 0.5 mm

Y BLADE

Blade working

It programs a blade working along the Y axis.

The parameters to be used are as follows:

GEOMETRIC PARAMETERS

[Y] Starting Y	Y coordinate of working start
[YF] Final Y	Y coordinate of working end
[X] Qx	X Coordinate of blade
[Z] Zp	Z Coordinate of depth
[D] Groove width	Set a significant value, if the groove to perform is larger than that of the working tool (assessment for an absolute value greater than 0.1 mm). In this case the working generates multiple parallel passes spaced from each other so as to obtain the required width and with a minimum coverage equal to 20% of the tool digging width. The side of the groove development, with respect to the programmed Y position is given by the parameter ***Compensation*** (in the node: ***ADVANCED TECHNOLOGY DATA),*** that does not interpret the side correction, but the groove development side • **Off**=distributes the development on both sides • **Left**= left side • **Right**= right side.

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number
[T] Tool	Tool number
[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed
[FI] Movement speed	Interpolation speed

ADVANCED TECHNOLOGY DATA

[BETA] Beta angle	Pivoting angle
[CORD] Chord calculation	It calculates the chord value on blade entry
[DN] Compensation	It enables the compensation with side selection • **Off**=no compensation • **Left**= left side • **Right**= right side
[Z2EN] Enable Z2	It enables the double passage of the blade
[Z2] Z2	Depth coordinate of the intermediate passage
[FZ] Z2 Speed	Interpolation speed of the intermediate passage

While confirming the data, some custom errors may be displayed:

Custom Errors

Custom Error 522: Invalid technology	If you set a Groove width and if width of the digging tool is greater than the value required
Custom Error 524: Null tool diameter	If you set a Groove width and if the width of the digging tool is width is less than 0.5 mm

XY BLADE

Blade working

It programs a blade working along a generic axis.

The parameters to be used are as follows:

GEOMETRIC PARAMETERS

[X] Starting X	X Coordinate of working start
[Y] Starting Y	Y Coordinate of working start
[Z] Zp	Z Coordinate of depth
[XF] Final X	X Coordinate of working end
[YF] Final Y	Y Coordinate of working end
[A] Angle	Angle of inclination of working in respect of X axis. If the final coordinate is set, it is disabled.
[U] Module	Length of the sawing segment. If the finale quote is set, it is disabled.

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number
[T] Tool	Tool number
[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed
[FI] Movement speed	Interpolation speed

ADVANCED TECHNOLOGY DATA

[BETA] Beta angle	Pivoting angle
[CORD] Chord calculation	It calculated the chord value on blade entry
[DN] Compensation	It enables the compensation with side selection • **Off**=no compensation • **Left**= left side • **Right**= right side
[Z2EN] Enable Z2	It enables the double passage of the blade
[Z2] Z2	Depth coordinate of the intermediate passage
[FZ] Z2 Speed	Interpolation speed of the intermediate passage

ENTRY AND EXIT SEGMENTS

[INEN] Entry segments	It enables or disables the control of the entry segment of the blade.
[OUEN] Exit segment	It enables or disables the management of the exit segment of the blade.
[IOLL] Length	It sets the length of the entry and exit segment

L01:Pf

Working programming a linear segment
L01 Pf Linear

It programs a linear segment from the current point, defining the final point dimensions directly.

The parameter to be used are the following ones:

GEOMETRIC PARAMETERS

[XI] Starting X [YI] Starting Y [ZI] Starting Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned upstream is carried on, otherwise an open profile starts (without setup).
[X] Final X [Y] Final Y [Z] Final Z	Final point coordinates. This is the application point
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A dimension can be forced as absolute by entering **"a;"** before the same dimension. For instance, if a Y dimension relative to the previous point but with absolute X dimension = 50 has to be programmed, the relative flag shall be enabled and X dimension shall be set = a;50.

TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the interpolated segment. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if interrupted or suspended, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode** only.
[F] Speed movement	It sets a movement speed value different from what set in the previous profile blocks.

L02: C,U,A

Working programming a linear segment
L02 Linear with polar coordinates (C,U,A)

It programs a linear segment, from the current point, defining the final point in polar dimensions directly. Pole, angle and module are assigned. The application point is calculated in an indirect way.

The parameter to be used are the following ones:

GEOMETRIC PARAMETERS

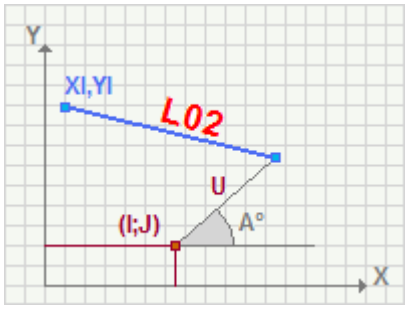
[XI] Starting X [YI] Starting Y [ZI] Starting Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned upstream is carried on, otherwise an open profile starts (without setup).
[Z] Final Z	Final Z coordinate
[I] X Centre [J] Y Centre	Pole coordinates. If not specified the starting dimension of the segment are taken on.
[A] Angle	Angle on xy plane against X axis (in degrees).
[U] Module	Distance of point of application or final point from pole.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A dimension can be forced as absolute by entering **"a;"** before the same dimension. For instance, if a Y dimension relative to the previous point but with absolute X dimension = 50 has to be programmed, the relative flag shall be enabled and X dimension shall be set = a;50.

TECHNOLOGICAL PARAMETERS

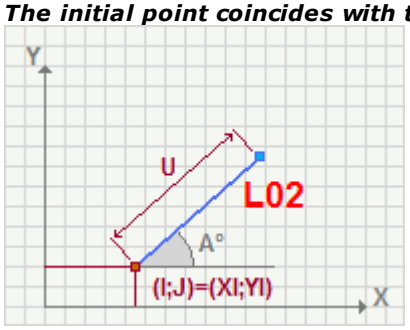
[DVAR] Compensation	It changes the tool compensation in the interpolated segment. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of compensation after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode** only.
[F] Speed movement	It sets a movement speed value different from what set in the previous profile blocks.

Particular cases:
If the value of the **Module** parameter is equal to 0, the dimensions of the programmed pole (X Centre and Y Centre) are used.

EXAMPLE:
The initial point does not coincide with the pole:



The initial point coincides with the pole:



L04: C,A,Xf

Working programming a linear-polar segment
L04 Linear with polar coordinates (C,A,Xf)

It programs a linear segment, starting from the current point, defining the final point in polar coordinates. Pole, angle and X dimension of the final point are assigned. The Y coordinate of the application point is calculated in an indirect way. as a point of intersection between the line passing through the pole with the inclination assigned in the **[A] Angle** parameter and the vertical line passing through **Final X coordinate.**

The parameter to be used are the following ones:

GEOMETRIC PARAMETERS

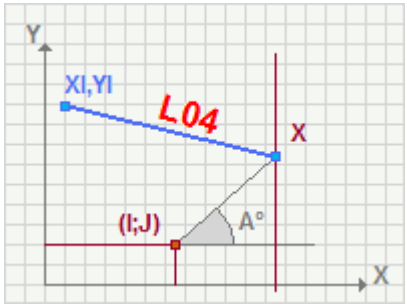
[XI] Starting X [YI] Starting Y [ZI] Starting Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned upstream is carried on, otherwise an open profile starts (without setup).
[X] Final X	X Coordinate of the final point It is the X point of application
[Z] Final Z	Final Z dimension.
[I] X Centre [J] Y Centre	Pole dimensions. If not specified the starting dimension of the segment are taken on.
[A] Angle	Angle on xy plane against X axis (in degrees).
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A dimension can be forced as absolute by entering **"a;"** before the same dimension. For instance, if a Y dimension relative to the previous point but with absolute X dimension = 50 has to be programmed, the relative flag shall be enabled and X dimension shall be set = a;50.

TECHNOLOGICAL PARAMETERS

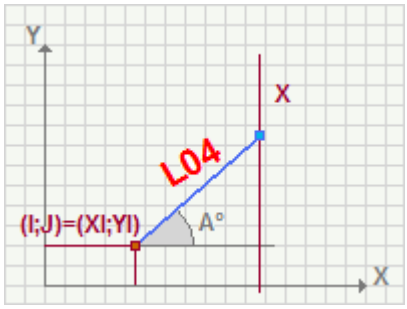
[DVAR] Compensation	It changes the tool compensation in the interpolated segment. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Compensation Tool**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode** only.
[F] Speed movement	It sets a movement speed value different from what set in the previous profile blocks.

Cases of error:
If the value calculated in the Module (distance between the pole and the application point)**,** has an infinite value, the Y coordinate of the final point coincides with the Y coordinate of the pole (**Y Centre**). The displayed message of error is no. 192:" Radius computed as infinite"

EXAMPLE:
The coordinates of the initial point do not coincide with the pole coordinates.



The coordinates of the initial point coincides with the pole coordinates.



L05: C,A,Yf

Working programming a linear segment
L05 Linear with polar coordinates (C,A,Yf)

It programs a linear segment, starting from the current point, defining the final point in polar coordinates. Pole, angle and X coordinate of the final point are assigned. The X coordinate of the application point is calculated in an indirect way. as a point of intersection between the line passing through the pole with the inclination assigned in the **[A] Angle** parameter and the horizontal line passing through **Final X coordinate.**

The parameter to be used are the following ones:

GEOMETRIC PARAMETERS

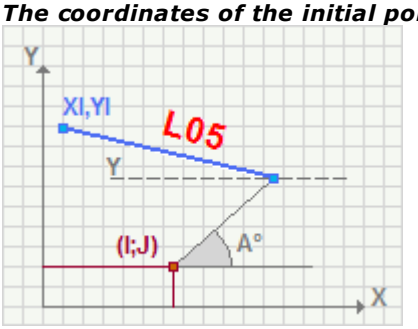
[XI] Starting X [YI] Starting Y [ZI] Starting Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned upstream is carried on, otherwise an open profile starts (without setup).
[Y] Final Y	Y Dimensions of the final point. It is the point of application
[DVAR] Compensation	Final Z dimension
[I] X Centre [J] Y centre	Pole dimensions. If not specified the starting dimension of the segment are taken on.
[A] Angle	Angle on xy plane against X axis (in degrees)
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A dimension can be forced as absolute by entering **"a;"** before the same dimension. For instance, if a Y dimension relative to the previous point but with absolute X dimension = 50 has to be programmed, the relative flag shall be enabled and X dimension shall be set = a;50.

TECHNOLOGICAL PARAMETERS

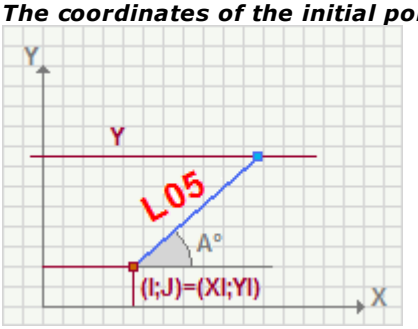
[DVAR] Compensation	It changes the tool compensation in the interpolated segment. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=** it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode** only.
[F] Speed movement	It sets a movement speed value different from what set in the previous profile blocks.

Cases of error:
If the value calculated in the Module (distance between the pole and the application point)**,** has an infinite value, the X coordinate of the final point coincides with the X coordinate of the pole (**X Centre**). The displayed message of error is no. 192:" Radius computed as infinite"

EXAMPLE:
The coordinates of the initial point do not coincide with the pole coordinates.



The coordinates of the initial point do coincide with the pole coordinates.



L09: Tgin_3d;U

Working programming a linear segment
L09 programmed length-linear (Tgin;U)

It programs a linear segment, having assigned length and inclination (arrival tangent) in the XYZ space. The point of application is calculated in an indirect way.

The parameter to be used are the following ones:

GEOMETRIC PARAMETERS

[U] Module	Length of the linear segment

TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the interpolated segment. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode** only.
[F] Speed movement	It sets a movement speed value different from what set in the previous profile blocks.

Particular cases:

- If the value of the linear segment is null **(Module** parameter) a null length segment is carried out.

L10 Pf=setup

Working for the profile end with linear segment

Working that ends a profile with a linear segment connecting the current point with the initial point of the same profile.

TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the interpolated segment. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode** only.
[F] Speed movement	It sets a movement speed value different from what set in the previous profile blocks.

Particular cases:
if the segment opens a profile and therefore it does not continue an existing previous profile, a null segment is carried out.

L12: Tgin;U

Working programming a linear segment
L12 linear segment of programmed length (Tgin;U)

It programs a linear segment, having assigned length and direction on XY plane. The application point is calculated in an indirect way.

The parameter to be used are the following ones:

GEOMETRIC PARAMETERS

[XI] Starting X [YI] Starting Y [ZI] Starting Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned upstream is carried on, otherwise an open profile starts (without setup).
[Z] Final Z	Final Z coordinate
[U] Module	Length of the linear segment
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A dimension can be forced as absolute by entering **"a;"** before the same dimension. For instance, if a Y dimension relative to the previous point but with absolute X dimension = 50 has to be programmed, the relative flag shall be enabled and X dimension shall be set = a;50.

ENTRY TANGENT

[TGIN] Arrival tangent	The segment takes on the exit tangent of the previous segment as entry tangent. If selected, it de-enables the input of the parameters of the starting tangent.
[A1] A1	Direction Angle of the segment. If selected, the dimensions of the starting tangent are not interpreted.
[X1] X1 [Y1] Y1	Dimensions of the first point of assignation of the starting tangent. If a value is assigned to the **A1** parameter, the set values are not interpreted.
[X2] X2 [Y2] Y2	Coordinates of the second assignment point of the starting tangent. If a value is assigned to the **A1** parameter, the set values are not interpreted.

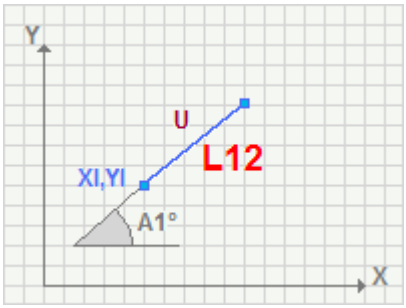
TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the interpolated segment. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Compensation Tool**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode** only.
[F] Movement speed	It sets a movement speed value different from what set in the previous profile blocks.

Particular cases:
- If the value of the linear segment is null **(Module** parameter) a null length segment is carried out.

Cases of error:
- If the entry coordinate is assigned with two coincident points, a horizontal tangent (inclination 0°) is taken on. The displayed message of error no. 196:"Invalid entry tangent".

EXAMPLE:



L13: TgIn, Pf on Lout

Working programming a linear segment
L13 Linear segment with inclination (TgIn, Pf on Lout)

It programs a linear segment defining its entry tangent and the end (final point) on intercept line. The point of application is assigned in an indirect way.

The parameter to be used are the following ones:

GEOMETRIC PARAMETERS

[XI] Starting X [YI] Starting Y [ZI] Starting Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned upstream is carried on, otherwise an open profile starts (without setup).
[Z] Final Z	Final Z coordinate.

ENTRY TANGENT

[TGIN] Arrival tangent	The segment takes on the exit tangent of the previous segment as entry tangent. If selected, it de-enables the input of the parameters of the starting tangent.
[A1] A1	Angle of direction of the segment. If selected, the dimensions of the starting tangent are not interpreted.
[X1] X1 [Y1] Y1	Coordinates of the first assignment point of the starting tangent. If a value is assigned to the **A1** parameter, the set values are not interpreted.
[X2] X2 [Y2] Y2	Coordinates of the second assignment point of the starting tangent. If a value is assigned to the **A1** parameter, the set values are not interpreted.

ARRIVAL INTERCEPT LINE

[A2] A2	Angle of inclination of the intercept line. If set, X4 and Y4 dimensions are not interpreted.
[X3] X3 [Y3] Y3	First point of assignation of the intercept line.
[X4] X4 [Y4] Y4	Second point of assignation of the intercept line. If a value is assigned to the **A2** parameter, the set values are not interpreted.

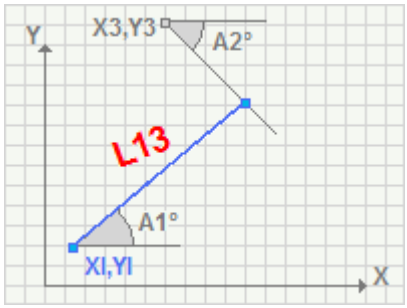
TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the segment between poles. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode** only.
[F] Movement speed	It sets a movement speed value different from what set in the previous profile blocks.

Cases of error:

- If the entry tangent is assigned with two coincident points, a horizontal tangent (Inclination 0°) is taken on. The displayed message of error is no. 196:"Invalid entry tangent".
- If the intercept line coincide is assigned with two coincident points, the horizontal line (Inclination 0°) passing through **X3,Y3** is taken on as intercept line. The displayed message of error is no. 197:"Invalid exit tangent"
- If the starting tangent and the intercept line are parallel or no intersection point exists on the half-line starting from the starting point of application with assigned angulation, a null segment is carried out. The displayed message of error no. 195:" Invalid interception line"

EXAMPLE:
Input data: coordinates of the XI, YI initial point angle of inclination of starting tangent A1, arrival intercept line X3,Y3 and A2 parameters



L14: C,A,Pf on Lout

Working programming a linear segment
L14 Linear segment with assignment in a polar system (C,A,Pf on Lout)

It programs a linear segment in a polar system defining its end (final point) on intercept line. The point of application is assigned in an indirect way.

The parameter to be used are the following ones:

GEOMETRIC PARAMETERS

[XI] Starting X [YI] Starting Y [ZI] Starting Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned upstream is carried on, otherwise an open profile starts (without setup).
[I] X Centre [J] Y Centre	Pole dimensions. If not assigned, it takes on the dimensions of the starting point.
[A] Angle	Angle on xy plane against X axis.
[Z] Final Z	Final Z coordinate.
[EG] Relative	If selected, it indicates that the coordinates of all the enabled axes are assigned in relative values. A dimension can be forced as absolute by entering **"a;"** before the same dimension. For instance, if a Y dimension relative to the previous point but with absolute X dimension = 50 has to be programmed, the relative flag shall be enabled and X dimension shall be set = a;50.

ARRIVAL INTERCEPT LINE

[A2] A2	Angle of inclination of the intercept line. If set, X4 and Y4 dimensions are not interpreted.
[X3] X3 [Y3] Y3	First point of assignation of the intercept line.
[X4] X4 [Y4] Y4	Second point of assignation of the intercept line. If a value is assigned to the **A2** parameter, the assigned values are not interpreted.

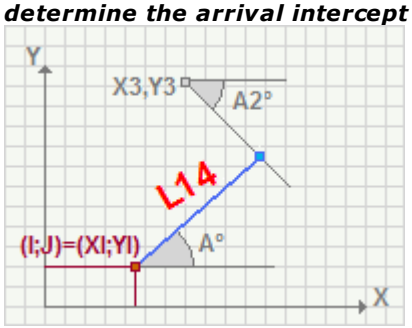
TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the segment between poles. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode** only.
[F] Movement speed	It sets a movement speed value different from what set in the previous profile blocks.

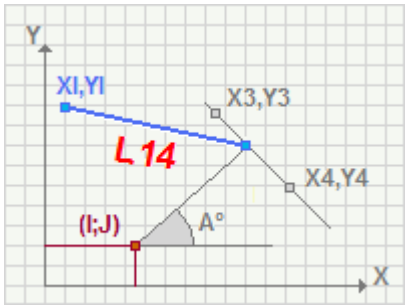
Particular cases:

- If the intercept line is assigned with two coincident points, the horizontal line (inclination 0°) passing through **X3,Y3** is taken on as intercept line.
- If the line defined by the **Angle** parameter and the intercept line are parallel or if no intersection point exists on the half-line starting from the pole with assigned angle, a null segment is carried out.

EXAMPLE:
The starting point coincides with the pole. The parameters X3, Y3 and A2 are assigned, to determine the arrival intercept line.



The starting point does not coincide with the pole. For the determination of the arrival line, the two points for the determination of the intercept line are assigned.



A01: Pf,C,Cw

Working programming a circular segment
A01 Arc in the xy plane with assignment of (Pf,C,Cw)

It programs a circle segment with assignation of a final point, centre, direction on xy plane with possible helicoidal development.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[X] Final X [Y] Final Y [Z] Final Z	Coordinates of the final point. It is the point of application
[EW] Direction	Direction of rotation • **Clockwise**= arc with Clockwise rotation. • **Counterclockwise**= arc with counterclockwise rotation
[I] X Centre [J] Y Centre	Dimensions of the arc centre. Incremental against the starting point of the arc. A centre dimension can be forced as absolute by indicating**"a;"**before the same coordinate.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values.

TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the segment. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode** only.
[F] Speed movement	It sets a movement speed value different from what set in the previous profile blocks.

Particular cases:
the starting point of the arc (XI, YI) is distinguished from the final point (X,Y):
- if both the centre coordinates were set:
  1. it verifies the consistency of the arc checking the equality of final radius and starting radius: if they differ by more than an *epsilon,* an error appears.
- if one of the two dimensions of the centre is not set, it solves the arc calculating the centre dimension that was not set;

the starting point of the arc (XI, YI) is not distinguished from the final point (X,Y):

- it sets the non-set dimension of the centre as equal to the dimension of the starting point and it carries out the resulting circle

Cases of error:
the starting point of the arc (XI, YI) is distinguished from the final point (X,Y):
- if no dimension of the centre is set, it carries out a linear segment up to the programmed point. The displayed message of error is no. 194:"Invalid arc"

the starting point of the arc (XI, YI) is not distinguished from the final point (X,Y):
- if the dimensions of the center coincide with the dimensions of the starting point (XI, YI) a null arc is carried out. The displayed message of error is no. 200: "Invalid arc (points are not distinguished)".

A04: P1,Pf

Working programming a circular segment
A04 Arc in the yx plane with assignment of three points (P1,Pf)

It programs a circle segment with assignation of three points, with helicoidal development direction on z.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[X] Final X [Y] Final Y [Z] Final Z	Coordinates of the final point. It is the point of application
[EW2] Direction	Direction of rotation • **Automatic**=it joins the starting point with the final point choosing a direction that involves the passes through point X1,Y1 • **Clockwise** it joins the starting point with the final point creating an arc with clockwise direction. Not necessarily the arc shall get through X1,Y1 • **Counterclockwise**= it joins the starting point with the final point creating an arc with anticlockwise direction. Not necessarily the arc shall pass through X1,Y1
[X1] X1 [Y1] Y1	Dimensions of a point on the arc. The point can belong to the circumference but not to the arc.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate as absolute can be forced by entering **"a;"** before the same dimension. For instance, if a Y dimension relative to the previous point, but with absolute X dimension = 50 has to be programmed, the relative flag shall be enabled and X dimension shall be set = a;50.

TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the segment. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=** it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode** only.
[F] Speed movement	It sets a movement speed value different from the settings in the previous profile blocks.

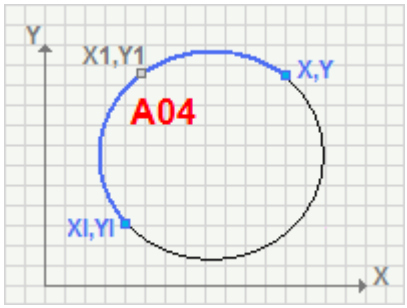
Particular cases:

- If (XI,YI) starting point and (X,Y) final point coincide, a *circle* is carried out with centre in the midpoint of the segment that joins the starting point and the point on the arc defined by X1,Y1 coordinates and direction of rotation as programmed.
- If (X1,Y1) point is not distinguished from the starting point (XI, YI) or from the final point (X,Y) a *half-circle* is drawn from the starting point to the final point, with centre in the midpoint of the segment that joins the two points and the direction of rotation as programmed.

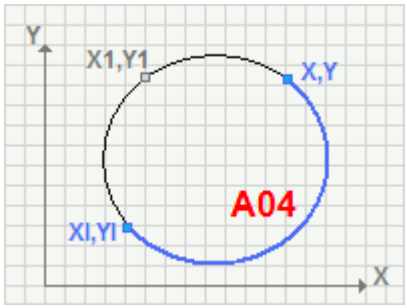
Cases of error:

- If the three points coincide, it carried out a null linear segment. The displayed message of error is no. 200: "Invalid arc (points are not distinguished)".
- if the three points are distinguished but aligned, it carries out a linear segment up to the programmed point of application (final point). The displayed message of error is no. 201:"Invalid arc (points aligned)".

EXAMPLE:
the arc goes through the X1, Y1 point



the arc does not go through the X1, Y1 point



A11: Pf,R,CW

Working programminga circular segment
A11 Arc on the xy plane with assignment of the (Pf,R,CW) radius

It programs a circle section with assignation of final point, radius, direction of rotation, selection between major and minor arc and helicoidal development on z.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[X] Final X [Y] Final Y [Z] Final Z	Coordinates of the final point. It is the point of application
[EW] Direction	Direction of rotation • **Clockwise**= an arc with Clockwise rotation. • **Counterclockwise=** an arc with counterclockwise rotation
[U] Radius	Value of the arc radius.
[AR] Arc	Arc selection. The choice is between Major and Minor.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A dimension can be forced as absolute by entering **"a;"**before the same dimension. For instance, if a Y dimension relative to the previous point but with absolute X dimension = 50 has to be programmed, the relative flag shall be enabled and X dimension shall be set = a;50.

TECHNOLOGICAL PARAMETERS

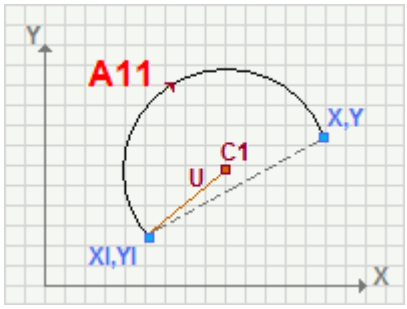
[DVAR] Compensation	It changes the tool compensation in the segment. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual chapter **Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode** only.
[F] Speed movement	It sets a movement speed value different from the settings in the previous profile blocks.

Cases of error:

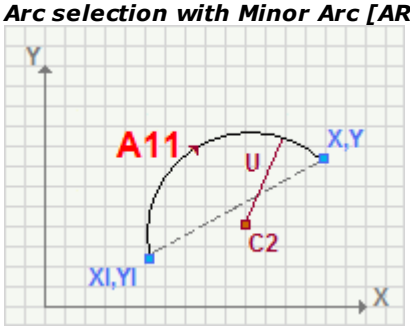
- If the dimensions of the starting point, (XI, YI), and of the final point, (X,Y), coincide, it resolves a null arc. The displayed message of error is no. 201:"Invalid arc (points aligned)"
- If the value of the Radius parameter is null, it draws a half-circle that joins the initial and the final point. The displayed message of error is no.193:"Radius null".

- If the value of the Radius parameter is less than the half-distance between the initial point and the final point, it draws a linear segment from the initial point to the final point. The displayed message of error is no. 194:"Invalid arc".

EXAMPLE:
Arc selection with Major Arc [AR] parameter and clockwise rotation



Arc selection with Minor Arc [AR] parameter and clockwise rotation



A13: C,Af

Working programming a circular segment
A13 Arc in the plane with assignation of (C, Af)

It programs a circle segment with assignment of centre, final angle and direction.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[Z] Final Z	Final depth dimension
[EW] Direction	Direction of rotation • **Clockwise**= an arc with Clockwise rotation. • **Counterclockwise**= an arc with counterclockwise rotation
[I] X Centre [J] Y Centre	Dimensions of the arc center, incremental against the starting point of the arc. A coordinate can be forced as absolute by entering **"a;"** before the same coordinate.
[A] Ending A (°)	Final angle. In degrees.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values.

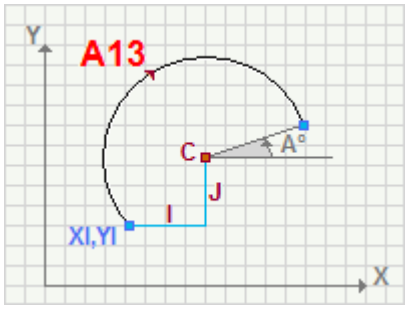
TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the segment between poles. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual chapter **Workings->Profile->Tool compensation.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode** only.
[F] Speed movement	It sets a movement speed value different from the settings in the previous profile blocks.

Cases of error:

- If the centre coincides with the initial point, the radius is null. The displayed message of error is no. 193: "Radius null".

EXAMPLE:


Y
A13
C
A°
J
I
XI,YI
X

A14: C,dA

Working programming a circular arc
A14 Arc the xy plane with assignation of covered angle (C, dA)

It programs a circle segment with assignation of centre, covered angle and direction with possible helicoidal development of Z axis.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

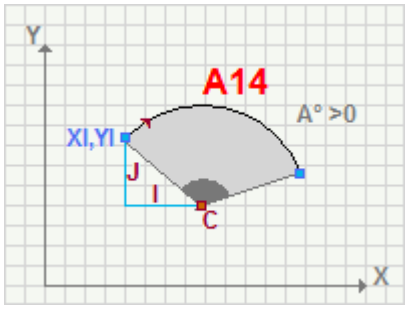
[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[Z] Final Z	Final depth dimension
[EW] Direction	Direction of rotation • **Clockwise**= an arc with Clockwise rotation. • **Counterclockwise**= an arc with counterclockwise rotation
[I] X Centre [J] Y Centre	Dimensions of the arc, incremental against the starting point of the arc. A coordinate can be forced as absolute by entering **"a;"**before the same dimension.
[A] A Path	Angle covered by the arc (in degrees). The positive value determines a clockwise direction of the rotation; the negative value determines an anticlockwise direction of the rotation; the null value carries out a circle with clockwise direction of the rotation.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values.

TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the segment between poles. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Tool compensation.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode** only.
[F] Speed movement	It sets a movement speed value different from the settings in the previous profile blocks.

Cases of error:

- If the centre coincide with initial point, the radius is null. The displayed message of error is no.193: "Radius null".


Y
A14
A° >0
Xl,Yl
J
I
C
X

A16: Pf,TgIn

Working programming a circular segment
A16 Arc in the xy plane with assignement of entry tangent (Pf, TgIn)

It programs a circle segment with assignation of final point, entry tangent on xy plane and rotation direction.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[X] Final X [Y] Final Y [Z] Final Z	Final point coordinates. This is the application point
[EW2] Direction	Direction of rotation • **Automatic**= it chooses the arc that permits to leave the starting tangent with continuity. • **Clockwise**= it chooses the arc with clockwise rotation • **Counterclockwise**= it chooses the arc with Counterclockwise rotation
[EG] Relative	If selected it indicates that the dimensions of all the axes are assigned in relative values.

ENTRY TANGENT

[A1] A1	Angle of the starting tangent. If selected, the dimensions of the starting tangent are not interpreted.
[X1] X1 [Y1] Y1	Dimensions of the first point of assignation of the starting tangent. If a value is assigned, to the **A1** parameter the setting values are not interpreted.
[X2] X2 [Y2] Y2	Dimensions of the second point of assignation of the starting tangent, if a value is assigned to **A1** parameter, the setting values are not interpreted.
[TGIN] Arrival tangent	The segment takes on the exit tangent of the previous segment as entry tangent. If selected, it de-enables the input of the parameters of the starting tangent.

TECHNOLOGICAL PARAMETERS

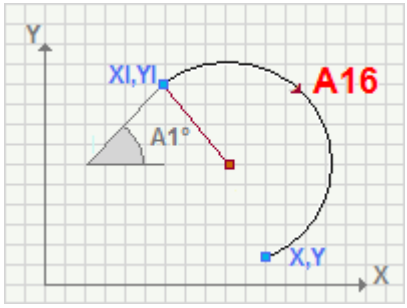
[DVAR] Compensation	It changes the tool compensation in the segment. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Tool compensation.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry.

	This option is available in **Professional mode** only.
[F] Speed movement	It sets a movement speed value different from the settings in the previous profile blocks.

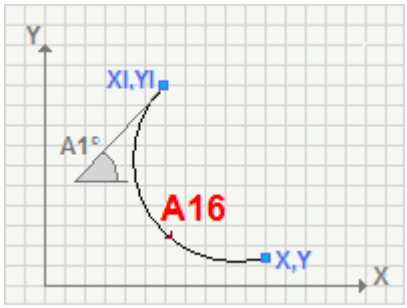
Cases of error:

- If the entry tangent is assigned with two coincident points, the horizontal tangent (inclination 0°) is taken on. The displayed message of error no. 196:"Invalid entry tangent".
- If the final point and the starting point of the arc coincide, a null arc is created. The displayed message of error is no. 194:"Invalid arc".
- If the final point and initial point of the arc are aligned on the tangent, a linear segment is determined up to the final point. The displayed message of error is no. 194:"Invalid arc".

EXAMPLE:
Choosing the Direction [EW2]: Automatic or Clockwise



Choosing the Direction [EW2]: Counterclockwise



A17: Pf,TgOut

Working programming a circular segment
A17 Arc with assignment of exit tangent (Pf, TgOut)

It programs a circle segment with assignment of final point, exit tangent on xy plane and direction.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[X] Final X [Y] Final Y [Z] Final Z	Coordinates of the final point. Itis the point of application
[EW2] Direction	Direction of rotation • **Automatic=** an arc with direction of rotation ensuring its ending with continuity on the final tangent. • **Clockwise**= an arc with Clockwise rotation. • **Countercklockwise**= an arc with counterclockwise rotation
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A dimension can be forced as absolute by entering **"a;"**before the same dimension. For instance, if a Y coordinate of the previous point, but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate shall be set = a;50.

EXIT TANGENT

[A2] A2	Angle of the arrival tangent. If selected, the dimensions of the starting tangent are not interpreted.
[X3] X3 [Y3] Y3	Coordinates of the first point of assignment of the arrival tangent. If a value is assigned to the **A2** parameter, the setting values are not interpreted.
[X4] X4 [Y4] Y4	Coordinates of the second point of assignment. If a value is assigned to the **A2** parameter, the setting values are not interpreted.

TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the segment. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Tool compensation.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode** only.

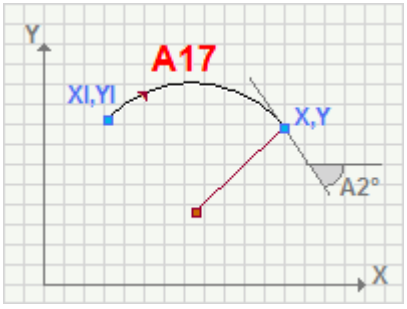
[F] Speed movement	It sets a movement speed value different from the settings in the previous profile blocks.

Cases of error:

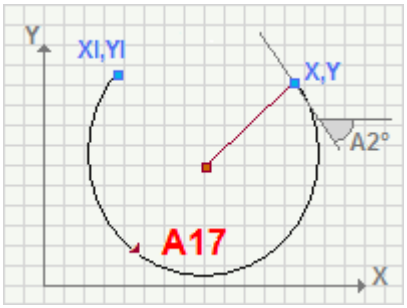
- If the exit tangent is assigned with two coincident points, 0° inclinationis taken on. The displayed message of error is no. 197:"Invalid exit tangent".
- If the final point and the starting point of the arc coincide, a null arc is generated. The displayed message of error is no. 194:"Invalid arc".
- If the final point and initial point of the arc are aligned on the tangent, a linear segment is determined up to the final point. The displayed message of error is no. 194:"Invalid arc".

EXAMPLE:

Selection of the direction [EW2]: Automatic or Clockwise



Selection of the direction [EW2]: Counterclockwise



A19: Pf=setup,TgIn

Working programming a circular segment
A19 Arc with assignation of final point Pf=setup,TgIn

It programs a circle segment with assignment of entry tangent on xy plane, final point coinciding with the setup point of the profile and direction of rotation.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[EW2] Direction	Direction of rotation • **Automatic=** an arc with direction of rotation that permits to get out with continuity to the starting tangent. • **Clockwise**= an arc with clockwise rotation. • **Counterclockwise**= an arc with counterclockwise rotation

ENTRY TANGENT

[TGIN] Arrival tangent	The segment takes on the exit tangent of the previous segment as entry tangent. If selected, it desables the input of the parameters of the starting tangent.
[A1] A1	Angle of the starting tangent. If selected, the dimensions of the starting tangent are not interpreted.
[X1] X1 [Y1] Y1	Coordinates of the first point of assignment of the starting tangent. If a value is assigned to the **A1** parameter, the setting values are not interpreted.
[X2] X2 [Y2] Y2	Coordinates of the second point of assignment of the starting tangent. If a value is assigned to the **A1** parameter, the setting values are not interpreted.

TECHNOLOGICAL PARAMETERS

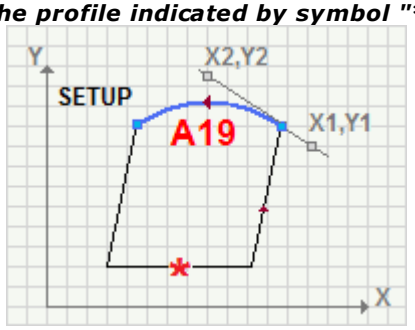
[DVAR] Compensation	It changes the tool compensation in the segment. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Tool compensation.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode** only.
[F] Speed movement	It sets a movement speed value different from what set in the previous profile blocks.

Cases of error:

- If the exit tangent is assigned with two coincident points, 0° inclinationis taken on. The displayed message of error no. 197:"Invalid exit tangent".

- If the final point and the starting point of the arc coincide, a null arc is generated. The displayed message of error is no. 194:"Invalid arc".
- If the final point and initial point of the arc are aligned on the tangent, a linear segment is determined up to the final point. The displayed message of error is no. 194:"Invalid arc".

EXAMPLE:
The profile indicated by symbol "*" (asterisk) is assigned before the segment A19



A21: Pf=setup,TgOut

Working programming a circular segment
A21 Arc with assignation of exit tangent and final point (Pf=setup,TgOut)

It programs a circle segment with assignment of exit tangent on xy plane, final point coinciding with the setup point of the profile and direction of rotation.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[EW2] Direction	Direction of rotation • **Automatic=** an arc with direction of rotation ensuring its ending with continuity on the final tangent. • **Clockwise**= an arc with clockwise rotation. • **Counterclockwise**= it defines an arc with counterclockwise rotation

EXIT TANGENT

[A2] A2	Angle of the arrival tangent. If selected, the dimensions of the starting tangent are not interpreted.
[X3] X3 [Y3] Y3	Dimensions of the first point of assignment of the arrival tangent. If a value is assigned to the **A2** parameter, the setting values are not interpreted.
[X4] X4 [Y4] Y4	Coordinates of the second point of assignment. If a value is assigned to the **A2** parameter, the setting values are not interpreted.
[TGOUT] Starting tangent	If selected, it sets the arrival tangent with the same parameters of the arrival tangent of the profile. In this case **A2, X3,Y3, X4,Y4** parameters are not interpreted.

TECHNOLOGICAL PARAMETERS

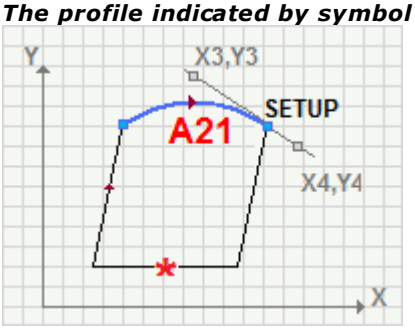
[DVAR] Compensation	It changes the tool compensation in the segment. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Tool compensation**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode** only.
[F] Speed movement	It sets a movement speed value different from the settings in the previous profile blocks.

Cases of error:

- If the exit tangent is assigned with two coincident points, 0° inclinations taken on. The displayed message of error no. 197:"Invalid exit tangent". The displayed message of error is no. 197:"Invalid exit tangent".

- If the final point and the starting point of the arc coincide, a null arc is generated. The displayed message of error is no. 194:"Invalid arc".

EXAMPLE:
The profile indicated by symbol "*" (asterisk) is assigned before the segment A21



A23: TgIn,TgOut,Pf on TgOut

Working programming a circular segment
A23 Arc with assignment of intercept line (TgIn, TgOut, Pf on TgOut)

It programs a circle segment with assignation of entry tangent on xy plane, intercept line tangent to the final point and direction of rotation.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X
[YI] Initial Y
[ZI] Initial Z
: Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).

[Z] Final Z
: Final depth dimension. It is the application point

[EW2] Direction
: Direction of rotation
- **Automatic=** an arc with direction of rotation that permits to get out with continuity to the starting tangent.
- **Clockwise**= an arc with Clockwise rotation.
- **Counterclockwise**= an arc with Counterclockwise rotation

[EG] Relative
: If selected, it indicates that the coordinates of all the axes are assigned in relative values. A dimension can be forced as absolute by entering **"a;"** before the same dimension. For instance, if a Y coordinate of the previous point, but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate shall be set = a;50.

ENTRY TANGENT

[TGIN] Arrival tangent
: If selected, it sets the starting tangent as assigned on the previous segment. In this case the **A1, X1,Y1, X2,Y2 parameters** are not interpreted.

[A1] A1
: Angle of the starting tangent. If selected, the coordinates of the starting tangent are not interpreted.

[X1] X1
[Y1] Y1
: Coordinates of the first point of assignment of the starting tangent. If a value is assigned to **A1** parameter, the setting values are not interpreted.

[X2] X2
[Y2] Y2
: Coordinates of the second point of assignment of the starting tangent. If a value is assigned to the **A1** parameter, the setting values are not interpreted.

EXIT TANGENT LINE AND INTERCEPT LINE

[A2] A2
: Angle of the arrival tangent and intercept line. If set, the X4 and Y4 coordinates are not interpreted.

[X3] X3
[Y3] Y3
: First assignment point of the intercept line.

[X4] X4
[Y4] Y4
: Coordinates of the second point of assignment. If a value is assigned to the **A2** parameter, the setting values are not interpreted.

TECHNOLOGICAL PARAMETERS

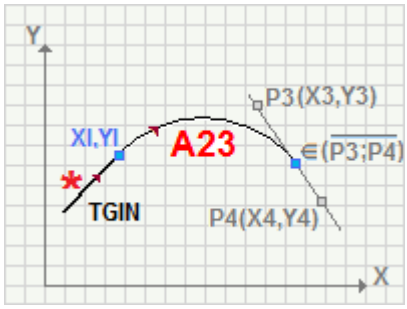
[DVAR] Compensation
: It changes the tool compensation in the segment between poles. Choice is made among:
- **Unchanged=** it carries on the present status;
- **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation);
- **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption.
- **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is

	calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual chapter **Working->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode** only.
[F] Speed movement	It sets a movement speed value different from the settings in the previous profile blocks.

Cases of error:

- If the exit tangent is assigned with two coincident points, 0° inclination is taken on. Displayed message of error no. 197: "Invalid Exit tangent"
- If the entry tangent line is assigned with two coincident points, a horizontal tangent (0° inclination) is taken on. Displayed message of error no. 196: "Invalid Entry tangent"
- If the starting point lies on the exit intercept line, it determines a null arc. The displayed message of error is no. 195 :"Invalid intersection line"

EXAMPLE:
The arrival tangent parameter [TGIN] is selected. The previous segment is pointed out by symbol "*" (asterisk). The final point of the arc lies on the intercept line of the exit, that determines also the arrival tangent of the arc



A25: TgIn,R,TgOut

Working programming a circular segment
A25 Arc with assignation of the arrival tangent point (TgIn,R,TgOut)

It programs a circle segment with assignation of entry tangent on xy plane, radius, tangent on final point and direction of rotation. The final point is calculated in an indirect way.
The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[Z] Final Z	Final depth coordinate
[EW2] Direction	Direction of rotation • **Automatic=** an arc with direction of rotation that permits to get out with continuity to the starting tangent. • **Clockwise**= an arc with Clockwise rotation. • **Counterclockwise**= an arc with Counterclockwise rotation
[U] Radius	Arc radius
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A dimension can be forced as absolute by entering **"a;"** before the same dimension. For instance, if a hole with Y dimension relative to the previous point but with absolute X dimension = 50 has to be programmed, the relative flag shall be enabled and X dimension shall be set = a;50.

ENTRY TANGENT

[A1] A1	Angle of the starting tangent. If selected, the dimensions of the starting tangent are not interpreted.
[X1] X1 [Y1] Y1	Coordinates of the first point of assignment of the starting tangent. If a value is assigned to **A1** parameter, the setting values are not interpreted.
[X2] X2 [Y2] Y2	Coordinates of the second point of assignment of the starting tangent. If a value is assigned to the **A1** parameter, the setting values are not interpreted.
[TGIN] Arrival tangent	If selected, it sets the arrival tangent with the same parameters of the arrival tangent of the profile. In this case **A1, X1,Y1, X2,Y2** parameters are not interpreted.

EXIT TANGENT LINE AND INTERCEPT LINE

[A2] A2	Angle of the arrival tangent. If selected, the coordinates of the starting tangent are not interpreted.
[X3] X3 [Y3] Y3	Dimensions of the first point of assignment of the arrival tangent. If a value is assigned to the **A2** parameter, the setting values are not interpreted.
[X4] X4 [Y4] Y4	Coordinates of the second point of assignment. If a value is assigned to the **A2** parameter, the setting values are not interpreted.

TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the segment. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is

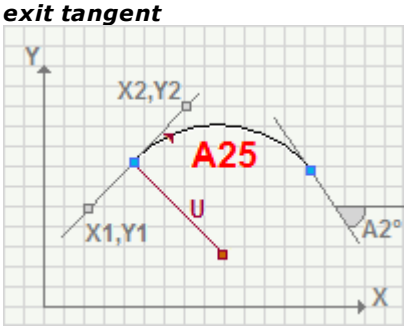
	calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode** only.
[F] Speed movement	It sets a movement speed value different from the settings in the previous profile blocks.

Cases of error:

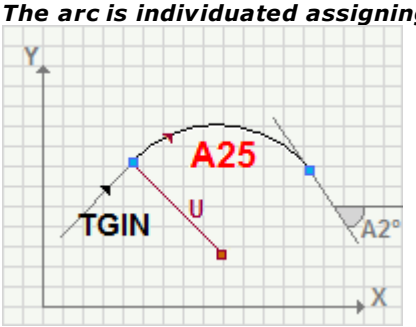
- If the exit tangent is assigned with two coincident points, 0° inclination is taken on. Displayed message of error no. 197: "Invalid Exit tangent"
- If the entry tangent line is assigned with two coincident points, a horizontal tangent (0° inclination) is taken on. Displayed message of error no. 196: "Invalid Entry tangent"
- If the value of the Radius is null, it determines a null arc. Displayed message of error no.193: "Radius null".

EXAMPLE:

The arc is individuated assigning the values for the determination of the entry tangent and exit tangent



The arc is individuated assigning the values for the exit tangent



A29: Fillet

Working Programming a Fillet

It programs a linear segment and an arc defining a fillet on xy plane, at a programmed edge.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[Z] Final Z	Final depth.
[EW2] Direction	Direction of rotation • **Automatic=** an arc with direction of rotation that allows the closure with continuity on the initial tangent. • **Clockwise**= an arc with clockwise rotation. • **Counterclockwise**= an arc with counterclockwise rotation
[U] Fillet	Radius of the fillet arc.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A dimension can be forced as absolute by entering **"a;"**before the same dimension. For instance, if a Y coordinate of the previous point, but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate shall be set = a;50.

EXIT and INTERCEPT TANGENT LINE

[X3] X edge [Y3] Y edge	Dimensions of the first point of assignation of the exit tangent. It is the edge point.
[A2] A2	Angle of the exit tangent. If set, the dimensions of the second point of definition of the exit tangent are not interpreted.
[X4] X4 [Y4] Y4	Coordinates of the second point of assignation of the exit tangent. If value is assigned to **A2** parameter, the setting values are not interpreted.

TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the segment. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode** only.

[F] Speed movement	It sets a movement speed value different from the settings in the previous profile blocks.
[FR] Fillet speed	It sets a feed rate value to be applied to fillet.

Particular cases:

- If the value of the **Fillet[U]** parameter is null, it determines a single linear segment from the starting point up to the point of intersection of the two lines.

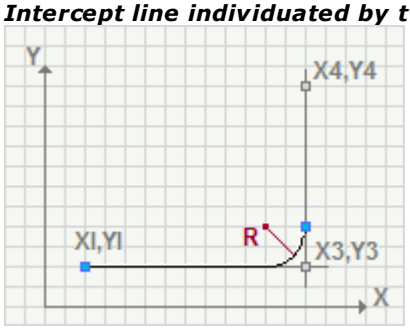
Cases of error:

- If the intercept line is assigned with two coincident point, a horizontal line (Inclination 0°) is taken on as intercept line passing through (X3, Y3). The displayed message of error is no. 197:"Invalid exit tangent".
- In some particular cases, such as:
  - starting point belonging to the exit intercept line,
  - the line defined by the starting angle and the intercept line are parallel,
  - edge point not individuated on the assigned half-lines,
  - first end of the chamfering preceding the starting point of the segment,

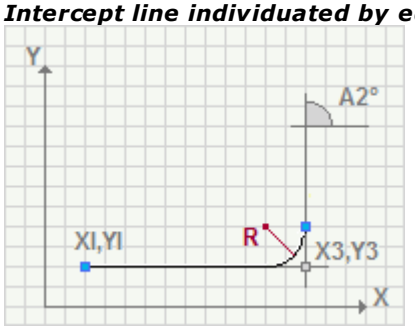
  it carries out a null linear segment. The displayed message of error is no. 195: "Invalid intersection line"
- If the starting point calculated for the first linear segment does not range between the starting point, (XI, YI, ZI), and the edge point, (X3,Y3), it determines a null linear segment. The displayed message of error is no. 198: "Point calculated outside the segments"

EXAMPLE:

Intercept line individuated by two points



Intercept line individuated by edge point and angle of inclination



L19: Chamfer

Working Programming a Chamfer

It programs two linear segments that define a chamfering on xy plane, at a programmed edge.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[Z] Final Z	Final depth coordinate
[LS] Typology	It assigns the type of chamfering to be carried out. • **Chamfer**= the Chamfer parameter sets the length of the chamfering segment • **Vertex segment=**the Chamfer parameter sets the length of the linear Intercept segments on the two lines from the edge on which the chamfering is required.
[U] Chamfer	Length of chamfering or length of the vertex segments according to the value set for Typology parameter
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A dimension can be forced as absolute by entering **"a;"**before the same dimension. For instance, if a Y coordinate of the previous point, but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate shall be set = a;50.

EXIT TANGENT LINE and INTERCEPT LINE

[X3] X edge [Y3] Y edge	Dimensions of the first point of assignation of the exit tangent. It is the edge point.
[A2] A2	Angle of the exit tangent. If set, the dimensions of the second point of definition of the exit tangent are not interpreted.
[X4] X4 [Y4] Y4	Dimensions of the second point of assignation of the exit tangent. If value is assigned to A2 parameter, the setting values are not interpreted.

TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the segment between poles. Choice is made among: • **Unchanged=** it carries on the current status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry.

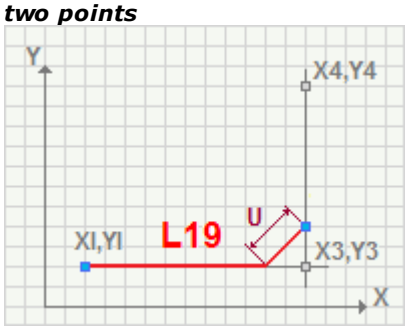
	This option is available in **Professional mode** only.
[F] Movement speed	It sets a movement speed value different from what set in the previous profile blocks.
[FR] Chamfer feed rate	It set the feed rate value to be applied to the chamfering segment

Particular cases:

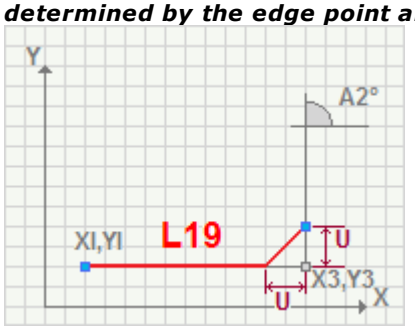
- If the value assigned to the **Chamfer [U]** parameter is null, it carries out a single linear segment from the starting point up to the intersection point of the two lines.
- If the intercept line is assigned with two coincident points, the horizontal line (inclination 0°) passing through (X3, Y3) is taken on as intercept line. The displayed message of error is no. 197:"Invalid exit tangent".
- In some particular cases, such as:
  - starting point belonging to the exit intercept line,
  - the line defined by the starting angle and the intercept line are parallel,
  - edge point not individuated on the assigned half-lines,
  - first end of the chamfering preceding the starting point of the segment,

  it carries out a null linear segment. The displayed message of error is no. 195: "Invalid intersection line"
- If the starting point calculated for the first linear segment does not range between the starting point, (XI, YI, ZI), and the edge point, (X3,Y3), it determines a null linear segment. The displayed message of error is no. 198: "Point computed external to traits"

EXAMPLE:
Value assigned to the Typology [LS] = Chamfer parameter and intercept line determined by two points



Value assigned to the Typology [LS] = Vertex segment parameter and intercept line determined by the edge point and the inclination angle.



A32: Arc 1 (C) Arc 2 (C,Pf)

Working Programming a Double-Arc
A32 Double arc with assignation on Arc 1 (C) Arc 2 (C,Pf) centre

It programs two consecutive arcs with assignment of centre for each one of them, of starting point for the first one and of final point for the second one.
The contact point is determined by the intersection of the two circumferences building the arcs.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the initial point of the first arc. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[X] Final X [Y] Final Y [Z] Final Z	Dimensions of the final point of the second arc.
[EG] Relative	If selected, it indicates that the coordinates of all the enabled axes are assigned in relative values. A dimension can be forced as absolute by entering **"a;"** before the same dimension. For instance, if a Y coordinate of the previous point, but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate shall be set = a;50.
[U] Fillet	Radius of the arc joining the two primary arcs. The fillet between the two arcs is calculated if a null value is not set.

ARC 1

[EW] Direction	Direction of rotation of the first arc.
[I] X Centre [J] Y Centre	Dimensions of the centre of the first arc. Incremental against the starting point of the arc.

ARC 2

[EW2] Direction	Direction of rotation of the second arc. • **Opposite**= the second arc with rotation contrary to the direction of rotation of the first arc. • **Equal**= the second arc with rotation equal to the first arc.
[I2] X Centre [J2] Y Centre	Dimensions of the centre of the second arc. Incremental against the final point of the arc.

TECHNOLOGICAL PARAMETERS

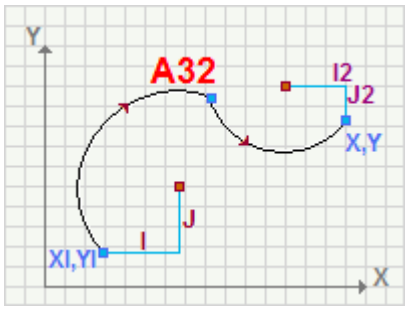
[DVAR] Compensation	It changes the tool compensation in the segment between poles. Choice is made among: • **Unchanged=** it carries on the current status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or

	• the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode** only.
[F] Speed movement	It sets a movement speed value different from the settings in the previous profile blocks.

Cases of error:

- In cases of null calculated radius for one of the two arcs or coinciding starting point and final point, it determines a null linear segment. Displayed message of error no.193: "Radius null".
- If no intersection point exists between the two circumferences, it determines a null linear segment. The displayed message of error is no. 199:"Intersection does not exist".
- When the calculated joining arc is not inside the two calculated arcs. Displayed error no. 198: "Point calculated outside the segments".

EXAMPLE:



A33: Arc 1 (C), Arc 2 (R,Pf)

Working programming a Double-Arc
A33 Double tangent arc with assignation of center and final point Arc 1 (C), Arc 2 (R,Pf)

It programs two consecutive arcs tangent to the contact point with assignation of the center for the first arc and of arc radius and final point for the second arc.
The solution is determined favouring the one that checks the tangency in the intersection point, applying the rotations programmed for the arcs. Considering that the system can be anyway indeterminate, in case of more solutions the one which makes the length of the first arc as short as possible is chosen.
If no solution that checks the tangency in the intersection point was found, a cusp solution (if existing) can solve the situation, with inversion of the direction in the intersection point.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the initial point of the first arc. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[X] Final X [Y] Final Y [Z] Final Z	Dimensions of the final point of the second arc.
[EG] Relative	If selected, it indicates that the coordinates of all the enabled axes are assigned in relative values. A dimension can be forced as absolute by entering **"a;"**before the same dimension. For instance, if a Y coordinate of the previous point, but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate shall be set = a;50.

ARC 1

[EW] Direction	Direction of rotation of the first arc.
[I] X Centre [J] Y Centre	Dimensions of the center of the first arc. Incremental against the starting point of the arc.

ARC 2

[EW2] Direction	Direction of rotation of the second arc. • **Opposite**= the rotation of the the second arc is contrary to the first arc. • **Equal**= the rotation of the the second arc is equal to the first arc.
[R2] Radius	Radius of the second arc.

TECHNOLOGICAL PARAMETERS

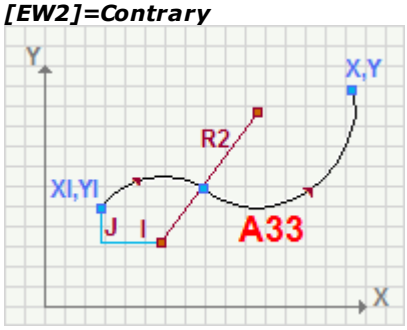
[DVAR] Compensation	It changes the tool compensation in the segment between poles. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or

	• the previous segments, corresponding to the request, assign an inverted geometry.This option is available in **Professional mode** only**.**
[F] Speed movement	It sets a movement speed value different from the settings in the previous profile blocks.

Cases of error:

- In case of null calculated radius for the first arc or coinciding starting point and final point, it determines a null linear segment. Displayed message of error no.193: "Radius null".
- If no solution exists for the first circumference, it determines a null linear segment. The displayed message of error is no. 199:"Intersection non-existent".

EXAMPLE:
Direction of rotation of the first arc [EW]=Clockwise, direction of rotation of the second arc [EW2]=Contrary



A34: Arc 1(C) Arc 2 (TgOut,Pf)

Working programming a double arc
A34 Double arc tangent to the fillet point Arc 1(C) Arc 2 (TgOut, Pf)

It programs two consecutive arcs tangent to the contact point with assignation of the centre for the first arc, and of exit tangency and final point for the second arc.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the initial point of the first arc. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[X] Final X [Y] Final Y [Z] Final Z	Dimensions of the final point of the second arc.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A dimension can be forced as absolute by entering **"a;"**before the same dimension. For instance, if a Y coordinate of the previous point, but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate shall be set = a;50.

ARC 1

[EW] Direction	Direction of rotation of the first arc.
[I] X Centre [J] Y Centre	Coordinates of the centre of the first arc. Incremental against the starting point of the arc.

ARC 2

[EW2] Direction	Direction of rotation of the second arc. • **Automatic**= it sets a rotation ensuring the continuity of tangency to the fillet point and the compliance with the arrival tangent of the second arc • **Clockwise**= it sets a clockwise rotation • **Counterclockwise**= it sets a counterclockwise rotation The choice of the direction (clockwise or counterclockwise) can require the execution of the complementary arc.
[A2] A2	Angle of the arrival tangent. If set, the coordinates of the arrival tangent are not interpreted.
[X3] X3 [Y3] Y3	Dimensions of the first point of assignment of the arrival tangent. If a value is assigned to the **A2** parameter, the setting values are not interpreted.
[X4] X4 [Y4] Y4	Coordinates of the second point of assignment. If a value is assigned to the **A2** parameter, the setting values are not interpreted.

TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the segment. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Compensation Tool.**

[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode only.**
[F] Speed movement	It sets a movement speed value different from the settings in the previous profile blocks.

Cases of error:

- If the exit tangent line is assigned with two coincident points, inclination 0° is taken on. The displayed message of error is no. 197:"Invalid exit tangent".
- In case of null calculated radius for the first arc or coinciding starting point and final point, it determines a null linear segment. Displayed message of error no.193: "Radius null".
- If no solution exists for the first circumference, it determines a null linear segment. The displayed message of error is no. 199:"Intersection non-existent".

EXAMPLE:
The choice of Direction[EW2]=Automatic determines a direction of rotation on the second arc, which ensures the continuity of tangency with the first arc and the compliance with the arrival tangent of the second arc.

A35: Arc1(R), Arc2 (C,Pf)

Working programming a double arc
A35 Two arcs tangent to the fillet point Arc 1(R), Arc 2 (C,Pf)

It programs two consecutive tangents to the contact point with assignment of radius for the first arc, of centre and final point for the second arc.
The solution is determined favouring the ones that check the tangency in the intersection point, applying the rotations programmed for the arcs. Considering that the system can be anyway indeterminate, in case of more solutions the one which makes the length of the second arc as short as possible is chosen. If no solution to check the tangency in the intersection point was found, a cusp solution (if existing) can solve the situation, with inversion of the direction in the intersection point.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the initial point of the first arc. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[X] Final X [Y] Final Y [Z] Final Z	Dimensions of the final point of the second arc.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A dimension can be forced as absolute by entering **"a;"**before the same dimension. For instance, if a Y coordinate of the previous point, but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate shall be set = a;50.

ARC 1

[EW] Direction	Direction of rotation of the first arc.
[R] Radius	Radius of the first arc.

ARC 2

[EW2] Direction	Direction of rotation of the second arc. • **Opposite**= it defines the second arc with rotation contrary to the direction of rotation of the first arc. • **Equal**= it defines the second arc with rotation equal to the direction of rotation of the first arc.
[I2] X centre [J2] Y centre	Dimensions of the centre of the second arc. Incremental against the final point of the arc.

TECHNOLOGICAL PARAMETERS

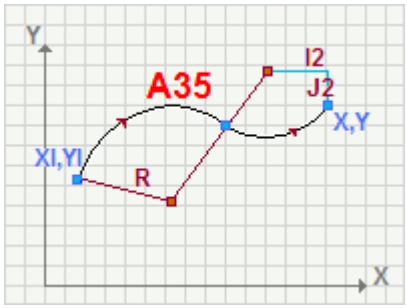
[DVAR] Compensation	It changes the tool compensation in the segment between poles. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or

	• the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode only.**
[F] Speed movement	It sets a movement speed value different from the settings in the previous profile blocks.

Cases of error:

- In case of null calculated radius for the second arc or coinciding starting point and final point, it determines a null linear segment. Displayed message of error no.193: "Radius null".
- If no solution exists for the first circumference, it determines a null linear segment. The displayed message of error is no. 199:"Intersection does not exist".

EXAMPLE:
Direction of the rotation for the first arc rotation [EW]=Clockwise, Direction of the rotation for the second arc [EW2]=Counterclockwise



A37: Arc1 (TgIn) Arc2(C,Pf)

Working Programming a double arc
A37 Two arcs assigned with starting tangency Arc1 (TgIn) Arc2(C, Pf)

It programs two consecutive arcs tangent to the contact point with arrival tangency for the first arc and centre and final point for the second arc.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X
[YI] Initial Y
[ZI] Initial Z
: Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).

[X] Final X
[Y] Final Y
[Z] Final Z
: Dimensions of the final point of the second arc.

[EG] Relative
: If selected, it indicates that the coordinates of all the axes are assigned in relative values. A dimension as absolute can be forced by entering **"a;"**before the same dimension. For instance, if a Y coordinate of the previous point, but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate shall be set = a;50.

ARC 1

[EW2] Direction
: Direction of rotation of the first arc.
- **Automatic**= it sets a rotation ensuring the continuity of tangency to the fillet point and the compliance with the starting tangent of the first arc.
- **Clockwise**= it sets a clockwise rotation
- **Counterclockwise**= it sets a counterclockwise rotation

The choice of the direction (clockwise or counterclockwise) can require the execution of the complementary arc.

[TGIN] Arrival tangent
: If selected, it sets the starting tangent as assigned to the previous segment. In this case **A1, X1,Y1, X2,Y2** parameters are not interpreted.

[A1] A1
: Angle of the starting tangent. If selected, the dimensions of the starting tangent are not interpreted.

[X1] X1
[Y1] Y1
: Dimensions of the first point of assignation of the starting tangent. If value is assigned to the **A1** parameter, the setting values are not interpreted.

[X2] X2
[Y2] Y2
: Dimensions of the second point of assignation of the starting tangent. If value is assigned to the **A1** parameter, the setting values are not interpreted.

ARC 2

[EW] Direction
: Direction of rotation of the second arc.

[I2] X Centre
[J2] Y Centre
: Dimensions of the centre of the second arc. Incremental against the ending point of the arc.

TECHNOLOGICAL PARAMETERS

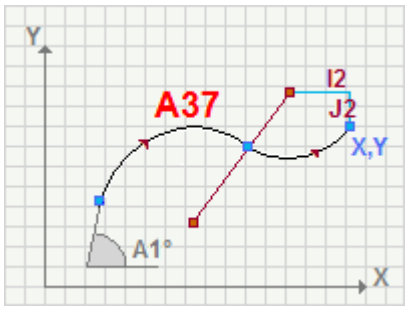
[DVAR] Compensation
: It changes the tool compensation in the segment between poles. Choice is made among:
- **Unchanged=** it carries on the present status;
- **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation);
- **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption.
- **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed.

	For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode only.**
[F] Speed movement	It sets a movement speed value different from the settings in the previous profile blocks.

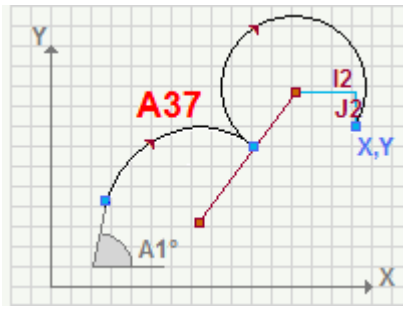
Cases of error:

- In case of null calculated radius for the second arc or coinciding starting point and final point, it determines a null linear segment. Displayed message of error no.193: "Radius null".
- If no solution exists for the first circumference, it determines a null linear segment. The displayed message of error is no. 199:"Intersection non-existent".
- If the entry tangent is assigned with two coincident points, a horizontal tangent (inclination 0°) is taken on. The displayed message of error no. 196:"Invalid entry tangent".

EXAMPLE:
The first arc is determined assigning starting point [XI, YI] and angle of inclination of the starting tangent [A1]. The second arc is determined assigning centre [I2,J2] and final point [X,Y]. The continuity of tangency is imposed, in the intersection point, with the choice of Direction [EW2] = Automatic.



The first arc is determined assigning starting point [XI, YI] and coordinate of assignment of the starting tangent [X1,Y1,X2,Y2]. The second arc is determined assigning center [I2,J2] and final point [X,Y]. In the intersection point of two arcs the continuity of tangency is imposed, with the choice of the Automatic Direction [EW2] = Automatic.



A39: Arc 1 (TgIn,R) Arc 2(TgOut,Pf)

Working programming a double arc
A39 Two assigned arcs with arrival tangent Arc1 (TgIn, R) Arc2(TgOut, Pf)

It programs two consecutive arcs tangent to the fillet point with assignation of radius and starting tangent for the first arc, of arrival tangent and final point for the second arc.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the initial point of the first arc. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[X] Final X [Y] Final Y [Z] Final Z	Dimensions of the final point of the second arc.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A dimension as absolute can be forced by entering **"a;"**before the same dimension. For instance, if a Y coordinate of the previous point, but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate shall be set = a;50.

ARC 1

[EW] Direction	Direction of rotation • **Clockwise**= an arc with Clockwise rotation. • **Counterclockwise**= an arc with counterclockwise rotation
[R] Radius	Radius of the first arc.
[TGIN] Arrival tangent	If selected, it sets the starting tangent as assigned to the previous segment. In this case **A1, X1,Y1, X2,Y2** parameters are not interpreted.
[A1] A1	Angle of the starting tangent. If selected, the dimensions of the starting tangent are not interpreted.
[X1] X1 [Y1] Y1	Dimensions of the first point of assignation of the starting tangent. If value is assigned to the **A1** parameter the setting values are not interpreted.
[X2] X2 [Y2] Y2	Dimensions of the second point of assignation of the starting tangent. If value is assigned to the **A1** parameter the setting values are not interpreted.

ARC 2

[EW2] Direction	Direction of rotation of the first arc. • **Automatic**= it sets a rotation ensuring the continuity of tangency to the fillet point and the compliance with the starting tangent of the first arc. • **Clockwise**= it sets a clockwise rotation • **Counterclockwise**= it sets a counterclockwise rotation The choice of the direction (clockwise or counterclockwise) can require the execution of the complementary arc.
[A2] A2	Angle of the arrival tangent. If set, the coordinates of the arrival tangent are not interpreted.
[X3] X3 [Y3] Y3	Dimensions of the first point of assignation of the arrival tangent. If a value is assigned to the **A2** parameter, the setting values are not interpreted.
[X4] X4 [Y4] Y4	Dimension of the second point of assignation of the arrival tangent. If a value is assigned to the **A2** parameter, the setting values are not interpreted.

TECHNOLOGICAL PARAMETERS

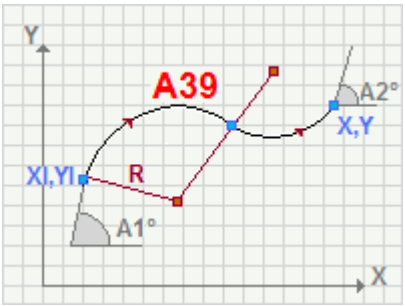
[DVAR] Compensation	It changes the tool compensation in the segment between poles. Choice is made among: • **Unchanged=** it carries on the present status;

	• **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode only.**
[F] Speed movement	It sets a movement speed value different from the settings in the previous profile blocks.

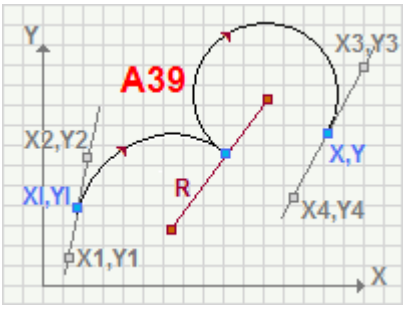
Cases of error:

- If no solution exists for both circumferences, it determines a null linear segment. The displayed message of error is no. 199:"Intersection non-existent".
- In case of null calculated radius for the first arc or coinciding starting point and final point, it determines a null linear segment. Displayed message of error no.193: "Radius null".
- If the entry tangent is assigned with two coincident points, a horizontal tangent (inclination 0°) is taken on. The displayed message of error no. 196:"Invalid entry tangent".
- If the exit tangent is assigned with two coincident points, a horizontal tangent (inclination 0°) is taken on. . The displayed message of error is no. 197:"Invalid exit tangent".

EXAMPLE:
The first arc is determined assigning starting point [XI, YI], radius [R] and angle of inclination of the starting tangent [A1]. The second arc is determined assigning final point [X,Y] and angle of inclination of the arrival tangent [A2]. The continuity of tangency is imposed, in the intersection point, with the choice of Direction [EW2] = Automatic.



The first arc is determined assigning starting point [XI, YI], radius [R] and dimensions of assignment of the starting tangent [X1,Y1,X2,Y2]. The second arc is determined assigning final point [X,Y] and dimensions of assignment of the arrival tangent [X3,Y3,X3,Y3]. The setting of the direction of rotation to the second arc does not determine the continuity of tangency in the point of intersection.


Y
A39
X3,Y3
X2,Y2
X,Y
R
X1,Y1
X4,Y4
X

A41: Arc1(TgIn),Arc2 (R,TgOut,Pf)

Working programming a double arc
A41 Two arcs assigned with final point Arc1(TgIn), Arc2 (R, TgOut, Pf)

It programs two consecutive arcs tangent in the fillet point with assignation of starting tangent for the first arc, radius, arrival tangent and final point for the second arc.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[X] Final X [Y] Final Y [Z] Final Z	Dimensions of the final point of the second arc.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A dimension can be forced as absolute by entering **"a;"** before the same dimension. For instance, if a Y coordinate of the previous point, but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate shall be set = a;50.

ARC 1

[EW2] Direction	Direction of rotation of the second arc. • **Automatic**= it sets a rotation ensuring the continuity of tangency to the fillet point and the compliance with the arrival tangent of the second arc. • **Clockwise**= it sets a clockwise rotation • **Counterclockwise**= it sets a counterclockwise rotation The choice of the direction (clockwise or counterclockwise) can require the execution of the complementary arc.
[TGIN] Arrival tangent	If selected, it sets the starting tangent as assigned to the previous segment. In this case **A1, X1,Y1, X2,Y2** parameters are not interpreted.
[A1] A1	Angle of the starting tangent. If selected, the dimensions of the starting tangent are not interpreted.
[X1] X1 [Y1] Y1	Dimensions of the first point of assignation of the starting tangent. If value is assigned to the **A1** parameter the setting values are not interpreted.
[X2] X2 [Y2] Y2	Dimensions of the second point of assignation of the starting tangent. If value is assigned to the **A1** parameter the setting values are not interpreted.

ARC 2

[EW] Direction	Direction of rotation • **Clockwise**= an arc with Clockwise rotation. • **Counterclockwise**= an arc with counterclockwise rotation
[R2] Radius	Radius of the second arc.
[A2] A2	Angle of the arrival tangent. If set, the coordinates of the arrival tangent are not interpreted.
[X3] X3 [Y3] Y3	Dimensions of the first point of assignation of the arrival tangent. If a value is assigned to the **A2** parameter, the setting values are not interpreted.
[X4] X4 [Y4] Y4	Dimension of the second point of assignation of the arrival tangent. If a value is assigned to the **A2** parameter, the setting values are not interpreted.

TECHNOLOGICAL PARAMETERS

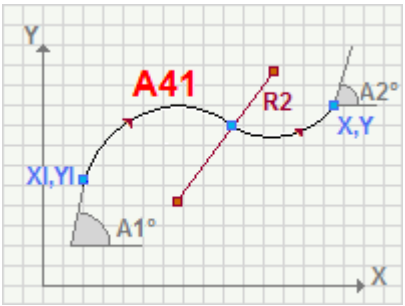
[DVAR] Compensation	It changes the tool compensation in the segment between poles. Choice is made among: • **Unchanged=** it carries on the present status;

	• **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode only.**
[F] Speed movement	It sets a movement speed value different from the settings in the previous profile blocks.

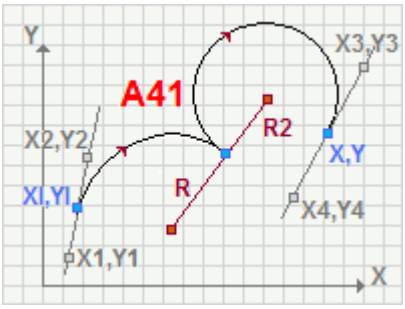
Cases of error:

- If the entry tangent is assigned with two coincident points, a horizontal tangent (inclination 0°) is taken on. The displayed message of error no. 196:"Invalid entry tangent".
- If the exit tangent is assigned with two coincident points, inclination 0° is taken on. The displayed message of error is no. 197:"Invalid exit tangent".
- If no solution exists for both circumferences, it determines a null linear segment. The displayed message of error is no. 199:"Intersection non-existent".
- In case of null calculated radius for the first arc or coinciding starting point and final point, it determines a null linear segment. Displayed message of error no.193: "Radius null".

EXAMPLE:
The first arc is determined assigning starting point [XI, YI] and angle of inclination of the starting tangent [A1]. The second arc is determined assigning final point [X,Y], radius [R] and angle of inclination of the arrival tangent [A2]. The continuity of tangency is imposed, in the intersection point, with the choice of Direction [EW2] = Automatic.



The first arc is determined assigning starting point [XI, YI] and coordinate of assignment of the starting tangent [X1,Y1,X2,Y2]. The second arc is determined assigning final point [X,Y], radius [R] and dimensions of assignation of the arrival tangent [X3,Y3,X3,Y3]. The setting of the direction of rotation to the second arc does not determine the continuity of tangency in the point of intersection.


Y
A41
X3,Y3
R2
X2,Y2
X,Y
X1,Y1
R
X4,Y4
X

A46: Circle (P1,Pf)

Working programming a circle
A46 Circle with assignment of 3 points (P1, Pf)

It programs a circle with assignation of three points, direction and helicoidal development on Z.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[Z] Final Z	Final depth coordinate
[EW] Direction	Direction of rotation • **Clockwise** = a circle with clockwise rotation • **Counterclockwise**= a circle with counterclockwise rotation.
[X1] X1 [Y1] Y1	Dimensions of the point assigned on the circle.
[X2] X2 [Y2] Y2	Dimensions of the second point assigned on the circle.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"** before the same dimension. For instance, if a Y coordinate of the previous point, but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate shall be set = a;50.

TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the interpolated segment. Choice is made among: • **Unchanged=** it carries on the current status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode only.**
[F] Movement Speed	It sets a movement speed value different from the settings in the previous profile blocks.

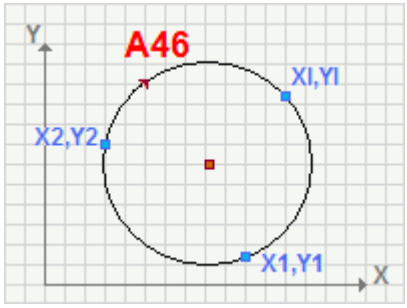
Particular cases:

- If the arc starting point (XI, YI, ZI) and (X1, Y1) or (X2, Y2) coincide, it determines a circle with centre in the intermediate point between starting point and (X1,Y1) or (X2, Y2), direction of rotation as programmed in **Direction [EW] parameter**.
- If (X1, Y1) and (X2, Y2) points coincides, it determines a circle with center in the midpoint of the segment that joins the starting point with (X1, Y1) point

Cases of error:

- If the three point that define the circle coincide, it determines a null arc. The displayed message of error is no. 194:"Invalid arc".

EXAMPLE:



A45: Circle (C,CW)

Working programming a circle
A45 Circle with assignment of centre (C, CW)

It programs a circle with assignation of centre, direction and helicoidal development on Z.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[Z] Final Z	Final depth coordinate
[EW] Direction	Direction of rotation • **Clockwise** = a circle with clockwise rotation • **Counterclockwise**= a circle with counterclockwise rotation.
[I] X Centre [J] Y Centre	Circle centre Incremental against the starting point. A dimension as absolute can be forced by entering **"a;"** before the same dimension.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values.

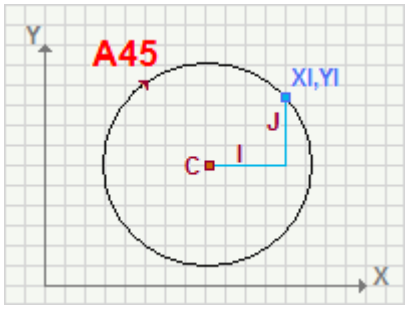
TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the interpolated segment. Choice is made among: • **Unchanged=** it carries on the current status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Compensation Tool**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode only.**
[F] Movement Speed	It sets a movement speed value different from the settings in the previous profile blocks.

Cases of error:

- If the centre coincides with the starting point, it determines a null segment. Displayed message of error no.193: "Radius null".

EXAMPLE:


Y
A45
XI,YI
J
C
I
X

A47: Circle (R,Ac)

Working programming a circle
A47 Circle with assignment of radius (R, Ac)

It programs a circle with assignation of radius and angle of the centre.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[Z] Final Z	Final depth coordinate
[EW] Direction	Direction of rotation • **Clockwise** = a circle with clockwise rotation • **Counterclockwise**= a circle with counterclockwise rotation.
[R] Radius	Arc radius
[U] Radius	Angle of centre against the starting point of the circle.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A dimension as absolute can be forced by entering **"a;"**before the same dimension. For instance, if a Y coordinate of the previous point, but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate shall be set = a;50.

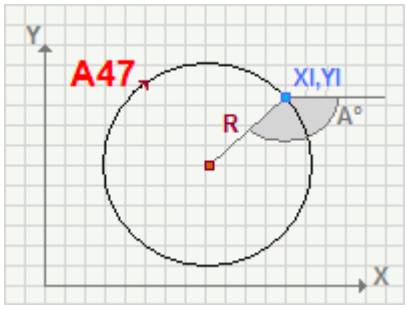
TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the interpolated segment. Choice is made among: • **Unchanged=** it carries on the current status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode only.**
[F] Movement Speed	It sets a movement speed value different from the settings in the previous profile blocks.

Cases of error:

- if the dimensions of the center coincide with the dimensions of the starting point, it determines a null arc. The displayed message of error is no. 194:"Invalid arc".

EXAMPLE:


Y
A47
XI,YI
R
A°
X

A05: Pf,C,Cw (xz plane)

Working programming an arc on the zx plane
A05 Arc in the zx plane with assignment of (Pf,C,Cw)

It programs a circle segment with assignation of final point, center, direction on xz plane with possible helicoidal development on the Y Cartesian axis.

The parameter to be used are as follows:

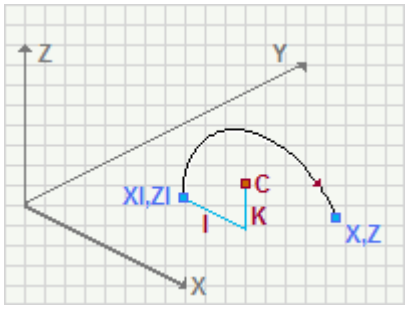
GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Dimensions of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[X] Final X [Z] Final Z	Dimensions of the final point.
[Y] Final Y	Depth dimension for the helicoidal coordinate on Y axis.
[EW] Direction	Direction of rotation • **Clockwise**= an arc with Clockwise rotation. • **Counterclockwise**= an arc with counterclockwise rotation
[I] X Centre [K] Z Centre	Dimensions of the arc center. Incremental against the starting point of the arc. A dimension as absolute can be forced by entering **"a;"** before the same dimension.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values.

TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the segment between poles. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode only.**
[F] Speed movement	It sets a movement speed value different from the settings in the previous profile blocks.

EXAMPLE:


Z
Y
XI,ZI
C
K
I
X,Z
X

A06: Pf,C,Cw (yz plane)

Working programming an arc on the yz plane
A06 Arc in the yz plane with assignment of (Pf,C,Cw)

It programs a circle segment with assignation of final point, centre, direction on yz plane with possible helicoidal development on X Cartesian axis.

The parameter to be used are as follows:

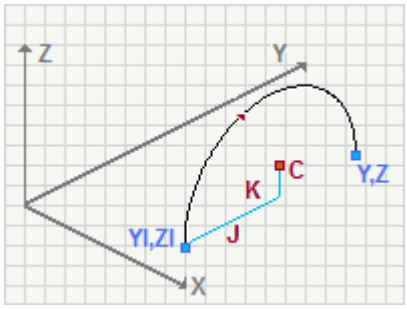
GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[Y] Final Y [Z] Final Z	Coordinates of the final point.
[X] Final X	Depth coordinate for the helicoidal development on X axis.
[EW] Direction	Direction of rotation • **Clockwise**= an arc with Clockwise rotation. • **Counterclockwise**= an arc with counterclockwise rotation
[J] Y Centre [K] Z Centre	Dimensions of the arc center. Incremental against the starting point of the arc. A dimension as absolute can be forced by entering **"a;"** before the same dimension.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values.

TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the segment between poles. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode only.**
[F] Speed movement	It sets a movement speed value different from the settings in the previous profile blocks.

EXAMPLE:


Z
Y
C
K
Y,Z
YI,ZI
J
X

A07: P1,Pf (xz plane)

Working programming an arc on the zx plane
A07 Arc in the zx plane with assignment of (P1,Pf)

It programs a circle segment with assignation of three points, direction on xz plane with possible helicoidal development on Y Cartesian axis.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Dimensions of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[X] Final X [Z] Final Z	Coordinates of the final point.
[Y] Final Y	Depth dimension for the helicoidal dimension on Y axis.
[EW2] Direction	Direction of rotation • **Automatic**= an arc with direction of rotation that involves the passage of the arc through **X1,Y1 point.** • **Clockwise**= = an arc with clockwise rotation. • **Counterclockwise**= an arc with counterclockwise rotation.
[X1] X1 [Z1] Z1	Coordinates of a point on the arc. It is not necessarily a working point.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A dimension as absolute can be forced by entering **"a;"** before the same dimension. For instance, if a Y dimension relative to the previous point, but with absolute X dimension = 50 has to be programmed, the relative flag shall be enabled and X dimension shall be set = a;50.

TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the segment between poles. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode only.**
[F] Speed movement	It sets a movement speed value different from the settings in the previous profile blocks.

A08: P1,Pf (yz plane)

Working programming an arc on the yz plane
A08 Arc in the yz plane with assignment of (P1,Pf)

It programs a circle segment with assignation of three points, direction on yz plane with possible helicoidal development on X Cartesian axis.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Dimensions of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[Y] Final Y [Z] Final Z	Coordinates of the final point.
[X] Final X	Depth dimension for the helicoidal dimension on X axis.
[EW2] Direction	Direction of rotation • **Automatic**= an arc with direction of rotation that involves the passage of the arc through **X1,Y1 point.** • **Clockwise**= an arc with Clockwise rotation. • **Counterclockwise**= an arc with counterclockwise rotation
[X1] X1 [Z1] Z1	Coordinates of a point on the arc. It is not necessarily a working point.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A dimension as absolute can be forced by entering **"a;"**before the same dimension. For instance, if a Y dimension relative to the previous point, but with absolute X dimension = 50 has to be programmed, the relative flag shall be enabled and X dimension shall be set = a;50.

TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the segment between poles. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode only.**
[F] Speed movement	It sets a movement speed value different from the settings in the previous profile blocks.

A09: Pf,C,CW (xyz)

Working programming an arc on a generic plan
A09 Arc with assignation of final point Pf, C, CW (xyz)

It programs a circle segment with assignation of final point, centre and direction on a generic plane.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Dimensions of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[X] Final X [Y] Final Y [Z] Final Z	Coordinates of the final point.
[EW] Direction	Direction of rotation **Clockwise**= an arc with clockwise rotation. **Counterclockwise**= an arc with counterclockwise rotation.
[I] X Centre [J] Y Centre [K] Z center	Dimensions of the arc center. Incremental against the starting point of the arc. A dimension as absolute can be forced by entering **"a;"** before the same dimension.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values.

TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the segment between poles. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode only.**
[F] Speed movement	It sets a movement speed value different from the settings in the previous profile blocks.

Cases of error:

- In case of Initial point distinguished from Final point:
  - If the starting radius differs from the final radius of a measure higher than, an error situation occurs. The displayed message of error is no. 194: "Invalid arc"
- In case of Initial point coinciding with Final point, even if centre coincide with the dimensions of the initial point, it determines a null arc. The displayed message of error is no. 200: "Invalid arc (points are not distinguished)"

A10: P1,Pf (xyz)

Working programming an arc
A10 Circle arc with assignation of direction P1, Pf (xyz)

It programs an arc with assignation of three points and direction on a generic plane.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Dimensions of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[X] Final X [Y] Final Y [Z] Final Z	Coordinates of the final point.
[EW2] Direction	Direction of rotation • **Automatic**= an arc with direction of rotation that involves the passage of the arc through **X1,Y1 point.** • **Clockwise**= it defines an arc with Clockwise rotation. • **Counterclockwise**= an arc with counterclockwise rotation
[X1] X1 [Y1] Y1 [Z1] Z1	Coordinates of a point on the arc. It is not necessarily a working point.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A dimension as absolute can be forced by entering **"a;"** before the same dimension. For instance, if a Y dimension relative to the previous point, but with absolute X dimension = 50 has to be programmed, the relative flag shall be enabled and X dimension shall be set = a;50.

TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the segment between poles. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Wokings->Profile->Compensation tool**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode only.**
[F] Speed movement	It sets a movement speed value different from the settings in the previous profile blocks.

Particular cases:

. If (XI, YI, ZI) starting point and (X,Y,Z) final point coincide, a *circle* is carried out with centre in the midpoint point of the segment that joins the starting point and the point on the arc defined by (X1,Y1,Z1) dimensions and direction of rotation as programmed.
. If the (X1,Y1,Z1) point is not distinguished from the starting point (XI,YI, ZI) or from the final point (X,Y,Z) a *half-circle* is drawn from the starting point to the final point, with centre in the middle point of the segment that joins the two points and the and the direction of rotation as programmed.

Cases of error:
. If the three points coincide, a null arc is determined. Displayed error no. 200: "Invalid arc (non distinguished points)"
. If the three points are separated, but aligned, it resolves the linear segment until the programmed application point (final point) The displayed message of error is no. 201:"Invalid arc (aligned points)".

A26: TgIn(3d),R,A(xyz)

Working programming a circular segment
A26 Arc in the space with assignment of (TgIn (3d),R,A)

It programs a circular segment with assignment of the tangency condition in the space with the previous segment of the radius and of the angular size. The entry tangent is taken from the previous segment and determined in xyz. The final point and the rotation of the arc are determined automatically:

- if the previous segment is an arc, it determines a counterclockwise rotation;
- if the previous segment is a linear segment, it determines a rotation with depth exit toward the direction above the piece.

If the previous segment is	**the segment resolved with COPA26 code, it performs**
an arc in xy plane	an arc in xyz plane
an arc in xz plane	an arc in xz plane
an arc in yz plane	an arc in yz plane
a linear segment	an arc in xyz plane

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[U] Radius	Arc radius
[A] A path	Angular size in degrees. If a value less then 1.0 or higher than 90.0 is assigned, an angular size of 90°0 is set.

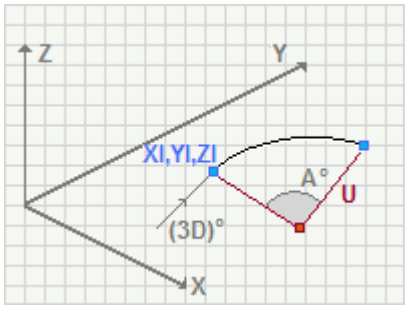
TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the segment between poles. Choice is made among: • **Unchanged=** it carries on the present status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual chapter **Workings->Profile->Compensation Tool.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode only.**
[F] Movement speed	It sets a movement speed value different from the settings in the previous profile blocks.

Particular cases:

- If the value assigned to the **Radius** parameter is less than epsilon a null arc is carried out.
- If the previous segment is an invalid segment, a linear segment is taken on by default with a 0° horizontal tangent.

EXAMPLE:


Z
Y
XI,YI,ZI
A°
U
(3D)°
X

A27: TgIn,R,dA,CW

Circular segment programming working
A27 Arc in the xy plane with assignment of (TgIn (2d),R,A)

It programs a circular segment with assignment of entry tangent in xy plane, of radius and of angular amplitude. The final point is calculated in an indirect way.

The parameters to be used are the following ones:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the initial point of the arc. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[Z] Final Z	Final depth position
[EW2] Direction	Direction of rotation • **Clockwise**= arc with clockwise rotation • **Counterclockwise**= arc with countericlockwise rotation
[U] Radius	Arc radius
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"**before the same dimension. For instance, if a Y dimension relative to the previous point but with absolute X dimension = 50 has to be programmed, the flag of *Relative* will be enabled and X dimension will be set = a;50.
[A] A path	Angular amplitude (in degrees). It must be greater than 1.0.

ENTRY TANGENT LINE

[A1] A1	Angle of the starting tangent. If it is set, the positions of the starting tangent are not interpreted.
[X1] X1 [Y1] Y1	Positions of the first point of assignment of the starting tangent. If a value is assigned to the A1 parameter, the settings are not interpreted.
[X2] X2 [Y2] Y2	Positions of the second point of assignment of the starting tangent. If a value is assigned to the A1 parameter, the settings are not interpreted.
[TGIN] Starting tangent	If selected, it sets the arrival tangent with the same parameters of the starting tangent. In this case the A1, X1,Y1, X2,Y2 parameters are not interpreted.

TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the segment between poles. Choice is made among: • **Unchanged=** it carries on the current status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment will not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For more information, please read the manual of TpaCAD, chapter ***Workings -> Profile->Tool compensation*** **.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa).

	The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode only.**
[F] Movement speed	It sets a movement speed value different from the settings in the previous profile blocks.

Particular cases:
- If the value set to the **Radius** parameter is less than epsilon, a null arc is carried out.
- If the value set to the **Covered angle** parameter is less than 1.0, a null arc is carried out.

L16 Rectangle

Working Programming a Rectangle

It programs a rectangle assigning center, sides and direction. A side of the rectangle is calculated as the distance between the center and the rectangle starting point. The starting point lies on the midpoint point of the second dimension. The fillet arcs can be assigned on the rectangle vertices. The depth variation set is distributed along the segments, in proportion to their length. The figure can be constructed making use of the tools of the Drawing menu too.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[Z] Final Z	Final depth coordinate
[I] X Centre [J] Y Centre	Coordinates of the figure centre Incremental against the initial point. Double the distance between the centre and the initial point determines the first side of the figure.
[EW] Direction	Direction of rotation • **Clockwise**= a rectangle with clockwise rotation. • **Counterclockwise**= a rectangle with counterclockwise rotation.
[UY] Axis 2	Second dimension of the rectangle.
[U] Fillet	Fillet radius on the rectangle vertices.
[LS] Typology	This value allows you to define how to use the value of the **Fillet** parameter to solve the vertices: • **Fillet** = Fillet parameter sets the radius of the joining arc • **Chamfer**= the Fillet parameter sets the length of the chamfering segment • **Lines to vertex=** the Fillet parameter sets the length of the linear segments available on both the lines from the edge on which the chamfering is required.
[U] Fillet	Fillet radius or length of the chamfer on the vertices of the rectangle. The value is significant if a non-null value is set.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A dimension can be forced as absolute by entering **"a;"** before the same dimension. For instance, if a Y coordinate of the previous point, but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate shall be set = a;50.

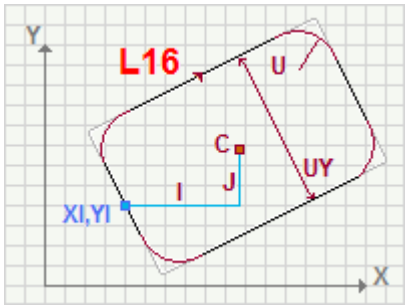
TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the segment between poles. Choice is made among: • **Unchanged=** it carries on the current status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Compensation Tool.**
[F] Movement speed	It sets a movement speed value different from the settings in the previous profile blocks.
[FR]Fillet feed rate	It sets a feed rate value to be applied to fillet.

Cases of error:

- If the rectangle centre coincides with the starting point (XI, YI) or the second dimension is null (**Axis 2**), it determines a null segment. The displayed message of error is no. 206: Rectangle: invalid axe/axis or radius
- If the fillet radius (Fillet) is higher than one half of the lower side, it determines a null segment. The displayed message of error is no. 206: Rectangle: invalid axe/axis or radius
- If the values of half-length, half-height and fillet radius are the same, it determines a null segment. The displayed message of error is no. 206: Rectangle: invalid axe/axis or radius

EXAMPLE:
The position of the centre of the rectangle determines the development of a rectangle rotated in xy plane. The vertices the rectangle are connected to the radius (U).



L17 Poligon

Working Programming a Polygon

It programs a polygon assigning center, direction and number of sides. The depth variation set is distributed along the segments, in proportion to their length. The figure can be constructed making use of the tools of the Drawing menu too.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[Z] Final Z	Final depth coordinate
[I] X Centre [J] Y Centre	Coordinates of the figure centre Incremental against the initial point. The distance between the centre and the initial point is the radius of the circle in which the polygon is inscribed.
[EW] Direction	Direction of rotation • **Clockwise**= it defines a polygon with clockwise rotation. • **Counterclockwise**= it defines a polygon with counterclockwise rotation.
[N] Sides	Number of the polygon sides. The value ranges between 3 and 99.
[EG] Relative	If selected, it indicates that the coordinates of all the enabled axes are assigned in relative values. A dimension can be forced as absolute by entering **"a;"** before the same dimension. For instance, if a Y coordinate of the previous point, but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate shall be set = a;50.

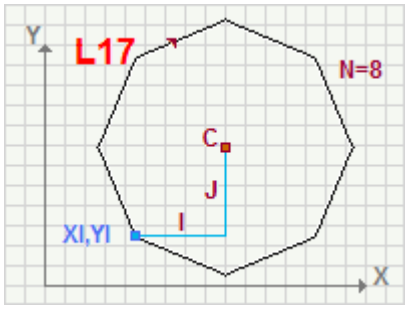
TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the interpolated segment. Choice is made among: • **Unchanged=** it carries on the current status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Compensation Tool.**
[F] Movement speed	It sets a movement speed value different from the settings in the previous profile blocks.

Particular cases:
If the number of sides is lower than 3, it indicates 3 as value; if the number of sides is higher than, it indicates 99 as number of sides.

Cases of error:
- If the polygon center (X centre, Y centre) coincides with the starting point (XI, YI), it determines a null segment. The displayed message of error is no. 193: "Radius null"

EXAMPLE:
Octagon programming


Y
L17
N=8
C
J
I
XI,YI
X

A42 Quadrants of ellipse/oval

Working programming an ellipse or an oval
A42 Ellipse /oval segment with assignment of a portion

It programs more circle interpolations on the xy Cartesian plane, to define a part of ellipse or oval. The development of the conic section (ellipse or oval) can correspond to integer multiples of quadrants (1/4, 2/4, 3/4, whole conic section), with starting point and final point coinciding with a point of quadrant change. The centre is set as incremental against the starting point.
The half-axis of the conic section is calculated as the distance between starting point and centre.
An ellipse develops with a set of arcs, sampling along the equation of the ellipse. The number of the samplings is assigned by quadrant from a minimum value of 8 to a maximum value of 30.
An oval develops as a geometric construction made of 4 circles in continuity of tangency. The variability of the curves (radii) is assigned by setting the minor radius.
The second axis is programmed. The depth variation set is distributed on the segments, proportionally to their length. The figure can be constructed making use of the tools of the Drawing menu too.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[Z] Final Z	Final depth coordinate
[EW] Direction	Direction of rotation • **Clockwise**= an ellipse or an oval with clockwise rotation. • **Counterclockwise**= an ellipse or an oval with counterclockwise rotation.
[I] X Centre [J] Y Centre	Centre of the conic section. It is incremental against the starting point.
[UY] Axis 2	Second axis of the conic section.
[N] Portion	Portion of the conic section. • **Integer**= it draws the whole figure • **1/4**= it draws the first quarter • **2/4**= it draws half figure • **3/4**= it draws three quarters
[TA] Typology	It select the typology of the figure. • **Ellipse**= it draws an ellipse • **Oval**= it draws an oval.
[U] Radius	Lower radius. Significant if an oval is carried out.
[AN] Arcs number	Number of sampled arcs per quadrant. The values ranges from 8 to 30. Significant if an ellipse is carried out.
[EG] Relative	If selected, it indicates that the coordinates of all the enabled axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"** before the same dimension. For instance, if a Y coordinate of the previous point, but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate shall be set = a;50.

TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the segment between poles. Choice is made among: • **Unchanged=** it carries on the current status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=** it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed.

	For further details reference is made to the TpaCAD manual, chapter **Workings->Profile ->Compensation Tool.**
[F] Movement Speed	It sets a movement speed value different from the settings in the previous profile blocks.

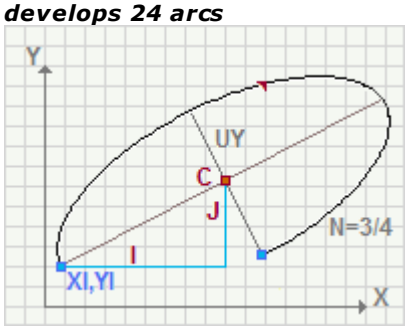
Particular cases:

- If an ellipse is carried out:
  - If the number of sampled arcs is less than 8, it indicates 8; if the number of sampled arcs is greater than 30, it indicates 30.

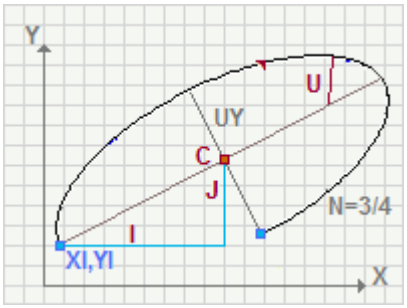
Cases of error:

- If one or both the half-axes are null, it determines a null segment. The displayed message of error is no. 193: "Radius null"
- If it carries out an oval:
  - If the lower radius (**Radius**) has a null value, a radius with a value equal to 50% of the lower half-axis is used. The displayed message of error is no. 202: Oval: invalid radius
  - If the lower radius (**Radius**) has a value greater or equal to the lower half-axis, a radius with a value equal to the 90% of the lower half-axis is used. The displayed message of error is no. 202: Oval: invalid radius

EXAMPLE:
Ellipse with number of sampled arcs [AN]=8 and selection of ¾ of conic section: the working develops 24 arcs



Oval with a selection of ¾ of conic section



A43: Arc of ellipse/oval

Working programming an ellipse or an oval
A43 Variable section of an ellipse/an oval

It programs two or more circle interpolations on the xy Cartesian plane, to define a part of ellipse or oval. The development of the conic section (ellipse or oval) can correspond to any portion of conic section. The centre is incremental against the starting point.
The final point of the conic section is determined by an angular position.
An ellipse develops with a set of arcs, sampling along the equation of the ellipse. An number of samplings is assigned by quadrant from a minimum value of 8 to a maximum value of 30.
An oval develops as a geometric construction made of 4 circles in continuity of tangency. The variability of the curves is assigned by setting the minor radius.
The depth variation set is distributed on the segments, proportionally to their length. The figure can be constructed making use of the tools of the Drawing menu too.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[Z] Final Z	Final depth coordinate
[EW] Direction	Direction of rotation • **Clockwise**= an ellipse or an oval with clockwise rotation. • **Counterclockwise**= an ellipse or an oval with counterclockwise rotation.
[I] X Centre [J] Y Centre	Center of the conic section. It is incremental against the starting point.
[UY] Axis 2	Higher axis of the conic section.
[AU] A2	Angle of inclination of the major axis against the centre.
[A] Ending A°	Angle of the final point against the centre.
[TA] Typology	It select the typology of the figure. • **Ellipse**= it draws an ellipse • **Oval**= it draws an oval.
[UX] Axis 1	Lower axis. Significant if an oval is carried out.
[U] Radius	Lower radius. Utilized only if the starting point corresponds to a point of quadrant change. Significant if an oval is carried out.
[AN] Arcs number	Number of sampled arcs per quadrant. Accepted values: from 8 to 30 Significant if an ellipse is carried out.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"** before the same dimension. For instance, if a Y coordinate of the previous point, but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate shall be set = a;50.

TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	It changes the tool compensation in the segment between poles. Choice is made among: • **Unchanged=** it carries on the current status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details reference is made to the TpaCAD manual, chapter **Workings->Profile->Compensation Tool.**

[F] Movement Speed	It sets a movement speed value different from the settings in the previous profile blocks.

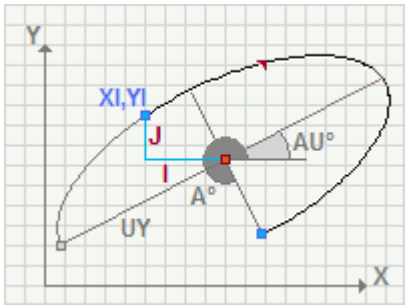
Particular cases:

- If an ellipse is carried out:
  - If the number of sampled arcs is less than 8, it indicates 8; if the number of sampled arcs is greater than 30, it indicates 30.

Cases of error:

- If one or both the half-axes are null, it determines a null segment. The displayed message of error is no. 193: "Radius null"
- If the starting point falls outside the assigned extents (limited by axes), it carries out a null segment. The displayed message of error is no. 205: Ellipse/Oval: start point exterior conic extents
- If the two axes have the same dimension, it determines a part of circumference with radius equal to the value of the half-axis. The displayed message of error is no. 203: "Oval reduced to a circle"

EXAMPLE:
The final point of the development of the conic section lies on the intersection between the conic section and the half-line starting from the centre with programmed inclination in the final angle [A].
The values set in [UY] and [AU] assign respectively one of the two axes and its inclination with respect to one horizontal axis passing through the centre of the conic section.



A48: Helix (C,CW,Zf,N)

Working that programs a circular and continuous development on several revolutions
A48 Helix with assignment of (C, CW, Repetitions, Residual angle)

It programs a circle with a centre assignment, direction and helical development in Z on also revolutions, that can also be multiple. The radius and the depth path remain constant.

The parameters to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X
[YI] Initial Y
[ZI] Initial Z
: Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).

[Z] Final Z
: Final depth coordinate

[EW] Direction
: Direction of rotation
- **Clockwise**= circle with Clockwise rotation
- **Counterclockwise**= circle with Counterclockwise rotation

[I] X Centre
[J] Y Centre
: Circle centre Incremental with respect to the initial point. A coordinate can be forced as absolute by entering **"a;"**before the same dimension.

[EG] Relative
: If selected, it indicates that the coordinates of all the axes are assigned in relative values.

[AN] Repetitions
: Number of revolutions on a turn (360°). Only the values between 0 and 100 are considered valid.

[AR] Residual angle
: Residual angle to be added to the number of repetitions set. This setting is related to the interval (0 -360). Examples:

Repetitions	Residual angle (°)	Overall covered angle (°)
0	50	50
1	0	360
3	20	1100
1	-10	710
1	380	380
0	0	360

As shown in the table, if for both the fields a null value is calculated, the working develops a circle. The programmed depth change is distributed on the whole development.

[DNR] End with a pass with a constant depth
: If selected, it adds a complete circle to close the programmed development, carried out at the position of the final depth.

TECHNOLOGICAL PARAMETERS

[DVAR] Compensation
: It changes the tool compensation in the segment between poles. Choice is made among:
- **Unchanged=** it carries on the current status.
- **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation).
- **Break=** it interrupts the compensation of the present segment: the downstream segment shall not be corrected until the next resumption.
- **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed.

For further details, please read the manual of TpaCAD, chapter ***Workings-> Profil->Tool compensation*** **.**

[DSIDE] Change compensation side
: It inverts the compensation side (from the left to the right or viceversa).
The activation of this selection is subject to limitations, as follows:
- The request may correspond to a resumption of correction after a interruption; or

- the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or
- the previous segments, corresponding to the request, assign an inverted geometry.

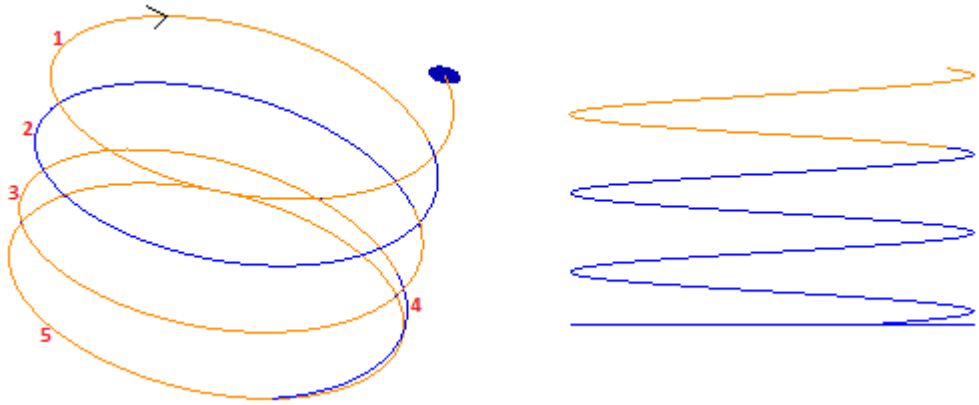
This option is available in **Professional mode only.**

[F] Movement Speed — It sets a movement speed value different from the settings in the previous profile blocks.

Cases of error:

- If the centre coincides with the initial point, a null segment is determined. Displayed error no. 193 "Radius null"

EXEMPLE:



The figure shows a programmed helix with 3 turns, residual angle of 90° and a constant depth closure.
On the left, for each basic element, colours alternate to facilitate the comprehension:
- 1,2,3) are the three circles
- 4) is the residual angle
- 5) is the constant depth final circle.

On the right, the helix is shown in a side view in order to highlight the development on the depth axis.

A49: Spiral (C,CW,Zf,Rf,N)

Working that programs a circular and continuous development on several revolutions
A49 Spiral with assignment of (C, CW, Final radius, Repetitions)

It programs a spiral to which centre, direction and development of the revolutions in Z, expansion or reduction of the radius are assigned. The pitch in depth remains constant as well as the radius changing pitch.

The parameters to be used are as follows:

GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[Z] Final Z	Final depth coordinate
[EW] Direction	Direction of rotation • **Clockwise**= circle with Clockwise rotation • **Counterclockwise**= circle with Counterclockwise rotation
[I] X Centre [J] Y Centre	Circle centre Incremental with respect to the initial point. A coordinate can be forced as absolute by entering **"a;"**before the same dimension.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values.
[AN] Repetitions	Number of revolutions on a turn (360°). Only the values between 0 and 100 are considered valid. If a value less than 1 is set, it interprets 1.
[DNR] End with a pass with a constant depth	If selected, it adds a complete circle to close the programmed development, carried out at the position of the final depth.
[SR] Pitch	Radius increment per each turn. The value is significant with the sign: • positive increase the radius; • negative decrease the radius.
[R] Final radius	Spiral final radius. The field is significant, if the **Path** is not set or if its value is less than (epsilon*5.0).

TECHNOLOGICAL PARAMETERS

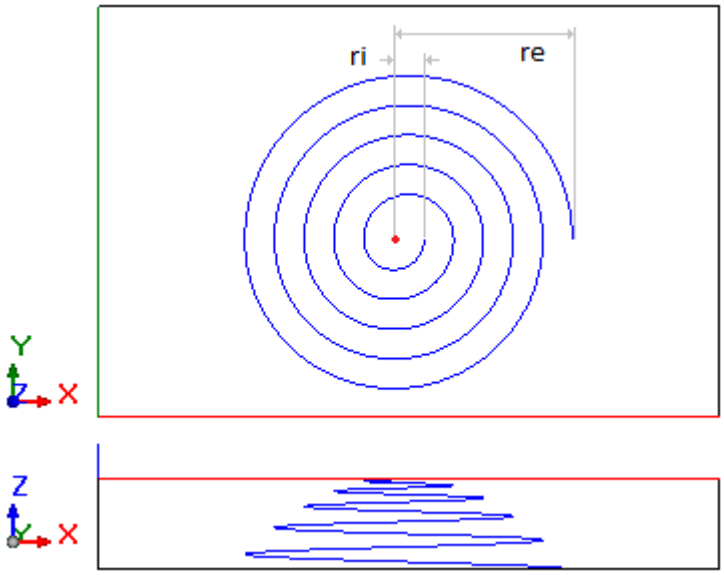
[DVAR] Compensation	It changes the tool compensation in the segment between poles. Choice is made among: • **Unchanged=** it carries on the current status; • **Restart=** if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=** it interrupts the compensation of the present segment: the downstream segment will not be corrected until the next resumption. • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. For further details, please read the manual of TpaCAD, chapter ***Workings-> Profilo->Tool compensation*** **.**
[DSIDE] Change compensation side	It inverts the compensation side (from the left to the right or viceversa). The activation of this selection is subject to limitations, as follows: • The request may correspond to a resumption of correction after a interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available in **Professional mode only.**
[F] Movement Speed	It sets a movement speed value different from the settings in the previous profile blocks.

Particular cases:

If:
- The **Pitch** on the programmed radius is less than (epsilon*5.0) and
- the **Final radius** is less than epsilon, or
- the difference between the **Final radius** and the initial one is less than (epsilon*5.0), or
- the pitch on the radius, calculated by dividing the difference of the two radii by the number of the **Repetitions**, is less than (epsilon*5.0)

the solutions correspond to the case of Helix (see working A48 Helix).

EXAMPLE:



The figure shows an endless spiral, programmed with 5 turns, positive pitch of the radius and constant depth, whose development on the depth axis from Z0 to Z is equal to the face thickness.
The figure highlights both the radii:
Ri= initial radius
Re= final radius

SUB

Working to recall a subroutine

It programs the call of a subroutine that manages the geometrical transformations and the multiple application with free repetition.

A subroutine is a piece-program file independently whether it is implemented with program or subroutine typology, with programmed workings in one or more faces. The face of the subroutine to be applied is set in the **Face** field. It has two possibilities of functioning:
- no assignation of face setting. (Induced call procedure)
- setting the face field.(Direct calling procedure)

In case of induced calls, every face of the program applies the corresponding face of the subroutine (face 1 of program recalls face 1 of subroutine, etc.). Nevertheless some conditions shall be checked, otherwise it only applies the corresponding face of subroutine:
- no point hooking shall be required
- the piece shall comply with program typology
- the level of application is the basic one (no expanded level)
- a text development subroutine is not recognized.

For the induced calls we apply the following rules:
- they are program lines that cannot be directly modified; they are entered and/or deleted and/or automatically changed by modifying the main call.
- they meet the logical conditions of the main call
- a selection of coordinate placing in *relative* is cancelled.

If the recall of the subroutine is programmed in face-piece, the face where the subroutine is applied, is assigned in the "F" field of the working.

For further details reference is made to the TpaCAD manual, chapter **Workings-> Subroutine.**

The parameter to be used are as follows:

IF (...)? (..) (...)	The subroutine call can be conditioned through the parameters of the IF (...)? (...)? (...)**..** The working is carried out only if the required condition is checked as true. The condition is checked as true anyway if the corresponding parameters are not set. Up to three terms of logical conditioning can be assigned.
[ESP1] e1	Assignment parameters of the first term of comparison
[ESP2] e2	(e1) ? (e2)
[TST1] ?	with [TST1]? assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it solves TRUE value, if both the terms are verified. • **Or**: it solves TRUE value, if at least one term is verified
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it solves TRUE value, if both the terms are verified. • **Or**: it solves TRUE value, if at least one term is verified
[ESP5] e5	Assignment parameters of the third comparison term:
[ESP6] e6	(e5) ? (e6)
[TST3] ?	with [TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)

GEOMETRIC PARAMETERS

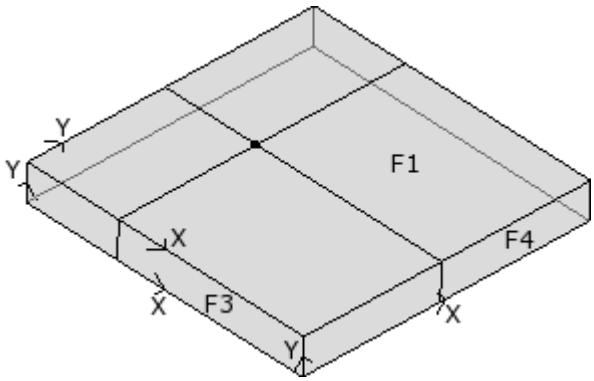
[X] X1 [Y] Y1 [Z] Z1	X, Y, Z coordinates of application. They are significant singularly. The point of application (programmed by Working of Point of application), if assigned, or the first working point of the subroutine is translated to the point. If dimensions are not assigned, no translation applies with respect to the original development of the subroutine.

[ER] Locate the extents rectangle	It locates coordinates of point of application according to overall rectangle dimensions (considered only in the xy plane). Possible options: • **Do not apply**= this option is not enabled • **Centre in XY**= it shifts the x,y making them coincide in the center of the overall rectangle • **X-Y-**= it shifts the x,y coordinates making them coincide with the minimum x and y coordinates of the overall rectangle • **X-Y+**= it shifts the x,y coordinates making them coincide with the x coordinates at the minimum overall dimension and the y coordinates at the maximum overall dimension • **X+Y-**= it shifts the x,y coordinates making them coincide with the x coordinates at the maximum overall dimension and the y coordinates at the minimum overall dimension • **X+Y+**= it shifts the x,y coordinates making them coincide with the x and y coordinates at the maximum overall dimension
[H] Subroutine	Denomination of the subroutine. It can be edited in parameter or assignation shape opening the file opening window. In this last case the research is set in the standard storage folder of the subroutines (SUB)
Rnnn	It sets the re-assignable (public) r variables of the subroutine by opening a specially-intended window. It does not operate if the subroutine has no re-assignable variables.
[SIDE] Face	Number of the subroutine face to be applied.
[SON] Induced faces	It lists the faces to be applied in case of induced calls. The syntax to be utilized is "nFaccia;nFaccia;..". Example: 1;2;4
[SOFF] Excluded faces	It lists the faces not to be applied in case of induced calls. If set, it is significant only if the field of the **Induced faces** is not assigned.
[SXY] Induced XY	Positioning mode of the XY point of application in case of induced calls. It is useful, when in case of no physical correspondence between the XY axes of the different faces (for example: the X coordinate of a side face can correspond to the Y coordinate of the base face) . • **Default=** it applies the TpaCAD configuration setting • **Adapt XY=**it adapts the point of application • **Forward XY unchanged =**it does not adapt the point • **Do not go through XY=** it does not forward the point of application. X and Y assignations are not considered in the induced call/calls. See the example.
[EG] Relative	If selected, also the parameter **Rel<-[EGI]** is assessed. If this parameter is enabled and comes before a complex working, the point of application is considered as relative to the starting point of application of the previous working, otherwise the point of application is considered as relative to the final point of application of the previous working.
[EGL] Point hook	If selected, it hooks the current application to the previous point and it validates the continuity to the profile started before. It prevails on each other assignment of placement, **X1,Y1,Z1** parameters included. The placing on (X, Y, Z) is defined in relative mode with null displacements against the final point of application of the previous working. In case of hooking between milling operations, the elimination of the tool raising from / lowering to the point of hooking can be checked too.
[EGI] Rel <-	It is assessed only if the **Relative[EG]** parameter is enabled.
[A] Rotation angle	Angle of rotation, programmed in degrees. The rotation applies on xy plane only. The rotation center is the application point applied to the development of the subroutine
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a specular setting around a vertical axis on the face place. If selected at the same time with **Vertical Mirror**, it sets a symmetry against X and Y axes
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around a horizontal axis on the face. If selected at the same time with **Horizontal Mirror**, it sets a symmetry against X and Y axes
[EINV] Invert	If selected, it inverts the execution of the subroutine: the last block becomes the first, etc. The transform inverts also the tool correction

	settings (right or left) of each setup.
STRETCH FACTOR	
[EFAT] Enable	If selected, it enables the modification of the dimension (scale).
[FAT] Factor	It sets the scale factor. The minimum value that can be set is 0.001. A value higher than 1 involves an amplification; a value lower than 1 involves a reduction; a value equal to 1 involves no transformation.
[ZFAT]3d scale	If selected, it applies the modification of the dimension also in depth. The selection is compulsory if the subroutine carries out arcs on planes different from XY.
REPETITIONS	
[NR] Repetitions	It sets the number of repetitions to be added to the base application. The minimum significant value is 1.
[NX] X Offset	It sets the X offset of placing applied to every repetition. It is interpreted in relative.
[NY] Y Offset	It sets the Y offset of placing applied to every repetition. It is interpreted in relative.
[NZ] Z Offset	It sets the Z offset of placing applied to every repetition. It is interpreted in relative.
[EGO] Rel <-	If selected, it applies the offset of the placements against the starting point of the previous repetition.
[EGLR] Point hook	If selected, it hooks every repetition to the final point of the previous repetition. The parameters of Offset [NX, NY, NZ] and of point hooking [EGO] are ignored.
[E1A] Offset A	It sets the angle increase for every repetition against the previous repetition.

Cases of error:
Requiring a geometric transform involves an error if the development of the subroutine has determined the application of a complex code to which a limitation in the application of the current transform is applied. This report can affect the following transform: inversion (**Invert[EINV]**), rotation (**Angle of rotation[A]**), symmetry (**Mirror [EMX] [EMY]**), scale factor (***STRETCH FACTORS***)

EXAMPLE:
Parameter: Induced Faces=Adapt XY
Consider the figure (it shows the three visible faces of the piece, supposing a piece in transparency):
- ***assign a subroutine application in face 1 (master face), inside which the application point on the face plane is shown***
- ***calls are induced in the two other faces indicated: face 3 and face 4***



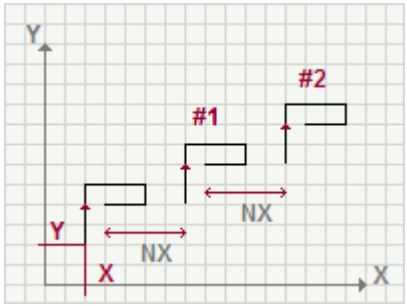
- face 3: x axis has a physical correspondence with x axis of face 1, while y axis has no physical correspondence with y axis of face 1;
- face 4: x axis has a physical correspondence with y axis of face 1, while y axis has no physical correspondence with x axis of face 1;

The **[SXY] XY induced** selection **= Adapt XY** carries out the automatic associations.
- face 3: coordinate of application on x coordinate = dimension of application on x coordinate of face 1; dimension of application on y coordinate = not assigned;
- face 4: coordinate of application on x coordinate = coordinate of application on y coordinate of face 1; coordinate of application on y coordinate = not assigned;

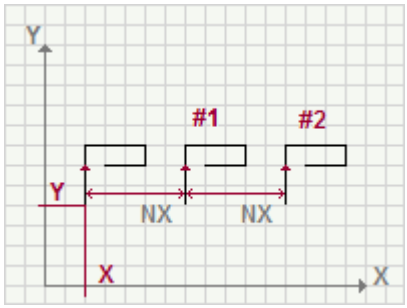
The table shows the correspondences applied with Induced **[SXY] XY** =Adapt XY:

Master face	*Induced face*	*Coordinate in induced face*
(1,2)	(4,6)	X = Y coordinate from master face (if not set ="") Y = ""
(1,2)	(3,5)	X= X coordinate from master face Y=""
(3,5)	(1,2)	X= X coordinate from master face Y=""
(4,6)	(1,2)	X = Y coordinate from master face (if not set ="") Y=""
(any other case)	(any other case)	X= X coordinate from master face Y = Y coordinate from master face

Free repetition with Rel<- [EGO] parameter not set, number of Repetitions [NN]=2 and Offset X[NX] of assigned placement . In the figure, X,Y are the dimensions of the point of application.



Free repetition with Rel<- [EGO] parameter set, number of Repetitions [NN]=2 and Offset X[NX] of assigned placement . In the figure, X,Y are the dimensions of the point of application.



SMAT

Working to recall a Subroutine

It programs the recall of a subroutine that manages the geometrical transformations and the multiple application with matrix repetition.

For further details reference is made to the TpaCAD manual, chapter **Workings->Subroutine.**

The parameter to be used are as follows:

IF (...)? (..) (...)	The subroutine call can be conditioned through the parameters of the ***IF (...)? (...)? (...).*** The working is carried out only if the required condition is checked as true. The condition is checked as true anyway if the corresponding parameters are not set. Up to 3 terms of logical conditioning can be assigned.
[ESP1] e1	Assignment parameters of the first term of comparison
[ESP2] e2	(e1) ? (e2)
[TST1] ?	with [TST1]? assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it solves TRUE value, if both the terms are verified. • **Or**: it solves TRUE value, if at least one term is verified
[ESP3] e3	Assignment parameters of the second term of comparison:
[ESP4] e4	(e3) ? (e4)
[TST2] ?	with [TST2]? assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it solves TRUE value, if both the terms are verified. • **Or**: it solves TRUE value, if at least one term is verified
[ESP5] e5	Assignment parameters of the third term of comparison
[ESP6] e6	(e5) ? (e6)
[TST3] ?	with [TST3]? assigned among six relation conditions:(<,<=,>,>=,=,#)

GEOMETRIC PARAMETERS

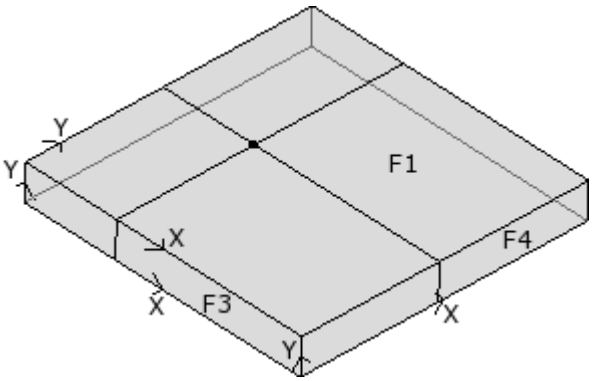
[X] X1 [Y] Y1 [Z] Z1	X, Y, Z dimension of application. They are significant singularly. The point of application (programmed by Working of Point of application), if assigned, or the first working point of the subroutine is translated to the point. If the dimensions are not assigned, no translation applies with respect to the original development of the subroutine.
[ER] Locate the extents rectangle	It locates coordinates of point of application according to overall rectangle dimensions (only considered in the xy plane). Possible options: • **Do not apply**= this option is not enabled • **Centre in XY**= it shifts the x,y making them coincide in the center of the overall rectangle • **X-Y-**= it shifts the x,y coordinates making them coincide with the minimum x and y coordinates of the overall rectangle • **X-Y+**= it shifts the x,y coordinates making them coincide with the x coordinates at the minimum overall dimension and the y coordinates at the maximum overall dimension • **X+Y-**= it shifts the x,y coordinates making them coincide with the x coordinates at the maximum overall dimension and the y coordinates at the minimum overall dimension

	• **X+Y+**= it shifts the x,y coordinates making them coincide with the x and y coordinates at the maximum overall dimension
[H] Subroutine	Denomination of the subroutine. It can be edited in parameter or assignation shape opening the file opening window. In this last case the research is set in the standard storage folder of the subroutines (SUB)
Rnnn	It sets the re-assignable (public) r variables of the subroutine by opening a specially-intended window. It does not operate if the subroutine has no re-assignable variables
[SIDE] Face	Number of the subroutine face to be applied.
[SON] Induced Faces	It lists the faces to be applied in case of induced calls. The syntax to be utilized is "nFaccia;nFaccia;..". Example: 1;2;4
[SOFF] Excluded Faces	It lists the faces not to be applied in case of induced calls.
[SXY] Induced XY	Modality of positioning of the XY point of application in case of induced calls, useful when there is no physical correspondence on the piece of the XY axes of the various faces (or instance, X dimension of a side face corresponds to Y dimension of the base face). • **Default=**it applies the configuration setting of TpaCAD • **Adapt XY=**it adapts the point of application • **Go through XY=**it does not adapt the point • **Do not go through XY=** it does not forward the point of application. X and Y assignations are not assigned in the induced call/calls. See the example
[EG] Relative	If selected, also the parameter **Rel<-[EGI]** is assessed. If this parameter is enabled and comes before a complex working, (for example recall of subroutine) the point of application is considered as relative to the starting point of application of the previous working, otherwise the point of application is considered as relative to the final point of application of the previous working.
[EGL] Point hook	If selected, it hooks the current application to the previous point and it validates the continuity to the profile started before. It prevails on each other assignment of placement, **X1,Y1,Z1** parameters included. The placing on (X, Y, Z) is defined in relative mode with null displacements against the final point of application of the previous working. In case of hooking between milling operations, the elimination of the tool raising from / lowering to the point of hooking can be checked too.
[EGI] Rel <-	It is assessed only if the **Relative[EG]** parameter is enabled.
[A] Rotation angle	Angle of rotation, programmed in degrees. The rotation applies on xy plane only. The rotation center is the application point applied to the development of the subrotuine.
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a specular setting around a vertical axis on the face place. If selected at the same time with **Vertical Mirror**, it sets a symmetry against X and Y axes
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around a horizontal axis on the face. If selected at the same time with **Horizontal Mirror**, it sets a symmetry against X and Y axes
[EINV] Invert	If selected, it inverts the execution of the subroutine: the last block becomes the first, etc. The transformed programming inverts also the tool correction settings (right or left) of every setyp.
STRETCH FACTOR	
[EFAT] Enable	If selected, it enables the modification of the dimension (scale).
[FAT] Factor	It sets the scale factor. The minimum value that can be set is 0.001. A value higher than 1 involves an amplification; a value lower than 1 involves a reduction; a value equal to 1 involves no transformation.
[ZFAT] 3d scale	If selected, it applies the modification of the dimension also in depth. The selection is compulsory if the subroutine carries out arcs on planes different from XY.
REPETITIONS	
[NL] Rows	It sets the number of execution rows of the repetition on the matrix development. The minimum value is 1. The rows are assigned along the direction of the Y axis.
[NC] Columns	It sets the number of execution rows of the repetition on the matrix development. The minimum value is 1. The columns are assigned along the direction of the X axis.

[NTX] Column spacing	It sets the distance between subsequent columns. They are values applied in relative.
[NTY] Row spacing	It sets the distance between subsequent rows. They are values applied in relative.
[EGO] Rel <-	If selected, it applies the value of distance (between rows an columns) at the starting point of the previous repetition.

Cases of error:
Requiring a geometric transform involves an error if the development of the subroutine has determined the application of a complex code to which a limitation in the application of the current transform is applied. This report can affect the following transform: inversion (**Invert[EINV]**), rotation (**Angle of rotation[A]**), symmetry (**Mirror [EMX] [EMY]**), scale factor (***STRETCH FACTORS***)

EXAMPLES:
Parameter: Induced Faces=Adapt XY
Consider the figure (it shows the three visible faces of the piece, supposing a piece in transparency):
- ***assign a subroutine application in face 1 (master face), inside which tha application point on the face plane is shown***
- ***calls are induced in the two other faces indicated: face 3 and face 4***



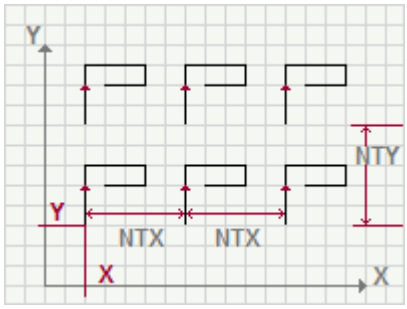
- face 3: x axis has a physical correspondence with x axis of face 1, while y axis has no physical correspondence with y axis of face 1;
- face 4: x axis has a physical correspondence with y axis of face 1, while y axis has no physical correspondence with x axis of face 1;

The selection of **induced [SXY] XY = Adapt XY** carries out the automatic associations:
- face 3: coordinate of application on x coordinate = dimension of application on x coordinate of face 1; dimension of application on y coordinate = not assigned;
- face 4: coordinate of application on x coordinate = coordinate of application on y coordinate of face 1; coordinate of application on y coordinate = not assigned;

The following table shows the correspondences applied with XY Induced parameter =AdaptXY:

Master face	***Induced face***	***Coordinate in induced face***
(1,2)	(4,6)	X = Y coordinate from master face (if not set ="") Y = ""
(1,2)	(3,5)	X= X coordinate from master face Y=""
(3,5)	(1,2)	X= X coordinate from master face Y=""
(4,6)	(1,2)	X = Y coordinate from master face (if not set ="") Y=""
(any other case)	(any other case)	X= X coordinate from master face Y = Y coordinate from master face

Repetition with matrix distribution with Rel<- [EGO] parameter set, column number [NC]=5, row number [NL]=2, Offset X[EX] and Offset Y [EY] of placing assigned. In the figure, P1 shows the point of application.


Y
NTY
Y
NTX
NTX
X
X

SEMPTY

Working to recall a subroutine

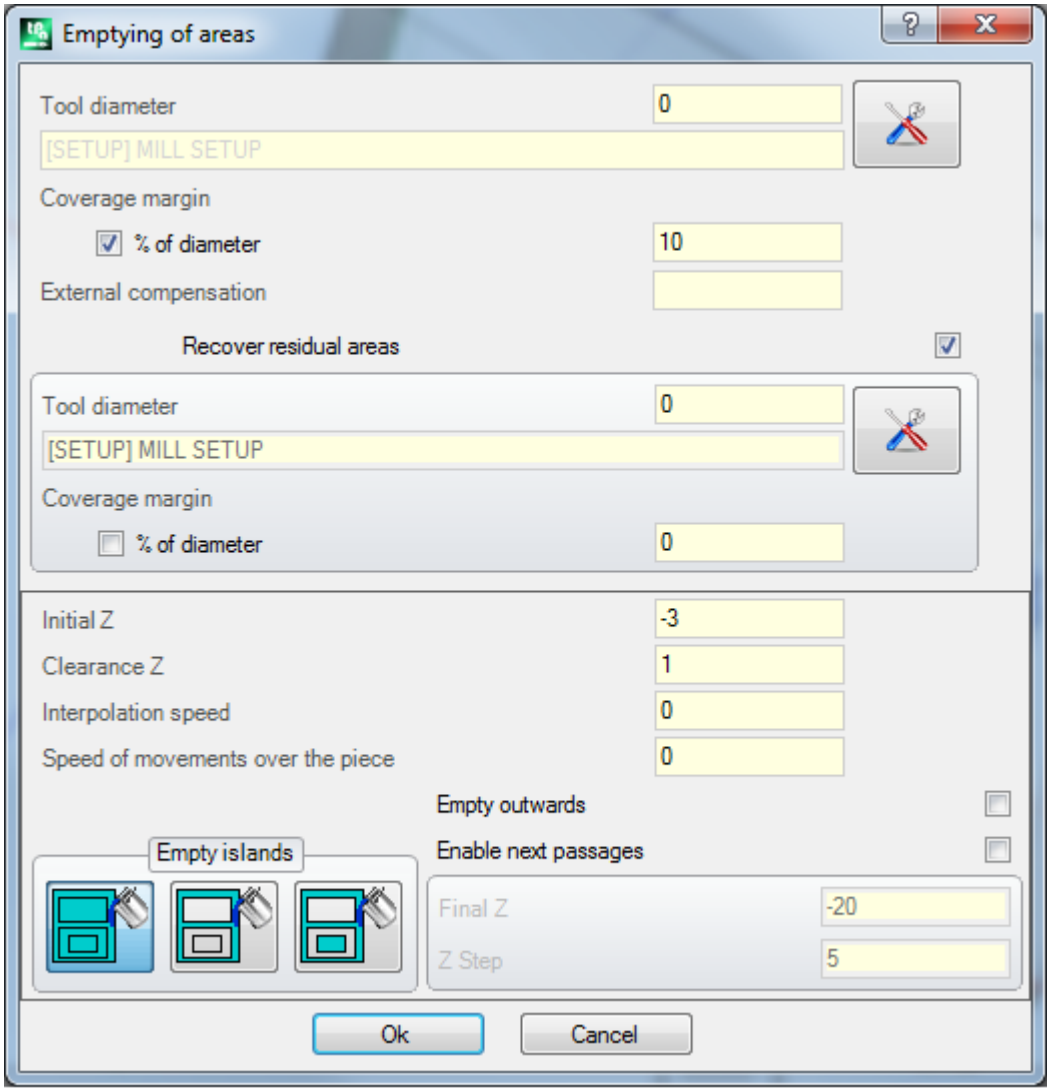
It programs the call of a subroutine for the application of emptying of closed areas

For further details reference is made to the TpaCAD manual, chapter **Workings->Subroutine.**

The parameter to be used are as follows:

IF (...)? (..) (...)	The subroutine call can be conditioned through the parameters of the ***IF (...)? (...)? (...).*** The working is carried out only if the required condition is checked as true. The condition is checked as true anyway if the corresponding parameters are not set. Up to 3 terms of logical conditioning can be assigned.
[ESP1] e1	Assignment parameters of the first term of comparison
[ESP2] e2	(e1) ? (e2)
[TST1] ?	with [TST1]? assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it solves TRUE value, if both the terms are verified • **Or**: it solves TRUE value, if at least one term is verified
[ESP3] e3	Assignment parameters of the second term of comparison:
[ESP4] e4	(e3) ? (e4)
[TST2] ?	with [TST2]? assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it solves TRUE value, if both the terms are verified. • **Or**: it solves TRUE value, if at least one term is verified
[ESP5] e5	Assignment parameters between the third term of comparison
[ESP5] e6	(e5) ? (e6)
[TST3] ?	with [TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)
GEOMETRIC PARAMETERS	
[X] X1 [Y] Y1 [Z] Z1	X, Y, Z dimension of application. They are significant singularly. The point of application (programmed by Working of Point of application), if assigned, or the first working point of the subroutine is translated to the point. If the dimensions are not assigned, no translation applies with respect to the original development of the subroutine.
[H] Subroutine	Denomination of the subroutine. It can be edited in parameter or assignation shape opening the file opening window. In this last case the research is set in the standard storage folder of the subroutines (SUB)
Rnnn	It sets the re-assignable (public) r variables of the subroutine by opening a specially-intended window. It does not operate if the subroutine has no re-assignable variables.
[SIDE] Face	Number of the subroutine face to be applied.
[SON] Induced faces	It lists the faces to be applied in case of induced calls. The syntax to be utilized is "nFaccia;nFaccia;..". Example ; 1;2;4
[SOFF] Excluded faces	It lists the faces not to be applied in case of induced calls. If set, it is significant only if the **Induced Faces** field is not assigned.
[SXY] Induced XY	Modality of positioning of the XY point of application in case of induced calls, for the physical correspondence on the piece of the XY axes of the various faces is not always possible (for instance, X dimension of a side face corresponds to Y dimension of the base face). • **Default=** it applies the configuration setting of TpaCAD

	• **Adapt XY=**it adapts the point of application • **Go through XY=**it does not adapt the point • **Do not go through XY=** it does not forward the point of application**.** X and Y assignations are not assigned in the induced call/calls. See the example
[EG] Relative	If selected, also the parameter **Rel<-[EGI]** is assessed. If this parameter is enabled and comes before a complex working, (for example recall of subroutine) the point of application is considered as relative to the starting point of application of the previous working, otherwise the point of application is considered as relative to the final point of application of the previous working.
[EGL] Point hook	If selected, it hooks the current application to the previous point and it validates the continuity to the profile started before. It prevails on each other assignment of placement, **X1,Y1,Z1** parameters included. The placing on (X, Y, Z) is defined in relative mode with null displacements against the final point of application of the previous working. In case of hooking between milling operations, the elimination of the tool raising from / lowering to the point of hooking can be checked too.
[EGI] Rel <-	It is assessed only if the **Relative[EG]** parameter is enabled.
[A] Rotation angle:	Angle of rotation, programmed in degrees. The rotation applies on xy plane only. The rotation centre is the application point applied to the development of the subrotuine.
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a specular setting around the vertical axis on the face place. If selected at the same time with **Vertical Mirror**, it sets a symmetry against X and Y axes
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face. If selected at the same time with **Horizontal Mirror**, it sets a symmetry against X and Y axes
[EINV] Invert	If selected, it inverts the execution of the subroutine: the last block becomes the first, etc. The transformed programming inverts also the tool correction settings (right or left) of every setyp.
EMPTYING	
[NR] Emptying enable	If selected, it enables the emptying of the closed profiles of subroutine.
[ONLY] Keep emptying operations only	If selected, it eliminates the original workings of the subroutine, even those which did **not** generate any emptying processes.
[NOP] Emptying setup	Setup working code. It can be set with direct edit or selecting the code from the setup list shown in the window. As an alternative to a working code and if it is permitted by the configuration of TpaCAD, you can set the NAME assigned to a working programmed before; in this case the field assigns the whole setup of the emptying profile. Setting a second name instead assigns the setup of the recover profiles of the residual areas (for further details, please read the manual of TpaCAD) If no code (or a Name) is assigned, the setup code by default is used, as set for the application face.
Emptying	It opens a dialogue window for the input of the parameters for the emptying application. For further details see the TpaCAD manual, chapter **Tools->Constructions->Emptying of areas.**


Emptying of areas
Tool diameter
0
[SETUP] MILL SETUP
Coverage margin
% of diameter
10
External compensation
Recover residual areas
Tool diameter
0
[SETUP] MILL SETUP
Coverage margin
% of diameter
0
Initial Z
-3
Clearance Z
1
Interpolation speed
0
Speed of movements over the piece
0
Empty outwards
Empty islands
Enable next passages
Final Z
-20
Z Step
5
Ok
Cancel

SSIDE-APPLY CALL

Working to program an induced call

It programs an induced call. The code operates only if applied in an list expanded from piece-face (face 0) and anyway not in the application of an automatic induced call.
The working is used to write a subroutine (or macro-program) and recalls on of its own face (ex.: the face 3) on another one (ex. face 2).

The parameters to be used are the following ones:

IF (...)? (...)? (...)	The execution of the working can be conditioned through the parameters of the ***IF (...)? node. (...)? (...).*** The working is carried out only if the required condition is verified as true. The condition is always verified as true, if the corresponding parameters are not set. Up to three **terms of logic conditioning** can be assigned
[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it resolves TRUE value, if both the terms are verified. • **Or**: it resolves TRUE value, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it resolves TRUE value, if both the terms are verified. • **Or**: it resolves TRUE value, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: **(e5) ? (e6)** with **[TST3]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
GEOMETRIC PARAMETERS	
XYZ	Select the box to activation the recognition process of the specific application point for the induced call here programmed, then set the coordinates in the following fields (in absolute mode and the programming is considered valid for all the 3 coordinates)
[X] X1 [Y] Y1 [Z] Z1	Coordinates of the application point X,Y,Z
[SIDE] Face	Number of the subroutine face to be recalled . It can assign a real of fictive face number.
[ISIDE] Induced face	Number of the induced face (piece face on which the call is to be applied). If the assigned number is less or equal to zero (<= 0), it considers the latest created automatic face

RECTANGLE

Working for the construction of a profile with technology assignment

It programs a profile, opened by a technological setup, for the execution of a rectangle.

The parameters to define the working are:

GEOMETRIC PARAMETERS

[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"**before the same coordinate, For instance, if a Y dimension relative to the previous point but with absolute X dimension = 50 has to be programmed, the flag of *Relative* will be enabled and X dimension will be set = a;50.
[X] X Centre [Y] Y Centre	Dimensions of the rectangle center.
[Z] Zp	Depth coordinate
[EW] Direction	Direction of rotation • **Clockwise**= a rectangle with clockwise rotation • **Counterclockwise**= a rectangle with counterclockwise rotation
[DL] Length	Rectangle length (dimension along the x axis)
[DH] Height	Rectangle height (dimension along the axis y)
[LS] Typology	This value allows you to define how to use the value of the **Fillet** parameter to solve the vertices: • **Fillet** = Fillet parameter sets the radius of the joining arc. • **Chamfer**= the Fillet parameter sets the length of the chamfering segment • **Lines to vertex=** the Fillet parameter sets the length of the linear segments available on both the lines from the edge on which the chamfering is required.
[U] Fillet	Fillet radius or length of the chamfer on the vertices of the rectangle. The value is significant if a non-null value is set.
[ARI] Entry arc	It enables the execution of an entry arc tangent to the figure. • **Unmanaged**= it does not execute • **Internal**= it execute an arc inside the figure • **External** = it execute an arc outside the figure
[ARO] Exit arc	It enables the execution of an exit arc tangent to the figure • **Unmanaged**= it does not set any arc • **Internal**= it sets an arc whose starting point and development are inside the figure • **External** = it sets an arc whose starting point and development are outside the figure
[UI] Entry/Exit radius	Radius of the entry/exit arc to the rectangle.
[EGL] Point hook	If selected, it hooks the new point to the previous point and validates the continuity between profiles. A hooking to a point always applies null deviations to the relative value. If the previous working permits the point hooking (setup, line, arc, subroutine ending with a profile element) the setup is not carried out and the profile carries on the profile that was possibly assigned before. In this case an ***hooking between profiles*** occurs.
[A] Rotation angle	Angle of rotation, programmed in degrees. The rotation applies on xy plane only.
[EMX] Horizontal mirror	Mirror parameter. If selected, it sets a specular setting around a vertical axis on the face place. If selected at the same time with **Vertical Mirror**, it sets a symmetry against X and Y axes
[EMY] Vertical mirror	Mirror parameter. If selected, it sets a specular setting around a horizontal axis on the face. If selected at the same time with **Horizontal Mirror**, it sets a symmetry against X and Y axes

[EINV] Invert	If selected, it inverts the execution of the profile. The transformed programming inverts also the tool correction settings (right or left).

TECHNOLOGICAL PARAMETERS

[TMC]Machine	Machine number
[TR]Group	Group number of the machine
[EM] Electric spindle	Number of the electric spindle
[T] Tool	Tool number.
[TP] Tool typology	Tool typology.
[F] Entry speed	Tool entry speed
[S]Rotation speed	Tool rotation speed
[FI] Speed movement	Interpolation speed

ADVANCED TECHNOLOGY DATA

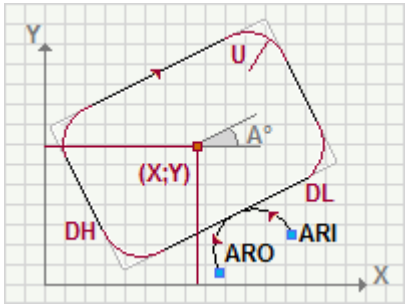
[NEXT] Nesting type	It defines the characterization of the profile that will be used in a nesting process to be applied later: • **None**=the profile is excluded by a nesting • **Nesting geometry**= nesting profile • **Enclose scraps** = characterizes a scraps hole (can be used for a nesting positioning). For nesting, consider the closed profiles only.
[DN] Compensation	It enables the compensation with side selection: • **Off**=no compensation; • **Left**= left side; • **Right**= right side.
[D] Compensation radius	Compensation radius to be set when a compensation is required that differs from the tool radius

During the confirmation of data some custom errors may be displayed.

Custom errors

Custom Error 12: Invalid figure overall dimensions	one or both the dimension of the figure are not set or are set with a value that is less than 1 mm.
Custom Error 12: Invalid figure overall dimensions	the value of the fillet radius is greater then the half of one or both the dimension of the figure.

EXAMPLE:
It draws a rectangle with:
- ***clockwise rotation***
- ***an entry arc [ARI] and an exit arc [ARO], outside the rectangle***
- ***filleted edges***
- ***a rotation [A] around the center [X,Y]***



POLYGON

Working for the construction of a profile with technology assignment

It programs a working profile, opened by a technological setup, for the execution of a polygon.

The parameters to define the working are:

GEOMETRIC PARAMETERS

[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"** before the same coordinate. For instance, if a Y coordinate relative to the previous point but with absolute X coordinate = 50 has to be programmed, the flag of *Relative* will be enabled and X coordinate = a;50 will be set.
[X] X Centre [Y] Y Centre	Coordinates of polygon center
[Z] Zp	Depth coordinate
[PL] Polygon	Type of polygon. • **Inscribed**= contained in a circonference • **Circumscribed** = containing a circonference
[EW] Direction	Direction of rotation • **Clockwise**= a figure with clockwise rotation • **Counterclockwise**= a figure with counterclockwise rotation
[U] Radius	Radius of the inscribed or circumscribed circle.
[N] Sides	Number of polygon edges Minimum value = 3
[A0] A0	Angle of the starting point in degrees
[EGL] Point hook	If selected, it hooks the new point to the previous point and it validates the continuity between profiles. A hooking point always applies null deviations to the relative values. If the previous working allows the point hooking (setup, line, arc, subroutine ending with a profile element), the present setup is not carried out and the profile carries on the profile that was possibly assigned before. In this way a ***hooking between profiles*** occurs.
[A] Angle of rotation.	Angle of rotation programmed in degrees. The rotation is only applied on xy plane.
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a specular setting around a vertical axis on the face place. If selected contemporaneously with the parameter **Vertical Mirror,** it sets a symmetry against X and Y axes.
[EMY] Vertical Mirror	Mirror parameter If selected, it sets a specular setting around a horizontal axis. If selected contemporaneously with the parameter **Horizontal Mirror** it sets a symmetry against X and Y axes.
[EINV] Invert	If selected, it inverts the execution of the profile. The transform inverts also the tool correction settings (right or left).

TECHNOLOGICAL PARAMETERS

[TMC]Machine	Machine number
[TR]Group	Machine group number
[EM]Electric spindle	Number of the electric spindle
[T] Tool	Tool number
[TP] Tool typology	Tool typology
[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed
[FI]Movement speed	Interpolation speed

ADVANCED TECHNOLOGY DATA

[NEXT] Nesting type	It defines the characterization of the profile that will be used in a nesting process to be applied later: • **None** = the profile is excluded by a nesting • **Nesting geometry** = nesting profile • **Enclose scraps** = characterizes a scraps hole (can be used for a nesting positioning). For nesting, consider the closed profiles only
[DN] Compensation	It enables the compensation with edge selection • **Off**=no compensation • **Left**= left edge • **Right**= right edge
[D] Compensation radius	Compensation radius. To be set if a different tool radius is required.

During the data confirmation some custom errors may be displayed.

Custom errors

Custom Error 18: Insufficient sides	The **[N]Sides** field a number is less than 3.
Custom Error 17: Too many sides required	The number of the polygon sides is greater than 99
Custom Error 7: Invalid Radius	The value in **[U]Radius** field is less than 1 mm

OVAL

Working for the construction of a profile with technology assignment

It programs a working profile, opened by a technological setup, for the execution of an oval.

The parameters to define the working are:

GEOMETRIC PARAMETERS

[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"** before the same coordinate.For instance, if a Y coordinate relative to the previous point but with absolute X coordinate = 50 has to be programmed, the flag of Relative will be enabled and X coordinate = a;50 will be set.
[X] X Centre [Y] Y Centre	Coordinates of the figure center
[Z] Zp	Depth coordinate
[EW] Direction	Direction of rotation • **Clockwise**= a figure with clockwise rotation • **Counterclockwise**= a figure with counterclockwise rotation
[N] Portion	Portion of ellipse or oval. • **Integer**= it draws the entire figure • **1/4**= it draws the first quarter • **2/4**= it draws half figure • **3/4**= it draws three quarters
[EL] Orientation	Choice of the axis along which the figure has to be developed. • **X**= it develops the figure along the X axis • **Y**= it develops the figure along the Y axis
[AX] Axis 1	First axis of the figure (major axis). It is developed along the axis defined by the **Direction**parameter.
[AY] Axis 2	Along the axis of the figure (minor axis)
[U] Radius	Radius along the major axis.
[ARI] Entry arc	It enables the execution of an entry arc to the figure. • **Unmanaged**= it does not execute • **Internal**= it execute an arc inside the figure • **External** =it executes an arc outside the figure
[ARO] Exit arc	It enables the execution of an exit arc to the figure. • **Unmanaged**= it does not execute • **Internal**= it executes an arc inside the figure • **External** = it executes an arc outside the figure
[EGL] Point hook	If selected, it hooks the new point to the previous point and it validates the continuity between profiles. A hooking point always applies null deviations to the relative values. If the previous working allows the point hooking (setup, line, arc, subroutine ending with a profile element) the present setup is not carried out and the profile carries on the profile that was possibly assigned before. In this way a ***hooking between profiles*** occurs.
[A] Angle of rotation.	Rotation angle programmed in degrees. The rotation is applied in xy plane only.
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a specular setting around an axis on the face place. If selected contemporaneously with the parameter **Vertical Mirror** it sets a symmetry against X and Y axes.
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around a horizontal axis on the face place. If selected contemporaneously with the parameter **Horizontal Mirror** it sets a symmetry against X and Y axes.

[EINV] Invert	If selected, it inverts the execution of the profile. The transformed programming inverts also the tool correction settings (right or left).

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Machine group number
[EM] Electric spindle	Number of the electric spindle
[T] Tool	Tool number
[TP] Tool typology	Tool typology
[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed
[FI] Movement speed	Interpolation speed

ADVANCED TECHNOLOGY DATA

[NEXT] Nesting type	It defines the characterization of the profile that will be used in a nesting process to be applied later: • **None**=the profile is excluded by a nesting • **Nesting geometry**= nesting profile • **Enclose scraps** = characterizes a scraps hole (can be used for a nesting positioning). For nesting, consider the closed profiles only.
[DN] Compensation	It enables the compensation with side selection • **Off**=no compensation • **Left**= left side • **Right**= right side
[D] Compensation radius	Compensation radius To be set, when a different tool radius is required.

While confirming the data some custom errors may be displayed:

Custom errors

Custom Error 13: Axis/invalid x overall dimension	X axis measure is less than 10mm.
Custom error 14: Axis/invalid y overall dimension	Y axis measure is less than 10mm.
Custom error 15: Axis/invalid overall dimensions, if they are equal	Difference between the two axis is less than di 5 mm.

ELLIPSE

Working for the construction of a complex profile

It programs a profile, opened by a technological setup, for the execution of an ellipse.

The parameters to define the working are:

GEOMETRIC PARAMETERS

[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A dimension can be forced as absolute by entering **"a;"**before the same coordinate. For instance, if a Y coordinate relative to the previous point but with absolute X coordinate = 50 has to be programmed, the flag of *Relative* will be enabled and X coordinate = a;50 will be set.
[X] X Centre [Y] Y Centre	Coordinates of the figure center
[Z] Zp	Depth coordinate
[EW] Direction	Direction of rotation • **Clockwise**= a figure with clockwise rotation • **Counterclockwise**= a figure with counterclockwise rotation
[N] Portion	Portion of ellipse or oval. • **Integer**= it draws the entire figure • **1/4**= it draws the first quarter • **2/4**= it draws half figure • **3/4**= it draws three quarters
[EL] Orientation	Choice of the axis along which the figure has to be developed. • **X**= it develops the figure along the X axis • **Y**= it develops the figure along the Y axis
[AX] Axis 1	First axis of the figure(major axis). It is developed along the axis defined by the **Direction** parameter.
[AY] Axis 2	Along the axis of the figure (minor axis)
[AN] Arcs number	Number of arc generated per quadrant.
[ARI] Entry arc	It enables the execution of an entry arc to the figure. • **Unmanaged**= it does not execute • **Internal**= it executes an arc inside the figure • **External** = it executes an arc outside the figure
[ARO] Exit arc	It enables the execution of an exit arc to the figure. • **Unmanaged**= it does not set any arc • **Internal**= it sets an arc whose initial point and development are inside the figure • **External** = it sets an arc whose initial point and development are outside the figure
[UI] Radius of entry/exit	Radius of the arc entering/exiting the figure
[EGL] Point hook	If selected, it hooks the new point to the previous point and it validates the continuity between profiles. A hooking point always applies null deviations to the relative values. If the previous working allows the point hooking (setup, line, arc, subroutine ending with a profile element) the present setup is not carried out and the profile carries on the profile that was possibly assigned before. In this way a ***hooking between profiles occurs.***
[A] Angle of rotation.	Rotation angle programmed in degrees. The rotation is applied in xy plane only.
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a specular setting around a vertical axis on the face place. If selected contemporaneously with the parameter **Vertical Mirror** it sets a symmetry against X and Y axes.
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around a horizontal axis on the face place. If selected contemporaneously with

	the parameter **Horizontal Mirror** it sets a symmetry against X and Y axes.
[EINV] Invert	If selected, it inverts the execution of the profile. The transformed programming inverts also the tool correction settings (right or left).

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR]Group	Machine group number
[EM] Electric spindle	Number of the electric spindle
[T] Tool	Tool number
[TP] Tool typology	Tool typology
[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed
[FI]Movement speed	Interpolation speed

ADVANCED TECHNOLOGY DATA

[NEXT] Nesting type	It defines the characterization of the profile that will be used in a nesting process to be applied later: • **None**=the profile is excluded by a nesting • **Nesting geometry**= nesting profile • **Enclose scraps** = characterizes a scraps hole (can be used for a nesting positioning). For nesting, consider the closed profiles only.
[DN] Compensation	It enables the compensation with side selection • **Off**=no compensation • **Left**= left side • **Right**= right side
[D] Compensation radius	Compensation radius. To be set when a different tool radius is required.

While confirming the data, some custom errors may be displayed.

Custom errors

Custom Error 13: Invalid x axis / overall dimension	the X axis measure is less than 10mm.
Custom Error 14: Invalid y axis / overall dimension	the Y axis measure is less than 10mm.
Custom Error 15: Invalid axes / overall dimensions if equal	the difference between the two axes is less than 5 mm.
Custom Error 11: Insufficient samplings	the **[AN] Number of arcs** field value per quadrant is less than 8.

CIRCLE

Working for the profile construction with technological assignment

It programs a profile, opened by a setup technological, for the execution of a circle

The parameters to define the working are:

GEOMETRIC PARAMETERS

[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"**before the same coordinate. For instance, if a Y coordinate relative to the previous point but with absolute X coordinate = 50 has to be programmed, the flag of *Relative* will be enabled and X coordinate = a;50 will be set.
[X] X Centre [Y] Y Centre	Coordinates of the circle center
[Z] Zp	Depth coordinate
[EW] Direction	Direction of rotation • **Clockwise**= a circle with Clockwise rotation • **Counterclockwise**= a circle with counterclockwise rotation
[R] Radius	Radius of the circle
[A0] Angle of the starting point	Angle in the beginning point of the circle (in degrees)
[ARI] Entry arc	It enables the execution of a tangent arc entering the figure. • **Unmanaged**= it does not execute • **Internal**= it execute an arc inside the figure • **External** = it execute an arc outside the figure
[ARO] Exit arc	It enables the execution of a tangent arc going out from the figure. • **Unmanaged**= it does not execute • **Internal**=it execute an arc inside the figure • **External** = it execute an arc outside the figure
[UI] Radius of entry/exit	Radius of the arc entering/exiting the circle
[EGL] Point hook	If selected, it hooks the new point to the previous point and it validates the continuity between profiles. A hooking point always applies null deviations to the relative values. If the previous working allows the point hooking (setup, line, arc, subroutine ending with a profile element) the present setup is not carried out and the profile carries on the profile that was possibly assigned before. In this way a ***hooking between profiles occurs.***
[A] Angle of rotation.	Rotation angle programmed in degrees. The rotation is applied in xy plane only.
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a mirror around the vertical axis on the face plane. If selected contemporaneously with the parameter **Vertical Mirror** it sets a symmetry against X and Y axes.
[EMY] Vertical mirror	Mirror parameter If selected, it sets a mirror around a horizontal axis on the face plane. If selected contemporaneously with the parameter **Horizontal Mirror** it sets a symmetry against X and Y axes.
[EINV] Invert	If selected, it inverts the execution of the profile. The transform also reverses the settings of tool correction (right or left) for each setup.

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Machine group number
[EM] Electric spindle	Number of the electric spindle

[T] Tool	Tool number
[TP] Tool typology	Tool typology
[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed
[FI] Movement speed	Interpolation speed

ADVANCED TECHNOLOGY DATA

[NEXT] Nesting type	It defines the characterization of the profile that will be used in a nesting process to be applied later: • **None**=the profile is excluded by a nesting • **Nesting geometry**= nesting profile • **Enclose scraps** = characterizes a scraps hole (can be used for a nesting positioning). For nesting, consider the closed profiles only.
[DN] Compensation	It enables the compensation with side selection • **Off**=no compensation • **Left**= left side • **Right**= right side
[D] Compensation radius	Compensation radius To be set when a different tool radius is required

During the data confirmation some custom errors can be displayed; they are specific of the relevant working and they can be generated by an ERROR instruction or a BREAK instruction:

Custom errors

Custom Error 7: Invalid radius	It appears, when in the **[R]Radius** field a value less than 1 mm is set.

HELIX

Profile construction working with technology attribution

It programs a profile, opened by a technological setup, to perform a helix.

The parameters to be used are the following ones:

GEOMETRIC PARAMETERS

[EG] Relative
If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"**before the same dimension. For instance, if a Y dimension relative to the previous point but with absolute X dimension = 50 has to be programmed, the flag of *Relative* will be enabled and X dimension will be set = a;50.

[X] X Center
[Y] Y Center
Coordinates of the figure centre

[ZI] Initial Z
Initial depth coordinate.

[Z] Final Z
Finale depth coordinate, if it differs from the initial depth.

[EW] Direction
Direction of rotation
- **Clockwise**= circle with Clockwise rotation
- **Counterclockwise**= circle with Counterclockwise rotation

[R] Radius
Radius of the circle

[A0] Angle of the initial point
Angle of the initial point of the figure (in degrees)

[AN] Repetitions
Number of revolutions on a turn (360°). Only the values between 0 and 100 are considered valid.

[AR] Residual angle
Residual angle to be added to the number of repetitions set. This setting is related to the interval (0 -360). Examples:

Repetitions	Residual angle (°)	Overall covered angle (°)
0	50	50
1	0	360
3	20	1100
1	-10	710
1	380	380
0	0	360

As shown in the table, if for both the fields a null value is calculated, the working develops a circle. The programmed depth change is distributed on the whole development.

[DNR] End with a pass with a constant depth
If selected, it adds a complete circle to close the programmed development, carried out at the position of the final depth.

[ARI] Entry arc
It enables the execution of a tangent arc entering the figure.
- **Unmanaged** = not performing
- **Internal**=it execute an arc inside the figure
- **External**=it execute an arc outside the figure

[ARO] Exit arc
It enables the execution of a tangent arc entering the figure.
- **Unmanaged** = not performing
- **Internal**=it execute an arc inside the figure
- **External**=it execute an arc outside the figure

[UI] Entry/Exit radius
Radius of the arc entering/exiting the circle

[EGL] Point hook
If selected, it hooks the new point to the previous point and it validates the continuity between profiles. A hooking to a point always applies null deviations to the relative value. If the previous working allows the point hooking (setup, line, arc, subroutine ending with a profile element) the present setup is not carried out and the profile carries on the profile that was possibly assigned before. In this case an ***hooking between profiles occurs.***

[A] Rotation angle	Angle of rotation, programmed in degrees. The rotation applies on xy plane only.
[EMX] Horizontal mirror	Mirror parameter. If selected, it sets a specular setting around a vertical axis on the face plane. If selected contemporaneously with the **Vertical Mirror** parameter, it sets a symmetry against X and Y.
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time as **Horizontal Mirror**, it sets a symmetry with regard to the X and Y axes.
[EINV] Invert	If selected, it inverts the execution of the profile. The transform also reverses the settings of tool correction (right or left) for each setup.

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[EM] Electric spindle	Number of the electric spindle
[T] Tool	Tool number.
[TP]Tool typology	Tool typology.
[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed
[FI] Movement speed	Interpolation speed

ADVANCED TECHNOLOGY DATA

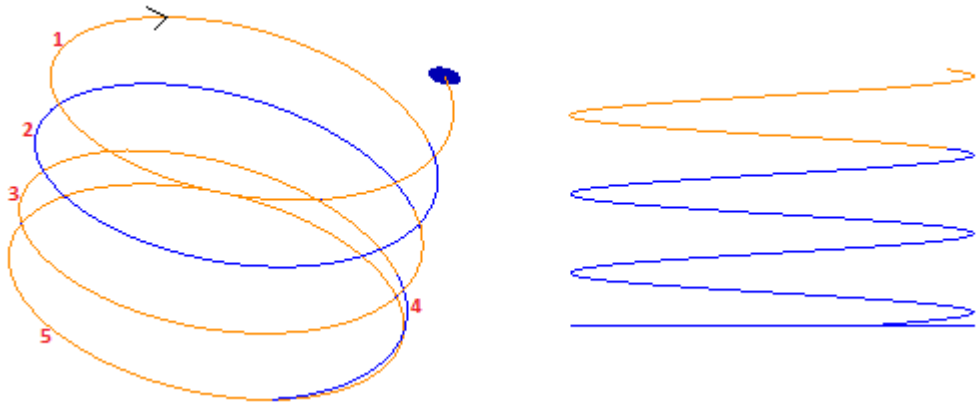
[DN] Compensation	It enables the compensation with side selection. • **Off**=no compensation; • **Left**= left side; • **Right**= right side.
[D] Compensation radius	Compensation radius. It has to be set when a compensation different from the tool radius is required

While confirming the data, some custom errors can be displayed:

Custom errors

Custom Error 7: Invalid radius	The value in the **[R] Radius** field sets a minimum value of 1 mm

EXAMPLE:



The figure shows a programmed helix with 3 turns, residual angle of 90° and a constant depth closure.
On the left, for each basic element, colours alternate to facilitate the comprehension:
- 1,2,3) are the three circles
- 4) is the residual angle
- 5) is the constant depth final circle.

On the right, the helix is shown in a side view in order to highlight the development on the depth axis.

SPIRAL

Profile construction working with technology attribution

It programs a profile, opened by a technological setup, to perform a spiral.

The parameters to be used are the following ones:

GEOMETRIC PARAMETERS

[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"**before the same dimension. For instance, if a Y dimension relative to the previous point but with absolute X dimension = 50 has to be programmed, the flag of *Relative* will be enabled and X dimension will be set = a;50.
[X] X Center [Y] Y Center	Coordinates of the figure centre
[ZI] Initial Z	Initial depth coordinate.
[Z] Final Z	Final depth coordinate
[EW] Direction	Direction of rotation • **Clockwise**= circle with Clockwise rotation • **Counterclockwise**= circle with Counterclockwise rotation
[R] Radius	Radius of the circle
[A0] Angle of the initial point	Angle of the initial point of the figure (in degrees)
[SR] Pitch	Radius increment per each turn. The value is significant with the sign: • positive increase the radius • negative decrease the radius
[R] Final radius	Spiral final radius. The field is significant, if the **Path** field is not set or if its value is less than (epsilon*5.0).
[AN] Repetitions	Number of revolutions on a turn (360°). Only the values between 0 and 100 are considered valid.
[DNR] End with a pass with a constant depth	If selected, it corresponds to the addition of a complete circle to close the programmed development, carried out at the position of the final depth.
[ARI] Entry arc	It enables the execution of a tangent arc entering the figure. • **Unmanaged** = it does not execute • **Internal**=it execute an arc inside the figure • **External**=it execute an arc outside the figure
[ARO] Exit arc	It enables the execution of a tangent arc entering the figure. • **Unmanaged** = not performing • **Internal**=it execute an arc inside the figure • **External**=it execute an arc outside the figure
[UI] Entry/Exit radius	Radius of the arc entering/exiting the circle
[EGL] Point hook	If selected, it hooks the new point to the previous point and it validates the continuity between profiles. A hooking to a point always applies null deviations to the relative value. If the previous working allows the point hooking (setup, line, arc, subroutine ending with a profile element) the present setup is not carried out and the profile carries on the profile that was possibly assigned before. In this case an ***hooking between profiles occurs.***
[A] Rotation angle	Angle of rotation, programmed in degrees. The rotation applies on xy plane only.
[EMX] Horizontal mirror	Mirror parameter. If selected, it sets a specular setting around a vertical axis on the face plane. If selected contemporaneously with the **Vertical Mirror** parameter, it sets a symmetry against X and Y.
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time as

	Horizontal Mirror, it sets a symmetry with regard to the X and Y axes.
[EINV] Invert	If selected, it inverts the execution of the profile. The transform also reverses the settings of tool correction (right or left) for each setup.

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[EM] Electric spindle	Number of the electric spindle
[T] Tool	Tool number.
[TP]Tool typology	Tool typology.
[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed
[FI] Movement speed	Interpolation speed

ADVANCED TECHNOLOGY DATA

[DN] Compensation	It enables the compensation with side selection. • **Off**=no compensation; • **Left**= left side; • **Right**= right side.
[D] Compensation radius	Compensation radius. It has to be set when a compensation different from the tool radius is required.

While confirming the data, some custom errors can be displayed:

Custom errors

Custom Error 7: Invalid radius	The value in the **[R] Radius** field sets a minimum value of 1 mm

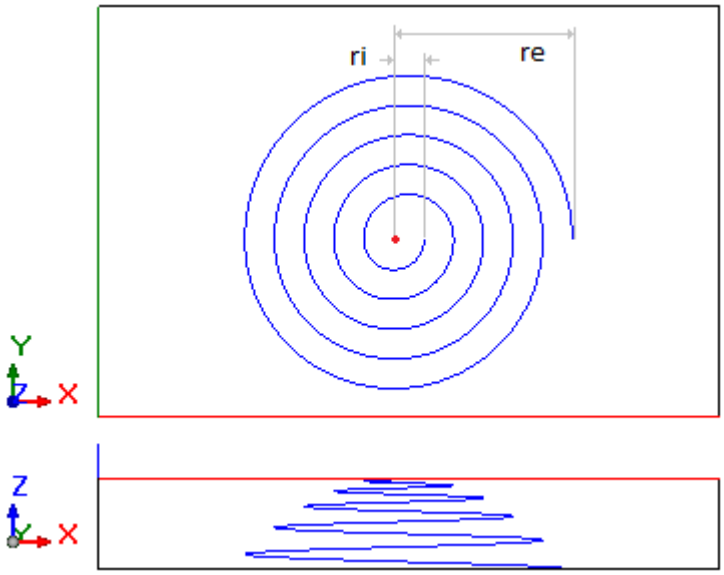
Particular cases:

If:

- The **Pitch** on the programmed radius is less than (epsilon*5.0) and
- the **Final radius** is less than epsilon, or
- the difference between the **Final radius** and the initial one is less than (epsilon*5.0), or
- the pitch on the radius, calculated by dividing the difference of the two radii by the number of the **Repetitions**, is less than (epsilon*5.0)

the solutions correspond to the case of Helix (see working A48 Helix).

EXAMPLE:



The figure shows an endless spiral, programmed with 5 turns, positive pitch of the radius and constant depth, whose development on the depth axis from Z0 to Z is equal to the face thickness.
The figure highlights both the radii :
Ri= initial radius

Re= final radius

POCKET

Working for the construction of a Profile with technology assignment

It programs a profile, opened by a technological setup, for the execution of a pocket.

The parameters to define the working are:

GEOMETRIC PARAMETERS

[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"**before the same coordinate. For instance, if a Y coordinate relative to the previous point but with absolute X coordinate = 50 has to be programmed, the flag of *Relative* flag will be enabled and X coordinate = a;50 will be set.
[X] X Centre [Y] Y Centre	Dimensions of the pocket arc centre. The meaning given to the position is assigned according to the selected item in **Position the centre** list.
[LC] Position the centre	Select where to place the point of Centre of the pocket: • **On the left**= (X Centre; Y Centre) corresponds to the centre of the left arc. The left arc is the arc whose position along the x axis is lower, • **In the centre**= (X Centre; Y Centre) corresponds to the centre of the figure • **On the right**= (X Centre; Y Centre) corresponds to the centre of the right arc. The right arc is the arc whose position along the x axis is higher.
[Z] Zp	Dimension of the profile depth.
[EW] Direction	Direction of rotation • **Clockwise**= a figure with clockwise rotation • **Counterclockwise**= a figure with counterclockwise rotation
[AX] Length	Figure length.
[U] Radius	Radius of the pocket arc.
[EGL] Point hook	If selected, it hooks the new point to the previous point and it validates the continuity between profiles. A hooking point always applies null deviations to the relative values. If the previous working allows the point hooking (setup, line, arc, subroutine ending with a profile element) the present setup is not carried out and the profile carries on the profile that was possibly assigned before. In this way a ***hooking between profiles occurs.***
[A] Angle of rotation.	Rotation angle programmed in degrees. The rotation is applied in xy plane only.
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a specular setting around a vertical axis on the face place. If selected contemporaneously with the parameter **Vertical Mirror** it sets a symmetry against X and Y axes.
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around a horizontal axis on the face place. If selected contemporaneously with the parameter **Horizontal Mirror** it sets a symmetry against X and Y axes.
[EINV] Invert	If selected, it inverts the execution of the profile. The transform programming inverts also the tool correction settings (right or left) of every setup.

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Machine group number
[EM] Electric spindle	Number of the electric spindle
[T] Tool	Tool number
[TP] Tool typology	Tool typology.

[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed
[FI] Movement speed	Interpolation speed

ADVANCED TECHNOLOGY DATA

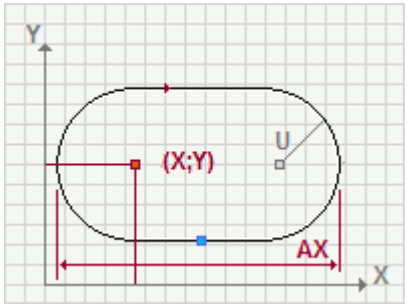
[NEXT] Nesting type	it defines the characterization of the profile that will be used in a nesting process to be applied later: • **None**=the profile is excluded by a nesting • **Nesting geometry**= nesting profile • **Enclose scraps** = characterizes a scraps hole (can be used for a nesting positioning). For nesting, consider the closed profiles only.
[DN] Compensation	It enables the compensation with side selection • **Off**=no compensation • **Left**= left side • **Right**= right side
[D] Compensation radius	Compensation radius. To be set when a different tool radius is required

Some custom errors may be displayed during the confirmation of the data.

Custom errors

Custom Error 13: Invalid X axis/overall dimension	the value set in the **[AX]Length** field is less than the double value set in the **[U]Radius** field.

EXAMPLE:



RECTANGLE EMPTYING

Working for the construction of an emptying profile

It programs the emptying of an area defined by a rectangle. The development of the working exclude the original rectangle. For further details, please read the TpaCAD manual, chapter ***Tools->Constructions->Emptying or areas.***

The parameters to define the working are:

GEOMETRIC PARAMETERS

[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A dimension can be forced as absolute by entering **"a;"**before the same coordinate. For instance, if a Y coordinate relative to the previous point but with absolute X coordinate = 50 has to be programmed, the flag of *Relative* will be enabled and X coordinate = a;50 will be set.
[X] X Centre [Y] Y Centre	Coordinates of the figure centre
[EW] Direction	Direction of rotation • **Clockwise**= it defines a figure with clockwise rotation • **Counterclockwise**= it defines a figure with counterclockwise rotation
[DL] Length	Length of the rectangle (dimension along the x axis)
[DH] Height	Height of the rectangle (dimension along the y axis)
[LS] Typology	This value allows you to define how to use the value of the **Fillet** parameter to solve the vertices: • **Fillet** = Fillet parameter sets the radius of the joining arc. • **Chamfer**= the Fillet parameter sets the length of the chamfering segment • **Lines to vertex=** the Fillet parameter sets the length of the linear segments available on both the lines from the edge on which the chamfering is required.
[U] Radius	Fillet radius or length of the chamfer on the vertices of the rectangle. The value is significant if a non-null value is set.
[EGL] Point hook	If selected, it hooks the new point to the previous point and it validates the continuity between profiles. A hooking point always applies null deviations to the relative values. If the previous working allows the point hooking (setup, line, arc, subroutine ending with a profile element) the present setup is not carried out and the profile carries on the profile that was possibly assigned before. In this way a hooking between profiles occurs.
[A] Angle of rotation.	Rotation angle programmed in degrees. The rotation is applied in xy plane only.
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a specular setting around a vertical axis on the face place. If selected contemporaneously with the parameter **Vertical Mirror,** it sets a symmetry against X and Y axes.
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around a horizontal axis on the face place. If selected contemporaneously with the parameter **Horizontal Mirror** it sets a symmetry against X and Y axes.
[EXT] Empty outward	It enables the emptying from the area inside outward.

EMPTYING

[NOP] Emptying setup	Setup working code to be assigned to the emptying profile. It can be set with direct edit or selecting the code from the setup list shown in the window. As an alternative to a working code and if it is permitted by the configuration of TpaCAD, you can set the NAME assigned to a working programmed before; in this case the field assigns the whole setup of the emptying profile. (For further details, please read the manual of TpaCAD).

	If no code (or Name) is assigned, the setup code by default is used, as set for the application face.
Emptying	It opens a dialogue window for the input of the parameters for the emptying application. For further details, please reed the manual of TpaCAD**.**

During the data confirmation some custom errors can be displayed.

Custom errors

Custom Error 12: Invalid figure overall dimensions	one or both the dimensions of the figure are not set or are set with a value less than 1 mm.
Custom Error 12: Invalid figure overall dimensions	the value of the fillet radius is greater than the half of one or both the dimensions of the figure.

POLYGON EMPTYING

Working for the construction of an emptying profile

It programs the emptying of an area defined by a rectangle. The development of the working exclude the original rectangle. For further details, please read the TpaCAD manual, chapter ***Tools->Constructions->Emptying or areas.***

The parameters to define the working are:

GEOMETRIC PARAMETERS

[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"** before the same coordinate. For instance, if a Y coordinate relative to the previous point but with absolute X coordinate = 50 has to be programmed, the flag of *Relative* will be enabled and X coordinate = a;50 will be set.
[X] X Centre [Y] Y Centre	Coordinates of the figure center
[PL] Polygon	Type of polygon. • **Inscribed**= it programs a polygon contained in a circumference • **Circumscribed** = it programs a polygon containing a circumference
[EW] Direction	Direction of rotation • **Clockwise**= it defines a figure with clockwise rotation • **Counterclockwise**= it defines a figure with counterclockwise rotation
[U] Radius	Radius of the circle
[N] Sides	Number of polygon sides. Minimum value = 3; maximum value: 99
[A0] A0	Angle of the starting point in degrees.
[EGL] Point hook	If selected, it hooks the new point to the previous point and it validates the continuity between profiles. A hooking point always applies null deviations to the relative values. If the previous working allows the point hooking (setup, line, arc, subroutine ending with a profile element) the present setup is not carried out and the profile carries on the profile that was possibly assigned before. In this way a hooking between profiles occurs.
[A] Angle of rotation.	Rotation angle programmed in degrees. The rotation is applied in xy plane only.
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a specular setting around the vertical axis on the face place. If selected contemporaneously with the parameter **Vertical Mirror** it sets a symmetry against X and Y axes.
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face place. If selected contemporaneously with the parameter **Horizontal Mirror** it sets a symmetry against X and Y axes.

EMPTYING

[NOP] Emptying setup	Setup working code to be assigned to the emptying profile. It can be set with direct edit or selecting the code from the setup list shown in the window. As an alternative to a working code and if it is permitted by the configuration of TpaCAD, you can set the NAME assigned to a working programmed before; in this case the field assigns the whole setup of the emptying profile. (For further details, please read the manual of TpaCAD). If no code (or Name) is assigned, the setup code by default is used, as set for the application face.
Emptying	It opens a dialogue window for the input of the parameters for the emptying application. For further details, please read the manual of TpaCAD.

During the data confirmation some custom errors may be displayed.

Custom errors

Custom Error 18: Insufficient edges	The number of polygon sides is less than 3
Custom Error 17: too many sides requested	The number of the polygon sides is greater than 99
Custom Error 7: Invalid radius	The value in **[U]Radius** field is less than 1 mm

OVAL EMPTYING

Working for the construction of an emptying profile

It programs the emptying of an area defined by an oval. The development of the working exclude the original oval. For further details, please read the TpaCAD manual, chapter ***Tools->Constructions-> Emptying of areas.***

The parameters to define the working area are:

GEOMETRIC PARAMETERS

[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"** before the same coordinate. For instance, if a Y coordinate relative to the previous point but with absolute X coordinate = 50 has to be programmed, the flag of *Relative* shall be enabled and X coordinate = a;50 shall be set.
[X] X Centre [Y] Y Centre	Coordinates of the figure centre
[EW] Direction	Direction of rotation • **Clockwise**= it defines a figure with clockwise rotation • **Counterclockwise**= it defines a figure with counterclockwise rotation
[EL] Orientation	Choice of the axis along which the figure has to be developed. • **X**= it develops the figure along the X axis • **Y**= it develops the figure along the Y axis
[AX] Axis 1	First axis of the figure(major axis). It is developed along the axis defined by the **Direction** parameter.
[AY] Axis 2	Along the axis of the figure (minor axis)
[U] Radius	Radius along the major axis.
[EGL] Point hook	If selected, it hooks the new point to the previous point and it validates the continuity between profiles. A hooking point always applies null deviations to the relative values. If the previous working allows the point hooking (setup, line, arc, subroutine ending with a profile element) the present setup is not carried out and the profile carries on the profile that was possibly assigned before. In this way a hooking between profiles occurs.
[A] Angle of rotation.	Rotation angle programmed in degrees. The rotation is applied in xy plane only.
[EMX] Horizontal mirror	Mirror parameter. If selected, it sets a specular setting around a vertical axis on the face place. If selected contemporaneously with the parameter **Vertical Mirror** it sets a symmetry against X and Y axes.
[EMY] Vertical mirror	Mirror parameter. If selected, it sets a specular setting around a horizontal axis on the face place. If selected contemporaneously with the parameter **Horizontal Mirror** it sets a symmetry against X and Y axes.

EMPTYING

[NOP] Emptying setup	Setup working code to be assigned to the emptying profile. It can be set with direct edit or selecting the code from the setup list shown in the window. As an alternative to a working code and if it is permitted by the configuration of TpaCAD, you can set the NAME assigned to a working programmed before; in this case the field assigns the whole setup of the emptying profile. (For further details, please read the manual of TpaCAD). If no code (or Name) is assigned, the setup code by default is used, as set for the application face.
Emptying	It opens a dialogue window for the input of the parameters for the emptying application. For further details, please read the manual of TpaCAD**.**

While confirming the data some custom errors may be displayed:

Custom errors

Custom error 13: Axis/invalid x overall dimension	X axis measure less than 10mm.
Custom error 14: Axis/invalid y overall dimension	Y axis measure less than 10mm.
Custom error 15: Axis/invalid overall dimensions if they are equal	the difference between the two axis is less than 5 mm.

ELLIPSE EMPTYING

Working for the construction of an emptying profile

It programs the emptying of an area defined by a ellipse. The development of the working exclude the original ellipse rectangle. For further details, please read the TpaCAD manual, chapter ***Tools->Constructions->Emptying or areas.***

The parameters to define the working area are:

GEOMETRIC PARAMETERS

[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"**before the same coordinate. For instance, if a Y coordinate relative to the previous point but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate = a;50 shall be set.
[X] X Centre [Y] Y Centre	Coordinates of the figure center
[EW] Direction	Direction of rotation • **Clockwise**= it defines a figure with clockwise rotation • **Counterclockwise**= it defines a figure with counterclockwise rotation
[EL] Orientation	Choice of the axis along which the figure has to be developed. • **X**= it develops the figure along the X axis • **Y**= it develops the figure along the Y axis
[AX] Axis 1	First axis of the figure(major axis). It is developed along the axis defined by the **Direction** parameter.
[AY] Axis 2	Along the axis of the figure (minor axis)
[AN] Arcs number	Number of arc generated per quadrant.
[EGL] Point hook	If selected, it hooks the new point to the previous point and it validates the continuity between profiles. A hooking point always applies null deviations to the relative values. If the previous working allows the point hooking (setup, line, arc, subroutine ending with a profile element) the present setup is not carried out and the profile carries on the profile that was possibly assigned before. In this way a hooking between profiles occurs.
[A] Angle of rotation.	Rotation angle programmed in degrees. The rotation is applied in xy plane only.
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a specular setting around a vertical axis on the face place. If selected contemporaneously with the parameter **Vertical Mirror** it sets a symmetry against X and Y axes.
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around a horizontal axis on the face place. If selected contemporaneously with the parameter **Horizontal Mirror** it sets a symmetry against X and Y axes.

EMPTYING

[NOP] Emptying setup	Setup working code to be assigned to the emptying profile. It can be set with direct edit or selecting the code from the setup list shown in the window. As an alternative to a working code and if it is permitted by the configuration of TpaCAD, you can set the NAME assigned to a working programmed before; in this case the field assigns the whole setup of the emptying profile. (For further details, please read the manual of TpaCAD). If no code (or Name) is assigned, the setup code by default is used, as set for the application face.

Emptying	It opens a dialogue window for the input of the parameters for the emptying application. For further details, please read the manual of TpaCAD.

Custom errors

Custom Error 13: Invalid x axis / overall dimension	the X axis measure is less than 10mm.
Custom Error 14: Invalid y axis / overall dimension	the Y axis measure is less than 10mm.
Custom Error 15: Axes / overall dimensions invalid if equal	the difference between the two axes is less than 5 mm.
Custom Error 11: Insufficient samplings	the **[AN] Number of arcs** field value per quadrant is less than 8.

CIRCLE EMPTYING

Working for the construction of an emptying profile

It programs the emptying of an area defined by a circle. The development of the working exclude the original circle. For further details, please read the TpaCAD manual, chapter ***Tools->Constructions->Emptying or areas.***

The parameters to define the working area are:

GEOMETRIC PARAMETERS

[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"**before the same coordinate. For instance, if a Y coordinate relative to the previous point but with absolute X coordinate = 50 has to be programmed, the *flag of Relative* will be enabled and X coordinate = a;50 will be set.
[X] X Centre [Y] Y Centre	Coordinates of the figure centre
[EW] Direction	Direction of rotation • **Clockwise**= it defines a figure with clockwise rotation • **Counterclockwise**= it defines a figure with counterclockwise rotation
[R] Radius	Radius of the circle
[A0] Angle of the starting point	Angle of the beginning point of the circle (in degrees)
[EGL] Point hook	If selected, it hooks the new point to the previous point and it validates the continuity between profiles. A hooking point always applies null deviations to the relative values. If the previous working allows the point hooking (setup, line, arc, subroutine ending with a profile element) the present setup is not carried out and the profile carries on the profile that was possibly assigned before. In this way a hooking between profiles occurs.
[A] Angle of rotation.	Rotation angle programmed in degrees. The rotation is applied in xy plane only.
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a specular setting around a vertical axis on the face place. If selected contemporaneously with the parameter **Vertical Mirror** it sets a symmetry against X and Y axes.
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around a horizontal axis on the face place. If selected contemporaneously with the parameter **Horizontal Mirror,** it sets a symmetry against X and Y axes.
[EXT] Empty outward	It enables the emptying from the area inside outward.

EMPTYING

[NOP] Emptying setup	Setup working code to be assigned to the emptying profile. It can be set with direct edit or selecting the code from the setup list shown in the window. As an alternative to a working code and if it is permitted by the configuration of TpaCAD, you can set the NAME assigned to a working programmed before; in this case the field assigns the whole setup of the emptying profile. (For further details, please read the manual of TpaCAD). If no code (or a Name) is assigned, the setup code by default is used as set for the application face.
Emptying	It opens a dialogue window for the input of the parameters for the emptying application. For further details, please read the manual of TpaCAD**.**

While confirming the data some custom errors may be displayed.

Custom errors

Custom Error 7: Invalid radius in the **[U] Radius** field a value less than 1 mm is set.

POCKET EMPTYING

Working for the construction of a profile

It programs the emptying of an area defined by a pocket. The development of the working exclude the original pocket. For further details, please read the TpaCAD manual, chapter ***Tools->Constructions->Emptying or areas.***

The parameters do define the working area:

GEOMETRIC PARAMETERS

[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced by entering **"a;"** before the same coordinate. For instance, if a Y as absolute coordinate relative to the previous point but with absolute X coordinate = 50 has to be programmed, the flag of *Relative* will be enabled and X coordinate = a;50 will be set.
[X] X Centre [Y] Y Centre	Dimensions of the pocket arc centre. The meaning given to the position is assigned according to the selected item in **Position the centre** list.
[LC] Position the centre	Select where to place the point of Centre of the pocket: • **On the left**= (X Centre; Y Centre) corresponds to the centre of the left arc. The left arc is the arc whose position along the x axis is lower, • **In the centre**= (X Centre; Y Centre) corresponds to the centre of the figure • **On the right**= (X Centre; Y Centre) corresponds to the centre of the right arc. The right arc is the arc whose position along the x axis is higher.
[EW] Direction	Direction of rotation • **Clockwise**= it defines a figure with clockwise rotation • **Counterclockwise**= it defines a figure with counterclockwise rotation
[AX] Length	Figure length.
[U] Radius	Radius of the figure construction arc.
[EGL] Point hook	If selected, it hooks the new point to the previous point and it validates the continuity between profiles. A hooking point always applies null deviations to the relative values. If the previous working allows the point hooking (setup, line, arc, subroutine ending with a profile element) the present setup is not carried out and the profile carries on the profile that was possibly assigned before. In this way a hooking between profiles occurs.
[A] Angle of rotation.	Rotation angle programmed in degrees. The rotation is applied in xy plane only.
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a specular setting around a vertical axis on the face place. If selected contemporaneously with the parameter **Vertical Mirror** it sets a symmetry against X and Y axes.
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around a horizontal axis on the face place. If selected contemporaneously with the parameter **Horizontal Mirror** it sets a symmetry against X and Y axes.

EMPTYING

[NOP] Emptying setup	Setup working code to be assigned to the emptying profile. It can be set with direct edit or selecting the code from the setup list shown in the window. As an alternative to a working code and if it is permitted by the configuration of TpaCAD, you can set the NAME assigned to a working programmed before; in this case the field assigns the whole setup of the emptying profile. (For further details, please read the manual of TpaCAD). If no code (or Name) is assigned, the setup code by default is used, as set for the application face.

Emptying	It opens a dialogue window for the input of the parameters for the emptying application. For further details, please read the manual of TpaCAD.

Some custom errors, specific of the working, can be displayed during the confirmation of the data; they are generated by an ERROR instruction or a BREAK instruction:

Custom errors

Custom Error 13: Invalid X axis/overall dimension	thevalue set in the **[AX]Length** field is less than the double value set in the **[U]Radius** field.

RECTANGLE PROGRESSIVE REDUCTION

Profile construction working with linear progressive variation

It programs the construction of a rectangle shaped-path with fitted development in different concentric passes, capable of a linear progression both in depth and in the profile in section.

The parameters to be used are the following ones:

GEOMETRIC PARAMETERS

[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"**before the same dimension. For example, if a Y position of the previous point but with absolute X dimension = 50 has to be programmed, the flag of *Relative* will be enabled and X position will be set = a;50.
[X] X Center [Y] Y Center	Coordinates of the figure centre
[Z] Initial Z	Initial depth position of the side wall.
[EW] Direction	Direction of rotation • **Clockwise**= figure with Clockwise rotation • **Counterclockwise**= figure with Counterclockwise rotation
[DL] Length	Length of the rectangle (dimension along the x axis).
[DH] Height	Height of the rectangle (dimension along the y axis).
[LS] Typology	This value allows you to define how to use the value of the **Fillet** parameter to solve the vertices: • **Fillet** = Fillet parameter sets the radius of the joining arc. • **Chamfer**= the Fillet parameter sets the length of the chamfering segment • **Lines to vertex=** the Fillet parameter sets the length of the linear segments available on both the lines from the edge on which the chamfering is required.
[U] Radius	Fillet radius or length of the chamfer on the vertices of the rectangle. The value is significant if a non-null value is set.
[ZD] Total depth feed	Depth feed applied to the **initial Z** . The setting is significant with a sign. The final depth reached at the end of the development along the side wall (with linear progression) is calculated by adding the value to the **initial Z.**
[DV] Width of the side wall	Width of the development, applied on the xy plane of the profile. The absolute value is considered.
[DXY] Correction pitch	Feed pitch on the xy plane of the profile. The absolute value is considered. If the pitch is not assigned or if its value is greater than the tool radius, the tool radius is applied. The minimum value is equal to epsilon*5.0.
[DT] Tool compensation	If selected, it generates the path by applying a first compensation to the original figure, internal or external, as requested. If the field is not selected, the path starts repeating the original figure.
[DE] External compensation	If selected, it applies the development externally: in this case the xy development of the profile increases the dimensions. Otherwise, the development is applied internally to decrease the xy dimension of the profile progressively.
[DY] Enable emptying	If selected, it performs the emptying in the residual area of an internal compensation. The emptying process is performed at the final depth of the development. The selection is ignored in the cases of selection of **External compensation** .
[DINV] Invert	If selected, it inverts the execution of the profile by starting from the inside part of the figure, from: • the inside part of the figure in case of internal compensation;

	• the external part of the overall development in case of external compensation.
[ARI] Entry radius	If selected, it enables an entry arc to be inserted as a first element of the profile. The selection is only applied, if the initial depth coordinate is higher than the final one. If applied, the arc is determined in tangency continuity, where radius, amplitude of the angle and rotation are automatically determined.
[EGL] Point hook	If selected, it hooks the profile to the previous point and validates the continuity between profiles. A hooking to a point always applies null deviations to the relative value. If the previous working permits the point hooking (setup, line, arc, subroutine ending with a profile element) the setup is not carried out and the profile continues the profile, if any, assigned before. In this case an **hooking between profiles occurs.**
[A] Rotation angle	Angle of rotation, programmed in degrees. The rotation applies on xy plane only.
[EMX] Horizontal mirror	Mirror parameter. If selected, it sets a specular setting around a vertical axis on the face plane. If selected at the same time as the **Vertical Mirror** parameter, it sets a symmetry with regard to the X and Y axes.
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time as **Horizontal Mirror**, it sets a symmetry with regard to the X and Y axes.
[NOP] Element of reference for the setup	The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a SETUP working programmed before; in this case the field assigns the whole setup of the generated profile and the settings of the setup in the **Technological parameters** node are ignored. The working must correspond to a Setup in Cartesian programming mode, the compilation must not have generated any error and the *Comment* field of the working cannot be selected. If defined in piece-face, the working must be applied to the same face. In the event of multiple correspondences (more than one Setup programmed with the same name) the last one found is selected, that is the Setup closer to the REDUCTION working. A *Construct* value of the Setup is reset in advance. *WARNING*: if the field assigns two names (example: "aa;bb") and if *Emptying in internal compensation* is enabled, the second name assigns a different setup to empty. For this second setup take into account the same considerations of the first one. To assign the second setup only, please use the: "-;bb" syntax.

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[EM] Electrospindel	Number of the electric spindle
[T] Tool	Tool number
[TP] Tool typology	Tool typology
[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed
[FI] Speed movement	Interpolation speed

While confirming the data, some custom errors can be displayed:

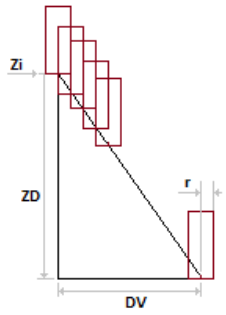
Custom errors

Custom Error 20: Invalid selected function	No *Professional* key recognised.
Custom Error 24: Null tool diameter	The tool radius is less than epsilon*5.0.
Custom Error 22: Invalid technology	The width of the side development is less than the diameter of the tool
Custom Error 19: Invalid geometry	The depth feed and/or the width of the side development are less than the tool diameter.
Custom Error 12: Invalid overall dimensions of the figure	One or both dimensions of the figure are not set or are set with a value less than: • the tool diameter *or*

- the width of the side development (if performing an internal compensation)

Custom Error 7: Invalid radius	The value of the radius exceeds half of one or both dimensions of the figure.

EXAMPLE:



The figure shows the development, in the section, along the side wall:
- the horizontal axis corresponds to the xy plane of the path
- the vertical axis corresponds to the development along the depth.

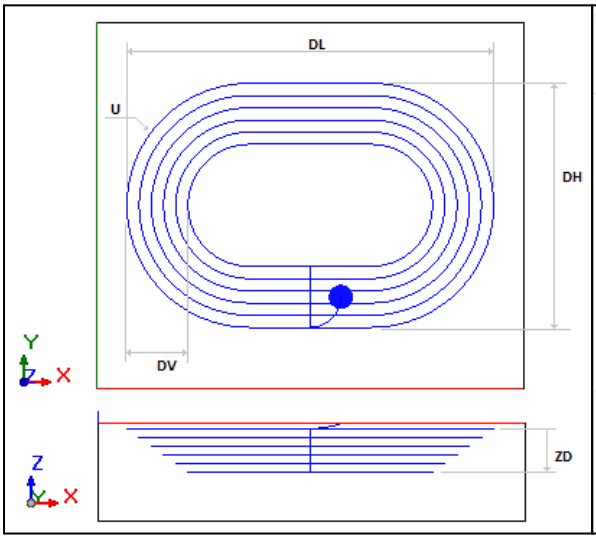
DV= Width of the side wall
R = Tool radius
ZI = Initial depth position of the side wall.
ZD= Total depth feed

Applies a pitch feed equal to the tool radius.
No Tool compensation required.

The cylinder represents the tool.
The hypotenuse of the triangle is the line that is sampled to determine its development.
- The horizontal axis is sampled in intervals equal to the tool radius.

The sampling along the vertical axis is determined by a simple algebraic proportion.

The union among consecutive passes is performed by two distinguished linear movements, in order to avoid incorrect movement of the tool in the piece in the case of a shaped tool.
More specifically:
- if the initial depth coordinate of the path is greater than the final one, the displacement in xy is performed as first, and afterward that in z is performed;
- otherwise, the displacement in z is performed as first and afterward that in xy is performed.



The figure shows the top and the side view in an internal reduction without emptying of the residual area.
The rectangle is programmed with a clockwise rotation and with an initial radius on the fillets equal to half of the height.

Colour of the generated path is blue, with the circle on the lower part to indicate the setup. The path begins at Z depth = 0 and reaches the initial depth by means of an entry arc carried out in tangency, within the portion of the plan concerned with the development of the side wall.

The programmed depth feed is negative.

POLYGON PROGRESSIVE REDUCTION

Working to construct the profile with linear progressive variation.

It programs the construction of a polygon-shaped path with fitted development in different concentric passes, capable of a linear progression both in depth and in the profile in section.

The parameters to be used are the following ones:

GEOMETRIC PARAMETERS

[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"**before the same dimension. For example, if a Y position of the previous point but with absolute X dimension = 50 has to be programmed, the flag of *Relative* will be enabled and X position will be set = a;50.
[X] X Center [Y] Y Center	Coordinates of the figure centre
[Z] Initial Z	Initial depth position of the side wall.
[PL] Polygon	Type of polygon • **Inscribed**= inscribed in a circumference • **Circumscribed** = circumscribed about a circumference
[EW] Direction	Direction of rotation • **Clockwise**= figure with clockwise rotation • **Counterclockwise**= figure with counterclockwise rotation
[U] Radius	Radius of the inscribed or circumscribed circle
Expressed in degrees.	Number of the polygon sides. The minimum value is 3, the maximum value is 99.
[A0] A0	Angle of the initial point (in degrees)
[ZD] Total depth feed	Depth feed applied to the **initial Z**. The setting is significant with a sign. The final depth reached at the end of the development along the side wall (with linear progression) is calculated by adding the value to the **initial Z.**
[DV] Width of the side wall	Width of the development, applied on the xy plane of the profile. The absolute value is considered.
[DXY] Correction pitch	Feed pitch on the xy plane of the profile. The absolute value is considered. If the pitch is not assigned or if its value is greater than the tool radius, the tool radius is applied. The minimum value is equal to epsilon*5.0
[DT] Tool compensation	If selected, it generates the path by applying a first compensation to the original figure, internal or external, as requested. If the field is not selected, the path starts repeating the original figure.
[DE] External compensation	If selected, it applies the development externally: in this case the xy development of the profile increases the dimensions. Otherwise, the development is applied internally to decrease the xy dimension of the profile progressively.
[DY] Enable emptying	If selected, it performs the emptying in the residual area of an internal compensation. The emptying process is performed at the final depth of the development.

	The selection is ignored in the cases of selection of **External compensation** .
[DINV] Invert	If selected, it inverts the execution of the profile by starting from the inside part of the figure, from: • the inside part of the figure in case of internal compensation; • the external part of the overall development in case of external compensation.
[ARI] Entry radius	If selected, it enables an entry arc to be inserted as a first element of the profile. The selection is only applied, if the initial depth coordinate is higher than the final one. If applied, the arc is determined in tangency continuity, where radius, amplitude of the angle and rotation are automatically determined.
[EGL] Point hook	If selected, it hooks the profile to the previous point and validates the continuity between profiles. A hooking to a point always applies null deviations to the relative value. If the previous working permits the point hooking (setup, line, arc, subroutine ending with a profile element) the setup is not carried out and the profile continues the profile, if any, assigned before. In this case an ***hooking between profiles occurs.***
[A] Rotation angle	Angle of rotation, programmed in degrees. The rotation applies on xy plane only.
[EMX] Horizontal mirror	Mirror parameter. If selected, it sets a specular setting around a vertical axis on the face plane. If selected at the same time as the **Vertical Mirror** parameter, it sets a symmetry with regard to the X and Y axes.
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time as **Horizontal Mirror**, it sets a symmetry with regard to the X and Y axes.
[NOP] Element of reference for the setup	The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a SETUP working programmed before; in this case the field assigns the whole setup of the generated profile and the settings of the setup in the ***Technological parameters*** node are ignored. The working must correspond to a Setup in Cartesian programming mode, the compilation must not have generated any error and the *Comment* field of the working cannot be selected. If in piece-face, the working must be applied to the same face. In the event of multiple correspondences (more than one Setup programmed with the same name) the last one found is selected, that is the Setup closer to the REDUCTION working. A *Construct* value of Setup is reset in advance. *WARNING*: if the field assigns two names (example: "aa;bb") and if *Emptying in internal compensation* is enabled, the second name assigns a different setup to empty. For this second setup take into account the same considerations of the first one. To assign the second setup only, please use the: "-;bb" syntax.

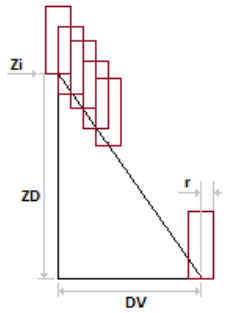
TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[EM] Electrospindel	Number of the electric spindle
[T] Tool	Tool number
[TP]Tool typology	Tool typology
[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed
[FI] Speed movement	Interpolation speed

While confirming the data, some custom errors can be displayed:
Custom errors

Custom error 20: Invalid selected function	No *Professional* key recognised
Custom Error 24: Null tool diameter	The tool radius is less than epsilon*5.0
Custom Error 22: Invalid technology	The width of the side development is less than the diameter of the tool
Custom Error 7: Invalid radius	The radius is not set or his value is less than: • the tool diameter *or* • the width of the side development (if performing an internal compensation)
Custom error 18: insufficient sides	The number of the polygon sides is less than 3
Custom error 17: too many sides required	The number of the polygon sides is greater than 99.

EXAMPLE:



The figure shows the development, in the section, along the side wall:
- the horizontal axis corresponds to the xy plane of the path
- the vertical axis corresponds to the development along the depth.

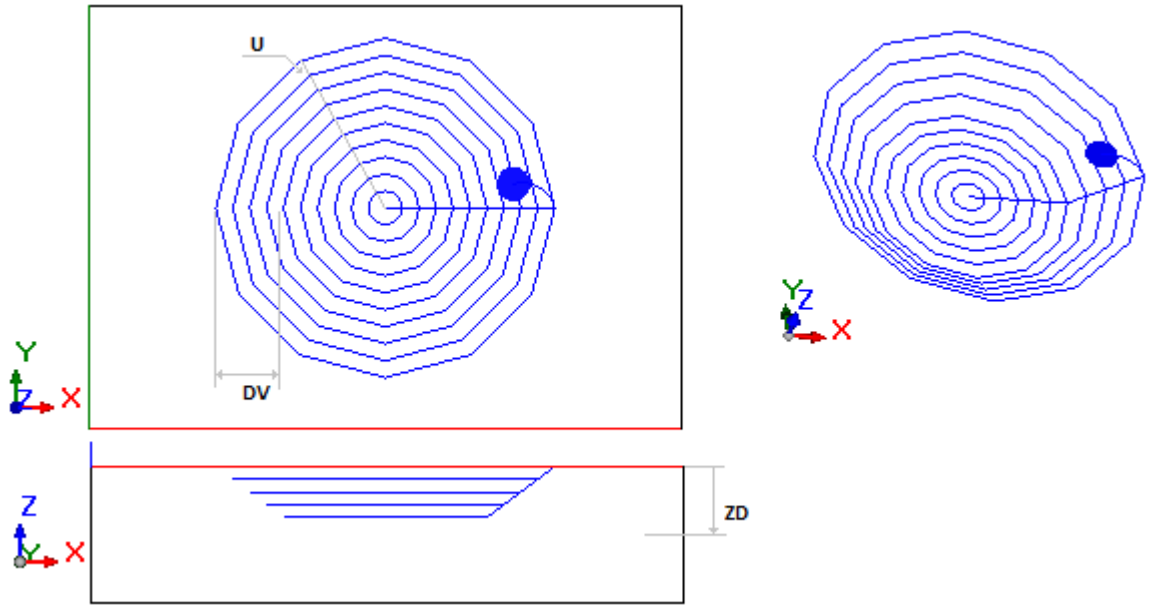
DV= Width of the side wall
R = Tool radius
ZI = Initial depth position of the side wall.
ZD= Total depth feed

Applies a pitch feed equal to the tool radius.
No Tool compensation required.

The cylinder represents the tool.
The hypotenuse of the triangle is the line that is sampled to determine its development.
- The horizontal axis is sampled in intervals equal to the tool radius.

The sampling along the vertical axis is determined by a simple algebraic proportion.

The union among consecutive passes is performed by two distinguished linear movements, in order to avoid incorrect movement of the tool in the piece in the case of a shaped tool.
More specifically:
- if the initial depth coordinate of the path is greater than the final one, the displacement in xy is performed as first, and afterward that in z is performed;
- otherwise, the displacement in z is performed as first and afterward that in xy is performed.



The figure shows the top and the side views in an internal reduction without emptying of the residual area.
The polygon is programmed with clockwise rotation and starting angle = 0°.
Colour of the generated path is blue, with the circle on the right to indicate the setup. The path begins at Z depth =0 and reaches the initial depth by means of an entry arc carried out in tangency, within the portion of the plan concerned with the development of the side wall. The programmed depth feed is negative. The part of internal emptying maintains the final depth.

OVAL SHAPE PROGRESSIVE REDUCTION

Working to construct the profile with linear progressive variation.

It programs the construction of a oval-shaped path with fitted development in different concentric passes, capable of a linear progression both in depth and in the profile in section.

The parameters to be used are the following ones:

GEOMETRIC PARAMETERS

[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"**before the same dimension. For example, if a Y position of the previous point but with absolute X dimension = 50 has to be programmed, the flag of *Relative* will be enabled and X position will be set = a;50.
[X] X Center [Y] Y Center	Coordinates of the figure centre
[Z] Initial Z	Initial depth position of the side wall.
[EW] Direction	Direction of rotation • **Clockwise**= figure with Clockwise rotation • **Counterclockwise**= figure with counterclockwise rotation
[AX] X Axis	Axis of the oval shape towards X
[AY] Y Axis	Axis of the oval shape towards Y
[U] Radius	Radius of the inscribed or circumscribed circle
[ZD] Total depth feed	Depth feed applied to the **initial Z** . The setting is significant with a sign. The final depth reached at the end of the development along the side wall (with linear progression) is calculated by adding the value to the **initial Z.**
[DV] Width of the side wall	Width of the development, applied on the xy plane of the profile. The absolute value is considered.
[DXY] Correction pitch	Feed pitch on the xy plane of the profile. The absolute value is considered. If the pitch is not assigned or if its value is greater than the tool radius, the tool radius is applied. The minimum value is equal to epsilon*5.0
[DT] Tool compensation	If selected, it generates the path by applying a first compensation to the original figure, internal or external, as requested. If the field is not selected, the path starts repeating the original figure.
[DE] External compensation	If selected, it applies the development externally: in this case the xy development of the profile increases the dimensions. Otherwise, the development is applied internally to decrease the xy dimension of the profile progressively.
[DY] Enable emptying	If selected, it performs the emptying in the residual area of an internal compensation. The emptying process is performed at the final depth of the development. The selection is ignored in the cases of selection of **External compensation** .
[DINV] Invert	If selected, it inverts the execution of the profile by starting from the inside part of the figure, from: • the inside part of the figure in case of internal compensation;

	• the external part of the overall development in case of external compensation.
[ARI] Entry radius	If selected, it enables an entry arc to be inserted as a first element of the profile. The selection is only applied, if the initial depth coordinate is higher than the final one. If applied, the arc is determined in tangency continuity, where radius, amplitude of the angle and rotation are automatically determined.
[EGL] Point hook	If selected, it hooks the profile to the previous point and validates the continuity between profiles. A hooking to a point always applies null deviations to the relative value. If the previous working permits the point hooking (setup, line, arc, subroutine ending with a profile element) the setup is not carried out and the profile continues the profile, if any, assigned before. In this case an ***hooking between profiles occurs.***
[A] Rotation angle	Angle of rotation, programmed in degrees. The rotation applies on xy plane only.
[EMX] Horizontal mirror	Mirror parameter. If selected, it sets a specular setting around a vertical axis on the face plane. If selected at the same time as the **Vertical Mirror** parameter, it sets a symmetry with regard to the X and Y axes.
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time as **Horizontal Mirror**, it sets a symmetry with regard to the X and Y axes.
[NOP] Element of reference for the setup	The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a SETUP working programmed before; in this case the field assigns the whole setup of the generated profile and the settings of the setup in the ***Technological parameters*** node are ignored. The working must correspond to a Setup in Cartesian programming mode, the compilation must not have generated any error and the *Comment* field of the working cannot be selected. If in piece-face, the working must be applied to the same face. In the event of multiple correspondences (more than one Setup programmed with the same name) the last one found is selected, that is the Setup closer to the REDUCTION working. A *Construct* value of Setup is reset in advance. *WARNING*: if the field assigns two names (example: "aa;bb") and if *Emptying in internal compensation* is enabled, the second name assigns a different setup to empty. For this second setup take into account the same considerations of the first one. To assign the second setup only, please use the: "-;bb" syntax.

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[EM] Electrospindel	Number of the electric spindle
[T] Tool	Tool number
[TP]Tool typology	Tool typology
[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed
[FI] Speed movement	Interpolation speed

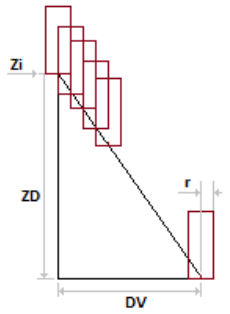
While confirming the data, some custom errors can be displayed:

Custom errors

Custom Error 20: Invalid selected function	No *Professional* key recognised
Custom Error 24: Null tool diameter	The tool radius is less than epsilon*5.0
Custom Error 22:	The width of the side development is less than the diameter of the tool

Custom Error 12: Invalid overall dimensions of the figure	One or both axes of the figure are not set or are set with a value less than: • the tool diameter or • the width of the side development (if performing an internal compensation) • the difference between both axes is less than (epsilon*50.0)
Custom Error 7: Invalid radius	the value of the radius exceeds half of one or both dimensions of the figure.

EXAMPLE:



The figure shows the development, in the section, along the side wall:
- the horizontal axis corresponds to the xy plane of the path
- the vertical axis corresponds to the development along the depth.

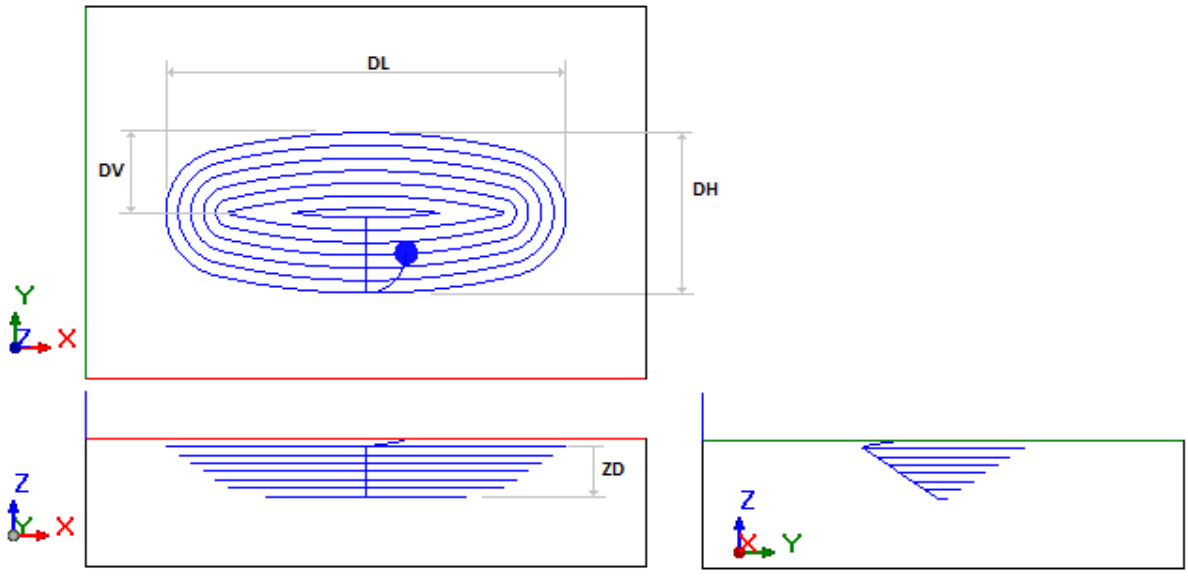
DV= Width of the side wall
R = Tool radius
ZI = Initial depth position of the side wall.
ZD= Total depth feed

Applies a pitch feed equal to the tool radius.
No Tool compensation required.

The cylinder represents the tool.
The hypotenuse of the triangle is the line that is sampled to determine its development.
- The horizontal axis is sampled in intervals equal to the tool radius.

The sampling along the vertical axis is determined by a simple algebraic proportion.

The union among consecutive passes is performed by two distinguished linear movements, in order to avoid incorrect movements of the tool in the piece in the case of a shaped tool.
More specifically:
- if the initial depth coordinate of the path is greater than the final one, the displacement in xy is performed as first, and afterward that in z is performed;
- otherwise, the displacement in z is performed as first and afterward that in xy is performed.



The figure shows the top view and both sides of a complete internal reduction.
The oval shape is programmed with clockwise rotation.
Colour of the generated path is blue, with the circle on the bottom to indicate the setup. The path begins at Z depth = 0 and reaches the initial depth by means of an entry arc carried out in tangency, within the portion of the plan concerned with the development of the side wall. The programmed depth feed is negative.

ELLIPSE PROGRESSIVE REDUCTION

Working to construct the profile with linear progressive variation.

It programs the construction of an ellipse-shaped path with fitted development in different concentric passes, capable of a linear progression both in depth and in the profile in section.

The parameters to be used are the following ones:

GEOMETRIC PARAMETERS

[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"**before the same dimension. For example, if a Y position of the previous point but with absolute X dimension = 50 has to be programmed, the flag of *Relative* will be enabled and X position will be set = a;50.
[X] X Center [Y] Y Center	Coordinates of the figure centre
[Z] Initial Z	Initial depth position of the side wall.
[EW] Direction	Direction of rotation • **Clockwise**= figure with Clockwise rotation • **Counterclockwise**= figure with counterclockwise rotation
[AX] X Axis	Axis of the ellipse towards X
[AY] Y Axis	Axis of the ellipse towards Y
[ZD] Total depth feed	Depth feed applied to the **initial Z** . The setting is significant with a sign. The final depth reached at the end of the development along the side wall (with linear progression) is calculated by adding the value to the **initial Z.**
[DV] Width of the side wall	Width of the development, applied on the xy plane of the profile. The absolute value is considered.
[DXY] Correction pitch	Feed pitch on the xy plane of the profile. The absolute value is considered. If the pitch is not assigned or if its value is greater than the tool radius, the tool radius is applied. The minimum value is equal to epsilon*5.0
[DT] Tool compensation	If selected, it generates the path by applying a first compensation to the original figure, internal or external, as requested. If the field is not selected, the path starts repeating the original figure.
[DE] External compensation	If selected, it applies the development externally: in this case the xy development of the profile increases the dimensions. Otherwise, the development is applied internally to decrease the xy dimension of the profile progressively.
[DY] Enable emptying	If selected, it performs the emptying in the residual area of an internal compensation. The emptying process is performed at the final depth of the development. The selection is ignored in the cases of selection of **External compensation**.
[DINV] Invert	If selected, it inverts the execution of the profile by starting from the inside part of the figure, from: • the inside part of the figure in case of internal compensation; • the external part of the overall development in case of external compensation.
[ARI] Entry radius	If selected, it enables an entry arc to be inserted as a first element of the profile. The selection is only applied, if the initial depth coordinate is higher than the final one. If applied, the arc is determined in tangency

	continuity, where radius, amplitude of the angle and rotation are automatically determined.
[EGL] Point hook	If selected, it hooks the profile to the previous point and validates the continuity between profiles. A hooking to a point always applies null deviations to the relative value. If the previous working permits the point hooking (setup, line, arc, subroutine ending with a profile element) the setup is not carried out and the profile continues the profile, if any, assigned before. In this case an ***hooking between profiles occurs.***
[A] Rotation angle	Angle of rotation, programmed in degrees. The rotation applies on xy plane only.
[EMX] Horizontal mirror	Mirror parameter. If selected, it sets a specular setting around a vertical axis on the face plane. If selected at the same time as the **Vertical Mirror** parameter, it sets a symmetry with regard to the X and Y axes.
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time as **Horizontal Mirror**, it sets a symmetry with regard to the X and Y axes.
[NOP] Element of reference for the setup	The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a SETUP working programmed before; in this case the field assigns the whole setup of the generated profile and the settings of the setup in the ***Technological parameters*** node are ignored. The working must correspond to a Setup in Cartesian programming mode, the compilation must not have generated any error and the *Comment* field of the working cannot be selected. If in piece-face, the working must be applied to the same face. In the event of multiple correspondences (more than one Setup programmed with the same name) the last one found is selected, that is the Setup closer to the REDUCTION working. A *Construct* value of Setup is reset in advance. *WARNING*: if the field assigns two names (example: "aa;bb") and if *Emptying in internal compensation* is enabled, the second name assigns a different setup to empty. For this second setup take into account the same considerations of the first one. To assign the second setup only, please use the: "-;bb" syntax.

TECHNOLOGICAL PARAMETERS

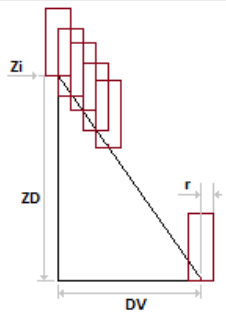
[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[EM] Electrospindel	Number of the electric spindle
[T] Tool	Tool number.
[TP]Tool typology	Tool typology.
[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed
[FI] Speed movement	Interpolation speed

While confirming the data, some custom errors can be displayed:

Custom errors

Custom Error 20: Invalid selected function	No *Professional* key is recognised
Custom Error 24: Null tool diameter	The tool radius is less than epsilon*5.0
Custom Error 22: Invalid technology	The width of the side development is less than the diameter of the tool
Custom Error 12: Invalid overall dimensions of the figure	One or both axes of the figure are not set or are set with a value less than: • the tool diameter or • the width of the side development (if performing an internal compensation) • the difference between both axes is less than (epsilon*50.0)
Custom Error 7: Invalid radius	the value of the radius exceeds half of one or both dimensions of the figure.

EXAMPLE:



The figure shows the development, in the section, along the side wall:
- the horizontal axis corresponds to the xy plane of the path
- the vertical axis corresponds to the development along the depth.

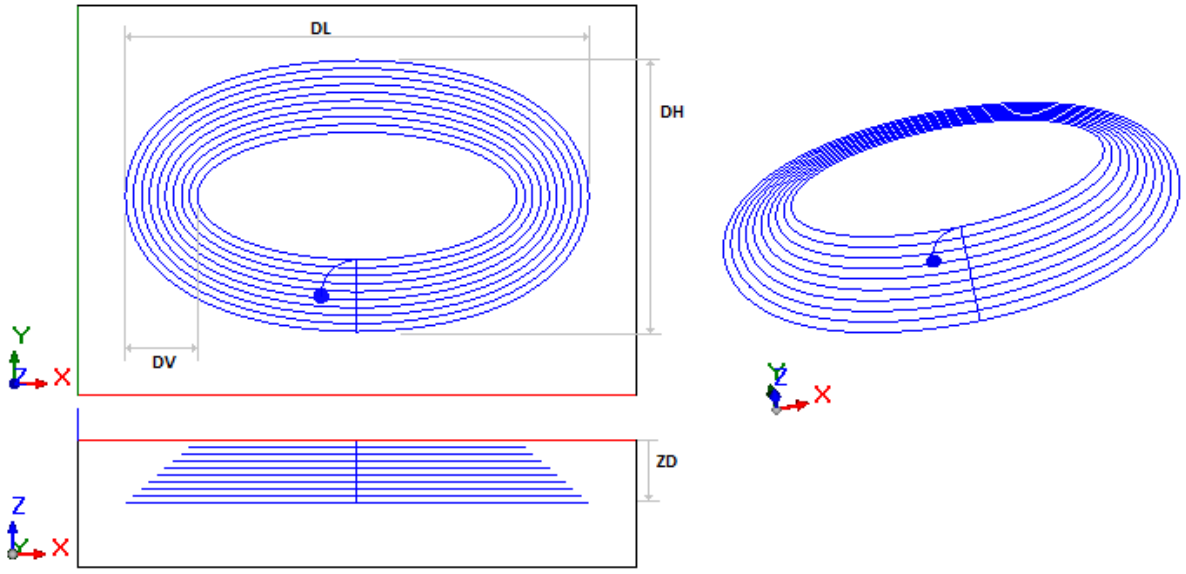
DV= Width of the side wall
R = Tool radius
ZI = Initial depth position of the side wall
ZD= Total depth feed

Applies a pitch feed equal to the tool radius.
No Tool compensation required.

The cylinder represents the tool.
The hypotenuse of the triangle is the line that is sampled to determine its development.
- The horizontal axis is sampled in intervals equal to the tool radius.

The sampling along the vertical axis is determined by a simple algebraic proportion.

The union among consecutive passes is performed by two distinguished linear movements, in order to avoid incorrect movements of the tool in the piece in the case of a shaped tool.
More specifically:
- if the initial depth coordinate of the path is greater than the final one, the displacement in xy is performed as first, and afterward that in z is performed;
- otherwise, the displacement in z is performed as first and afterward that in xy is performed.



This figure shows top, side and three-dimensional view of an external reduction: the original directions of the figure rise at each pass.
The ellipse is programmed with counterclockwise rotation.
Colour of the generated path is blue, with the circle on the bottom to indicate the setup. The path begins at Z depth =0 and reaches the initial depth by means of an entry arc carried out in tangency, within the portion of the plan concerned with the development of the side wall. The programmed depth feed is negative.

CIRCLE PROGRESSIVE REDUCTION

Working to construct the profile with linear progressive variation.

It programs the construction of a circular path with fitted development in different concentric passes, capable of a linear progression both in depth and in the profile in section.

The parameters to be used are the following ones:

GEOMETRIC PARAMETERS

[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"**before the same dimension. For example, if a Y position of the previous point but with absolute X dimension = 50 has to be programmed, the flag of *Relative* will be enabled and X position will be set = a;50.
[X] X Center [Y] Y Center	Coordinates of the figure centre
[Z] Initial Z	Initial depth position of the side wall.
[EW] Direction	Direction of rotation • **Clockwise**= figure with Clockwise rotation • **Counterclockwise**= figure with counterclockwise rotation
[U] Radius	Circle radius
[A0] A0	Angle of the initial point (in degrees)
[ZD] Total depth feed	Depth feed applied to the **initial Z** . The setting is significant with a sign. The final depth reached at the end of the development along the side wall (with linear progression) is calculated by adding the value to the **initial Z.**
[DV] Width of the side wall	Width of the development, applied on the xy plane of the profile. The absolute value is considered.
[DXY] Correction pitch	Feed pitch on the xy plane of the profile. The absolute value is considered. If the pitch is not assigned or if its value is greater than the tool radius, the tool radius is applied. The minimum value is equal to epsilon*5.0
[DT] Tool compensation	If selected, it generates the path by applying a first compensation to the original figure, internal or external, as requested. If the field is not selected, the path starts repeating the original figure.
[DE] External compensation	If selected, it applies the development externally: in this case the xy development of the profile increases the dimensions. Otherwise, the development is applied internally to decrease the xy dimension of the profile progressively.
[DY] Enable emptying	If selected, it performs the emptying in the residual area of an internal compensation. The emptying process is performed at the final depth of the development. The selection is ignored in the cases of selection of **External** **compensation** .
[DINV] Invert	If selected, it reverses the execution of the profile from: • the internal side of the figure in the event of internal compensation;

	• the external side of the overall development in the event of an external compensation.
[ARI] Entry radius	If selected, it enables an entry arc to be inserted as a first element of the profile. The selection is only applied, if the initial depth coordinate is greater than the final one. If applied, the arc is determined in tangency continuity, where radius, amplitude of the angle and rotation are automatically determined.
[EGL] Point hook	If selected, it hooks the profile to the previous point and validates the continuity between profiles. A hooking to a point always applies null deviations to the relative value. If the previous working permits the point hooking (setup, line, arc, subroutine ending with a profile element) the setup is not carried out and the profile continues the profile, if any, assigned before. In this case an ***hooking between profiles occurs.***
[A] Rotation angle	Angle of rotation, programmed in degrees. The rotation applies on xy plane only.
[EMX] Horizontal mirror	Mirror parameter. If selected, it sets a specular setting around a vertical axis on the face plane. If selected at the same time as the **Vertical Mirror** parameter, it sets a symmetry with regard to the X and Y axes.
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time as **Horizontal Mirror**, it sets a symmetry with regard to the X and Y axes.
[NOP] Element of reference for the setup	The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a SETUP working programmed before; in this case the field assigns the whole setup of the generated profile and the settings of the setup in the ***Technological parameters*** node are ignored. The working must correspond to a Setup in Cartesian programming mode, the compilation must not have generated any error and the *Comment* field of the working cannot be selected. If in piece-face, the working must be applied to the same face. In the event of multiple correspondences (more than one Setup programmed with the same name) the last one found is selected, that is the Setup closer to the REDUCTION working. A *Construct* value of Setup is reset in advance. *WARNING*: if the field assigns two names (example: "aa;bb") and if *Emptying in internal compensation* is enabled, the second name assigns a different setup to empty. For this second setup take into account the same considerations of the first one. To assign the second setup only, please use the: "-;bb" syntax.

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[EM] Electrospindel	Number of the electric spindle
[T] Tool	Tool number
[TP]Tool typology	Tool typology
[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed
[FI] Speed movement	Interpolation speed

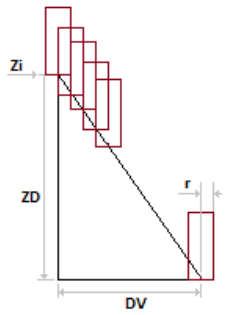
While confirming the data, some custom errors can be displayed:

Custom errors

Custom Error 20: Invalid selected function	No *Professional* key recognised
Custom Error 24: Null tool diameter	The tool radius is less than epsilon*5.0
Custom Error 22: Invalid technology	The width of the side development is less than the diameter of the tool
Custom Error 7: Invalid radius	The radius is not set or his value is less than: • the tool diameter or

- the width of the side development (if performing an internal compensation)

EXAMPLE:



The figure shows the development, in the section, along the side wall:
- the horizontal axis corresponds to the xy plane of the path
- the vertical axis corresponds to the development along the depth.

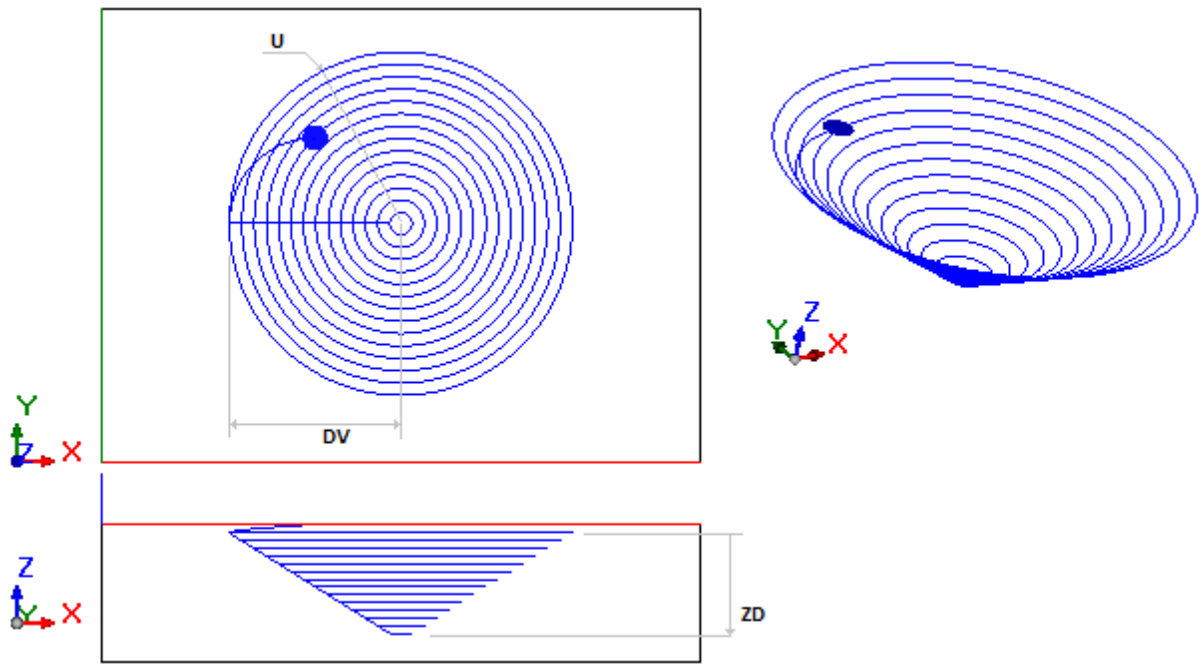
DV= Width of the side wall
R = Tool radius
ZI = Initial depth position of the side wall.
ZD= Total depth feed

Applies a pitch feed equal to the tool radius.
No Tool compensation required.

The cylinder represents the tool.
The hypotenuse of the triangle is the line that is sampled to determine its development.
- The horizontal axis is sampled in intervals equal to the tool radius.

The sampling along the vertical axis is determined by a simple algebraic proportion.

The union among consecutive passes is performed by two distinguished linear movements, in order to avoid incorrect movements of the tool in the piece in the case of a shaped tool.
More specifically:
- if the initial depth coordinate of the path is greater than the final one, the displacement in xy is performed as first, and afterward that in z is performed;
- otherwise, the displacement in z is performed as first and afterward that in xy is performed.



The figure shows the top and the side and the three-dimensional views of a total internal reduction.
The circle is programmed with clockwise rotation and starting angle = 180°.
Colour of the generated path is blue, with the circle on the left to indicate the setup. The path begins at depth Z=0 and reaches the initial depth by means of an entry arc carried out in tangency, within the portion of the plan concerned with the development of the side wall. The programmed depth feed is negative.

The progressive reduction terminates with a movement of the tool towards the centre of the circle at the final depth: the result is a conical reduction.

POCKET PROGRESSIVE REDUCTION

Working to construct the profile with linear progressive variation.

It programs the construction of a pocket-shaped path with fitted development in different concentric passes, capable of a linear progression both in depth and in the profile in section.

The parameters to be used are the following ones:

GEOMETRIC PARAMETERS

[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"**before the same dimension. For example, if a Y position of the previous point but with absolute X dimension = 50 has to be programmed, the flag of *Relative* will be enabled and X position will be set = a;50.
[X] X Center [Y] Y Center	Dimensions of the pocket arc centre. The meaning given to the position is assigned according to the selected item in **Position the centre** list.
[LC] Position the centre	Select where to place the point of Centre of the pocket: • **On the left**= (X Centre; Y Centre) corresponds to the centre of the left arc. The left arc is the arc whose position along the x axis is lower, • **In the centre**= (X Centre; Y Centre) corresponds to the centre of the figure • **On the right**= (X Centre; Y Centre) corresponds to the centre of the right arc. The right arc is the arc whose position along the x axis is higher.
[Z] Initial Z	Initial depth position of the side wall.
[EW] Direction	Direction of rotation • **Clockwise**= figure with Clockwise rotation • **Counterclockwise**= figure with counterclockwise rotation
[DL] Length	Length of the rectangle (dimension along the X axis).
[U] Radius	Radius of the figure construction arc (half the dimension along the Y axis)
[ZD] Total depth feed	Depth feed applied to the **initial Z** . The setting is significant with a sign. The final depth reached at the end of the development along the side wall (with linear progression) is calculated by adding the value to the **initial Z.**
[DV] Width of the side wall	Width of the development, applied on the xy plane of the profile. The absolute value is considered.
[DXY] Correction pitch	Feed pitch on the xy plane of the profile. The absolute value is considered. If the pitch is not assigned or if its value is greater than the tool radius, the tool radius is applied. The minimum value is equal to epsilon*5.0
[DT] Tool compensation	If selected, it generates the path by applying a first compensation to the original figure, internal or external, as requested. If the field is not selected, the path starts repeating the original figure.
[DE] External compensation	If selected, it applies the development externally: in this case the xy development of the profile increases the dimensions. Otherwise, the development is applied internally to decrease the xy dimension of the profile progressively.
[DY] Enable emptying	If selected, it performs the emptying in the residual area of an internal compensation. The emptying process is performed at the final depth of the development.

	The selection is ignored in the cases of selection of **External compensation**.
[DINV] Invert	If selected, it reverses the execution of the profile from: • the internal side of the figure in the event of internal compensation; • the external side of the overall development in the event of an external compensation.
[ARI] Entry radius	If selected, it enables an entry arc to be inserted as a first element of the profile. The selection is only applied, if the initial depth coordinate is higher than the final one. If applied, the arc is determined in tangency continuity, where radius, amplitude of the angle and rotation are automatically determined.
[EGL] Point hook	If selected, it hooks the profile to the previous point and validates the continuity between profiles. A hooking to a point always applies null deviations to the relative value. If the previous working permits the point hooking (setup, line, arc, subroutine ending with a profile element) the setup is not carried out and the profile continues the profile, if any, assigned before. In this case an ***hooking between profiles occurs.***
[A] Rotation angle	Angle of rotation, programmed in degrees. The rotation applies on xy plane only.
[EMX] Horizontal mirror	Mirror parameter. If selected, it sets a specular setting around a vertical axis on the face plane. If selected at the same time as the **Vertical Mirror** parameter, it sets a symmetry with regard to the X and Y axes.
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time as **Horizontal Mirror**, it sets a symmetry with regard to the X and Y axes.
[NOP] Element of reference for the setup	The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a SETUP working programmed before; in this case the field assigns the whole setup of the generated profile and the settings of the setup in the ***Technological parameters*** node are ignored. The working must correspond to a Setup in Cartesian programming mode, the compilation must not have generated any error and the *Comment* field of the working cannot be selected. If in piece-face, the working must be applied to the same face. In the event of multiple correspondences (more than one Setup programmed with the same name) the last one found is selected, that is the Setup closer to the REDUCTION working. A *Construct* value of Setup is reset in advance. *WARNING*: if the field assigns two names (example: "aa;bb") and if *Emptying in internal compensation* is enabled, the second name assigns a different setup to empty. For this second setup take into account the same considerations of the first one. To assign the second setup only, please use the: "-;bb" syntax.

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[EM] Electrospindel	Number of the electric spindle
[T] Tool	Tool number.
[TP]Tool typology	Tool typology.
[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed
[FI] Speed movement	Interpolation speed

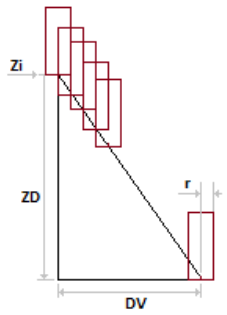
While confirming the data, some custom errors can be displayed:

Custom errors

Custom Error 20: Invalid selected function	No *Professional* key recognized

Custom Error 24: Null tool diameter	The tool radius is less than epsilon*5.0
Custom Error 22: Invalid technology	The width of the side development is less than the diameter of the tool
Custom Error 12: Invalid overall dimensions of the figure	one or both dimensions of the figure are not set or are set with a value less than: • the tool diameter or • the width of the side development (if performing an internal compensation)
Custom Error 7: Invalid radius	the value of the radius exceeds half of one or both dimensions of the figure.

EXAMPLE:



The figure shows the development, in the section, along the side wall:
- the horizontal axis corresponds to the xy plane of the path
- the vertical axis corresponds to the development along the depth.

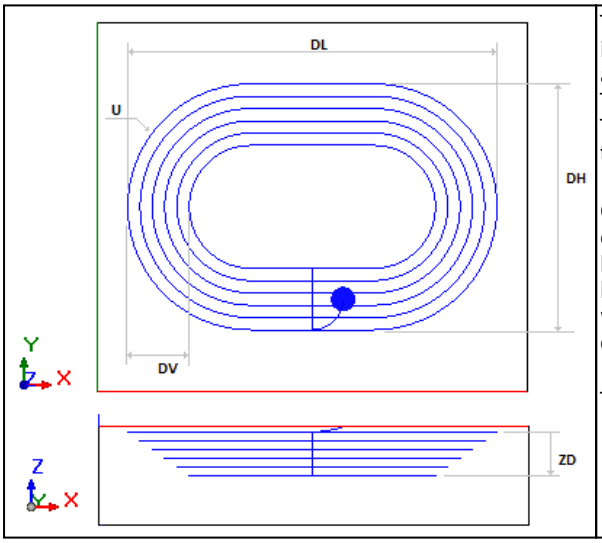
DV= Width of the side wall
R = Tool radius
ZI = Initial depth position of the side wall.
ZD= Total depth feed

Applies a pitch feed equal to the tool radius.
No Tool compensation required.

The cylinder represents the tool.
The hypotenuse of the triangle is the line that is sampled to determine its development.
- The horizontal axis is sampled in intervals equal to the tool radius.

The sampling along the vertical axis is determined by a simple algebraic proportion.

The union among consecutive passes is performed by two distinguished linear movements, in order to avoid incorrect movements of the tool in the piece in the case of a shaped tool.
More specifically:
- if the initial depth coordinate of the path is greater than the final one, the displacement in xy is performed as first, and afterward that in z is performed;
- otherwise, the displacement in z is performed as first and afterward that in xy is performed.



The figure shows the top and the side view in an internal reduction without emptying of the residual area.
The pocket is programmed with clockwise rotation.
The height of the figure (DH) is calculated equal to twice the U radius.

Colour of the generated path is blue, with the circle on the lower part to indicate the setup. The path begins at Z depth = 0 and reaches the initial depth by means of an entry arc carried out in tangency, within the portion of the plan concerned with the development of the side wall.

The programmed depth feed is negative.

PATH PROGRESSIVE REDUCTION

Working to construct the profile with linear progressive variation.

It programs the construction of a generic closed path with fitted development in different concentric passes, capable of a linear progression both in depth and in the profile in section.

The parameters to be used are the following ones:

GEOMETRIC PARAMETERS

[X] X1 [Y] Y1 [Z] Initial Z	X, Y, Z application coordinates. They are significant individually. The first working point is translated on the point. For unassigned coordinates, the translation cannot be assigned, with respect to the original development of the workings. Z position assigns the initial depth of the side wall.
[HN] Geometric profile	It sets the NAME of the profile to which apply the construction. It is possible to indicate one only profile. The profile geometry is calculated in the xy plane of the face and possible entry/exit elements programmed on the setup are excluded. No evaluation is carried out for possible intersections of the profile itself. The profile itself determines the direction of the rotation and the compensation side. If the profile is closed, the path reverses its direction at each advancement in depth and the complete emptying of the internal area cannot be required (see following parameters). At each pass of the generated path any variation in the depth of the original profile are performed again.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"**before the same dimension. For example, if a Y position of the previous point but with absolute X dimension = 50 has to be programmed, the flag of *Relative* will be enabled and X position will be set = a;50.
[ZD] Total depth feed	Depth feed applied to the **initial Z** . The setting is significant with a sign. The final depth reached at the end of the development along the side wall (with linear progression) is calculated by adding the value to the **initial Z.**
[DV] Width of the side wall	Width of the development, applied on the xy plane of the profile. The absolute value is considered.
[DXY] Correction pitch	Feed pitch on the xy plane of the profile. The absolute value is considered. If the pitch is not assigned or if its value is greater than the tool radius, the tool radius is applied. The minimum value is equal to epsilon*5.0
[DT] Tool compensation	If selected, it generates the path by applying a first compensation to the original figure, internal or external, as requested. If the field is not selected, the path starts repeating the original figure.
[DE] External compensation	If selected, it applies the development externally. In the event of a closed profile: • the xy development of the profile increases the dimensions • otherwise, the development is internally applied to decrease the xy dimensions of the profile progressively. If, instead, the profile is not closed, the internal/external compensation side is determined on the assumption that the profile is closed by means of a linear segment.
[DY] Enable emptying	If selected, it performs the emptying in the residual area of an internal compensation. The emptying process is performed at the final depth of the development.

	The selection is ignored in the cases of selection of **External compensation** .
[DINV] Invert	If selected, it reverses the execution of the profile from: • the internal side of the figure in the event of internal compensation; • the external side of the overall development in the event of an external compensation.
[EGL] Point hook	If selected, it hooks the profile to the previous point and validates the continuity between profiles. A hooking to a point always applies null deviations to the relative value. If the previous working permits the point hooking (setup, line, arc, subroutine ending with a profile element) the setup is not carried out and the profile continues the profile, if any, assigned before. In this case an ***hooking between profiles occurs.***
[A] Rotation angle	Angle of rotation, programmed in degrees. The rotation applies on xy plane only.
[EMX] Horizontal mirror	Mirror parameter. If selected, it sets a specular setting around a vertical axis on the face plane. If selected at the same time as the **Vertical Mirror** parameter, it sets a symmetry with regard to the X and Y axes.
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time as **Horizontal Mirror**, it sets a symmetry with regard to the X and Y axes.
[NOP] Element of reference for the setup	The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a SETUP working programmed before; in this case the field assigns the whole setup of the generated profile and the settings of the setup in the ***Technological parameters*** node are ignored. The working must correspond to a Setup in Cartesian programming mode, the compilation must not have generated any error and the *Comment* field of the working cannot be selected. If in piece-face, the working must be applied to the same face. In the event of multiple correspondences (more than one Setup programmed with the same name) the last one found is selected, that is the Setup closer to the REDUCTION working. A *Construct* value of Setup is reset in advance. *WARNING*: if the field assigns two names (example: "aa;bb") and if *Emptying in internal compensation* is enabled, the second name assigns a different setup to empty. For this second setup take into account the same considerations of the first one. To assign the second setup only, please use the: "-;bb" syntax.

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[EM] Electrospindel	Number of the electric spindle
[T] Tool	Tool number
[TP]Tool typology	Tool typology
[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed
[FI] Speed movement	Interpolation speed

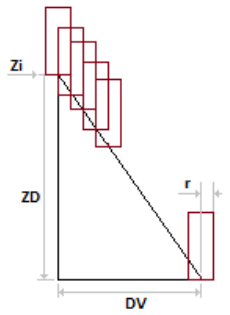
While confirming the data, some custom errors can be displayed:

Custom errors

Custom Error 20: Invalid selected function	No *Professional* key recognised or the management of the *Working name* field is not enabled.
Custom Error 24: Null tool diameter	The tool radius is less than epsilon*5.0.

Custom Error 22: Invalid technology	The width of the side development is less than the tool diameter
Custom Error 19: Invalid geometry	No profile has been found or the profile is not valid (~~it is not closed~~). Possible cases: • *Geometric profile* is not set or it does not find any profile • *Geometric profile* finds several distinguished profiles
Custom Error 32: Invalid geometry: assign a closed profile	*Geometric profile* finds a non closed profile (in XY) *Internal compensation* with *Emptying* is required.
Custom Error 12: Invalid overall dimensions of the figure	The value of one or both profile dimensions is less than: • the tool diameter or • the width of the side development (if performing an internal compensation)

EXAMPLE:



The figure shows the development, in the section, along the side wall:
- the horizontal axis corresponds to the xy plane of the path
- the vertical axis corresponds to the development along the depth.

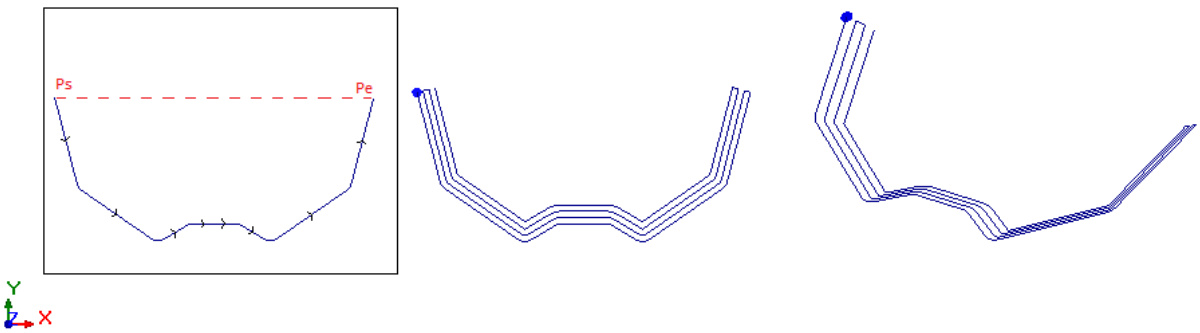
DV= Width of the side wall
R = Tool radius
ZI = Initial depth position of the side wall.
ZD= Total depth feed

Applies a pitch feed equal to the tool radius.
No Tool compensation required.

The cylinder represents the tool.
The hypotenuse of the triangle is the line that is sampled to determine its development.
- The horizontal axis is sampled in intervals equal to the tool radius.

The sampling along the vertical axis is determined by a simple algebraic proportion.

The union among consecutive passes is performed by two distinguished linear movements, in order to avoid incorrect movements of the tool in the piece in the case of a shaped tool.
More specifically:
- if the initial depth coordinate of the path is greater than the final one, the displacement in xy is performed as first, and afterward that in z is performed;
- otherwise, the displacement in z is performed as first and afterward that in xy is performed.



On the right side of the figure the top view and the three-dimensional view of a reduction of an open profile appear.

On the left the original profile appear: Ps indicates the initial point of the profile and Pe the final point. The hatched segment between the two points makes the profile closed and allow finding the internal/external compensation side.
In the example above the reduction is performed from the internal side. The following reducing passes are performed by reversing the profile alternately.

PATH SHAPED REDUCTION

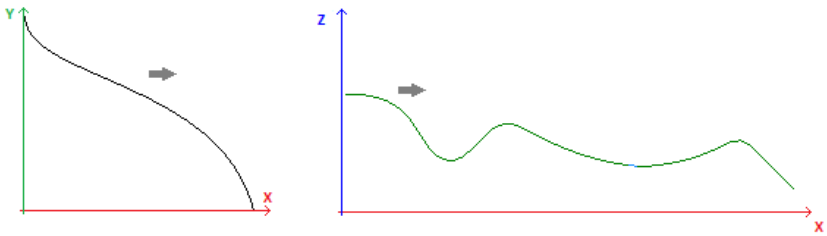
Working to construct the profile with a shaped variation

It programs the construction of a generic closed path with fitted development in different concentric passes, capable of a shaped progression in the profile in section.

The parameters to be used are the following ones:

GEOMETRIC PARAMETERS

[X] X1 [Y] Y1 [Z] Initial Z	X, Y, Z application coordinates. They are significant individually. The first working point is translated on the point. For unassigned coordinates, the translation cannot be assigned, with respect to the original development of the workings. Z position assigns the initial depth of the side wall.
[HN] Geometric profile	It sets the NAME of the profile to which apply the construction. It is possible to indicate one only profile. The profile geometry is calculated in the xy plane of the face and possible entry/exit elements programmed on the setup are excluded. No evaluation is carried out for possible intersections of the profile itself. The profile itself determines the direction of the rotation and the compensation side. If the profile is closed, the path reverses its direction at each advancement in depth and the complete emptying of the internal area cannot be required (see following parameters). At each pass of the generated path any variation in the depth of the original profile are performed again. the path reverses its direction at each advancement in depth and the complete emptying of the internal area cannot be required (see following parameters). At each pass of the generated path any variation in the depth of the original profile are performed again.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"**before the same dimension. For example, if a Y position of the previous point but with absolute X dimension = 50 has to be programmed, the flag of *Relative* will be enabled and X position will be set = a;50.
[GN] Section profile	It sets the profile NAME assigning the section shape It is possible to specify one only profile that must be made of arc or line segments. The development along the face x axis corresponds with the width of the section and must have a progression along increasing values (monotonic curve in increasing x): the sampling of the curve starts from the minimum x coordinate. The development along the depth axis is Y or Z long: one only of both axes can change; check of monotonicity is not required. The following figure shows two valid examples of a profile to be used for the section: • on the left the original development in the xy plane is assumed, with progression along the y axis towards lower values (the curve is monotonically decreasing along y). The development along the Y axis will be applied to the depth axis; • on the right the original development on the xz plane is assumed, with progression along the non-monotonic z axis.

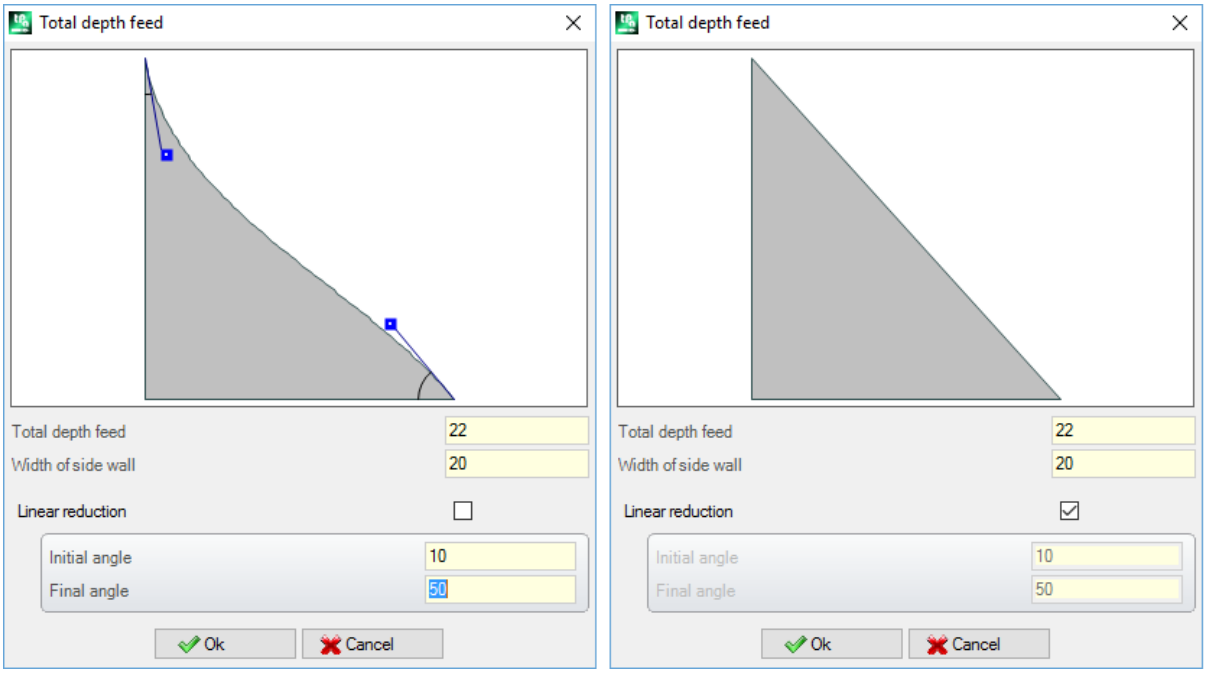


	The positioning of the xy/xz Cartesian system shall mean in relative at the beginning of the curve, that is, the curve itself must not necessarily begin at the 0 position of X. Both faces show the direction of the development and of sampling of the curves: the starting point is linked to the *initial Z* set. The profile is used after splitting up and linearising some curved segments.
[GZ] It reverses the feed direction	If selected, it reverses the sampling along the depth axis of the profile assigned for the section: it is a vertical mirror of the curve of the depth axis around the initial point.

As an alternative to the *Section profile* indicated by Name, the section profile can be directly assigned

[ZD] Total depth feed	Depth feed applied to the **initial Z**. The setting is significant with a sign. The final depth reached at the end of the development along the side wall (with linear progression) is calculated by adding the value to the **initial Z.**
[DV] Width of the side wall	Width of the development, applied on the xy plane of the profile. The absolute value is considered.
[DL] Linear reduction	If selected, it requires a progressive reduction (see: PATH PROGRESSIVE REDUCTION working. As an alternative a sampled curve can be assigned by giving the initial and final angles.
[DA1] Initial angle	Curve initial angle The valid values range from 0 and 90°.
[DA2] Final angle	Curve final angle. The valid values range from 0 and 90°.

It is possible to set the profile of the section by opening the window in the *Total depth feed* field:



- on the left a shaped development appears
- on the right a linear development appears

It is possible to modify the angles interactively as follows: move the mouse to the extreme point of one of the two linear coloured segments, click the left mouse button and move as required.

The *Initial angle* appears on the left: 0° value gives the vertical segment (top-down), 90° value gives the horizontal segment (from left to right).
The *Final angle* appears on the right: 0° value gives the horizontal segment (from right to left), the 90° gives the vertical segment (buttom-up).

The values of the angles that are not included between 0 and 90° are reduced between (0 and 360)° , then brought to the interval (0- 90). Example: *Initial angle* =-450:

- removes multiples of 360: *Initial angle* =-90
- brings to a positive value: *Initial angle* =270
- reduces to the max. interval: *Initial angle* =90.

[DXY] Correction pitch	Feed pitch on the xy plane of the profile. The absolute value is considered. If the pitch is not assigned or if its value is greater than the tool radius, the tool radius is applied. The minimum value is equal to epsilon*5.0
[DT] Tool compensation	If selected, it generates the path by applying a first compensation to the original figure, internal or external, as requested. If the field is not selected, the path starts repeating the original figure.
[DE] External compensation	If selected, it applies the development externally. In the event of a closed profile: • the xy development increases the dimensions; • otherwise, the development is internally applied to decrease progressively the xy dimensions of the profile. If, instead, the profile is not closed, the side of the internal/external compensation is determined by the hypothesis of closing the profile by means of a linear segment. Otherwise, the development is applied internally to decrease the xy dimension of the profile progressively.
[DY] Enable emptying	If selected, it performs the emptying in the residual area of an internal compensation. The emptying process is performed at the final depth of the development. The selection is ignored in the cases of selection of **External compensation** .
[DINV] Invert	If selected, it inverts the execution of the profile, from • the internal side of the figure, in the event of an internal compensation • the external side of the overall development in the event of an external compensation.
[EGL] Point hook	If selected, it hooks the profile to the previous point and validates the continuity between profiles. A hooking to a point always applies null deviations to the relative value. If the previous working permits the point hooking (setup, line, arc, subroutine ending with a profile element) the setup is not carried out and the profile continues the profile, if any, assigned before. In this case an ***hooking between profiles occurs.***
[A] Rotation angle	Angle of rotation, programmed in degrees. The rotation applies on xy plane only.
[EMX] Horizontal mirror	Mirror parameter. If selected, it sets a specular setting around a vertical axis on the face plane. If selected at the same time as the **Vertical Mirror** parameter, it sets a symmetry with regard to the X and Y axes.
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time as **Horizontal Mirror**, it sets a symmetry with regard to the X and Y axes.
[NOP] Element of reference for the setup	The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a SETUP working programmed before; in this case the field assigns the whole setup of the generated profile and the settings of the setup in the ***Technological parameters*** node are ignored. The working must correspond to a Setup in Cartesian programming mode, the compilation must not have generated any error and the *Comment* field of the working cannot be selected. If in piece-face, the working must be applied to the same face. In the event of multiple correspondences (more than one Setup programmed with the same name) the last one found is selected, that

is the Setup closer to the REDUCTION working. A *Construct* value of Setup is reset in advance.
WARNING: if the field assigns two names (example: "aa;bb") and if *Emptying in internal compensation* is enabled, the second name assigns a different setup to empty. For this second setup take into account the same considerations of the first one. To assign the second setup only, please use the: "-;bb" syntax.

TECHNOLOGICAL PARAMETERS

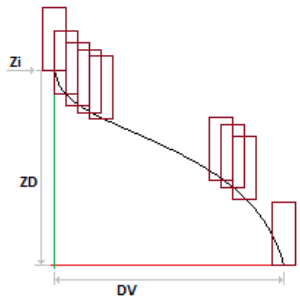
[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[EM] Electrospindel	Number of the electric spindle
[T] Tool	Tool number
[TP]Tool typology	Tool typology
[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed
[FI] Speed movement	Interpolation speed

While confirming the data, some custom errors can be displayed:

Custom errors

Custom Error 20: Invalid selected function	No *Professional* key recognised or the management of the *Working name* field is not enabled.
Custom Error 24: Null tool diameter	The tool radius is less than epsilon*5.0
Custom Error 22: Invalid technology	The width of the side development is less than the diameter of the tool
Custom Error 11: Insufficient samplings	An external profile of the section is assigned where the number of the samplings is not sufficient (min. 5 after the fragmentation and linearisation).
Custom Error 19: Invalid geometry	No profile was found or the profile is not valid (it is not closed). Some possible events: • *Geometric profile* is not set or it does not find a profile • *Geometric profile* finds several distinguished profiles
Custom Error 32: Invalid geometry: assign a closed profile	*Geometric profile* finds a non-closed profile (in XY): an *Internal compensation* with *Emptying* is required.
Custom Error 19: Invalid Geometry	An invalid profile is assigned outside the section. Some possible events: • *Section profile* does not find a profile • *Section profile* finds several distinguished profiles
Custom error 32: Invalid Geometry: assign a closed profile	*Geometric profile* finds a non closed profile (in XY) and an *Internal compensation* with *Emptying* is required.
Custom Error 31: Invalid Geometry: assign a profile with constant Y or Z	*Section profile* does not find a profile by moving both on Y and Z
Custom Error 30: Invalid geometry: assign a monotonic profile in increasing X	*Section profile* finds a profile that is not monotonic in increasing X (at less than: 10.0*epsilon)
Custom Error 12: Invalid overall dimensions of the figure	The value of one or both profile dimensions is less than: • the tool diameter *or* • the width of the side development (if performing an internal compensation)

EXAMPLE:



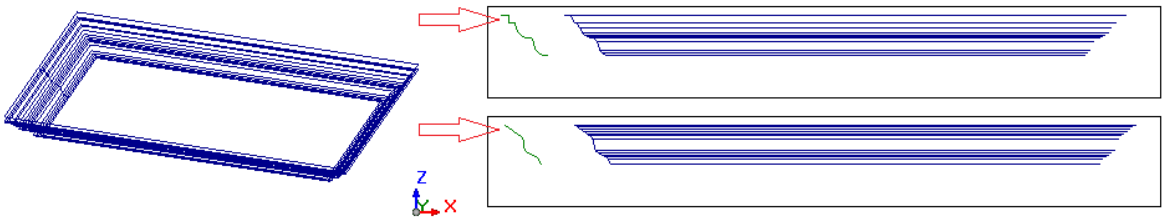
The figure shows the development, in the section, along the side wall:
- the horizontal axis corresponds to the xy plane of the path
- the vertical axis corresponds to the development along the depth.

DV= Width of the side wall
R = Tool radius
ZI = Initial depth position of the side wall.
ZD= Total depth feed

Applies a pitch feed equal to the tool radius.
No Tool compensation required.

The cylinder represents the tool.
- The horizontal axis is sampled in intervals equal to the tool radius.
- The sampling along the vertical axis is determined by intercepting the coordinate matching the development of the curve.

The union among consecutive passes is performed by two distinguished linear movements, in order to avoid incorrect movements of the tool in the piece in the case of a shaped tool.
More specifically:
- if the initial depth coordinate of the path is greater than the final one, the displacement in xy is performed as first, and afterward that in z is performed;
- otherwise, the displacement in z is performed as first and afterward that in xy is performed.



On the left side of the figure appears the three-dimensional view of a shaped reduction inside a rectangle.
On the right appears the side view of two different section profiles, both assigned external and marked by additional arrows.

CUT OF RECTANGLE

Working of profile construction with technology attribution.

This working programs a profile, open by a technological setup, that executes a rectangle.
The rectangle is programmed from the lower edge and the path of the milling cutter applies the tool correction outside the figure.

These are parameters to use:

GEOMETRIC PARAMETERS

[EG] Relative	If selected, it shows that the positions of the axes are assigned in relative. A coordinate can be forced as absolute by entering **"a;"**before the same dimension. For example, if a Y position of the previous point but with absolute X dimension = 50 has to be programmed, the flag of Relative shall be enabled and X position shall be set = a;50.
[X] Qx [Y] Qy	Positions of the lower edge of the rectangle
[Z] Zp	Coordinate of final depth
[DZ] Feed pitch	It sets the Z feed pitch of the depth applied to each development. The value to be set must be at least equal to the 10.0**epsilon* of coordinate resolution (as set in the TpaCAD configuration). This setting is significant without a sign. The procedure applies the feed needed (+/-) to reach the final depth. The actual pitch applied is generally modified in order to distribute the feed uniformly.
[EW] Direction	Direction of rotation • **Clockwise**= rectangle with Clockwise rotation • **Counterclockwise**= rectangle with counterclockwise rotation
[DL] Length	Length of the rectangle (dimension along the x axis).
[DH] Height	Height of the rectangle (dimension along the y axis).
[D] Internal margin	Position added to the tool radius and determining the actual path.
[NOP] Element of reference for the setup	sets the NAME assigned to a working programmed before or the name of a global Setup; in this case the field assigns the whole setup of the profile. If the field is not assigned, the technology is used as set directly in the next node.

SPECIAL

[EN] Apply connectors	Select to distribute connectors along the profile. In the case of development of the profile in several passes, the distribution of the connectors is applied at the last pass.
[AN] Number of connectors	sets the number of the connectors to be distributed. Values between 2 and 50 are accepted. The real number of connectors distributed along each profile depends also on the total development of the same profile (total length and its fragmentation) and can differ from the value set here.

[DN] Distance of succeeding connectors	sets the linear distance of succeeding connectors and the value is significant if greater than (epsilon*10.0). This setting is a substitute for **Number of connectors**, if the number set for the connectors is less than 2. If **Number of connectors** is greater than 2, it completes his use: the distance set here can be recalculated in order to distribute at least the number of the connectors required. Minimum number of distributed connectors: 2 If both fields **Number of connectors** and **Distance of connectors** are not set as significant, 2 connectors are distributed.
[AL] Length of the connectors	it sets the length of the connector (in the xy plane of the face) The minimum value used is equal at least to 2.0**epsilon* of coordinate resolution (as set in the TpaCAD configuration)
[AZ] Residual thickness	sets the thickness that the tool leaves in the connector execution piece The value used is at least equal to the 2.0**epsilon* of coordinate resolution (as set in the TpaCAD configuration)
[AD] Tool compensation	Select to modify the actual length of the connector, taking into account the overall dimension of the tool. • **Unmanaged**: it does not change the length of the connector • **Inner Compensation**: the connector created is narrower than the tool diameter • **Outer Compensation**: the connector created is wider than the tool diameter

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[EM] Electrospindel	Number of the electric spindle
[T] Tool	Tool number.
[TP] Tool typology	Tool typology.
[F] Entry speed	Tool entry speed.
[S] Rotation speed	Tool rotation speed
[FI] Speed movement	Interpolation speed

While confirming the data, some custom errors can be displayed:

Custom errors

Custom Error 12: Invalid overall dimensions of the figure	One or both dimensions of the figure are not set or are set with a value less than 1 mm.
Custom Error 22: Invalid technology	Case of selection of **Inner Compensation and Diameter** of the tool whose value is greater than the length of the connectors.

DOOR

Working to construct the profile with allocation of technology.

It programs a profile, opened by a technological setup, to realize a door with a single star-shaped profile, mirrored on the top.

The parameters to be used are the following ones:

GEOMETRIC PARAMETERS

[Z] Zp	Depth coordinate.
[DL] Margin	Distance of the sides of the door in X and Y and from the edge of the piece. The development of the door adapts the dimension of length and height of the face.
[DH] Dome height	Measure along Y for the curved area of the doom development of the door

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[EM] Electrospindel	Number of the electric spindle
[T] Tool	Tool number.
[TP] Tool typology	Tool typology.
[F] Entry speed	Tool entry speed.
[S] Rotation speed	Tool rotation speed
[F] Movement speed	Interpolation speed

ADVANCED TECHNOLOGY DATA

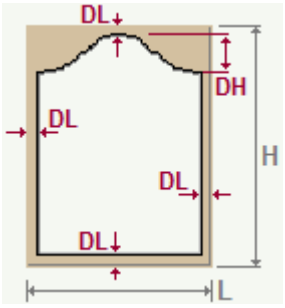
[DN] Compensation	It enables the compensation with side selection. • **Off**=no compensation; • **Left**= left side; • **Right**= right side.
[D] Compensation radius	Compensation radius It has to be set when a compensation different from the tool radius is required

While confirming the data, some custom errors can be displayed:

Custom errors

Custom Error 12: Invalid overall dimensions of the figure	The value set in **[DL] Margin** is less than the tool diameter (minimum value = 1 mm); or the minimum value set in **[DH] Doom height** is less the diameter of the tool (minimum value = 1 mm.

EXAMPLE:



DOOR

Working to construct the profile with allocation of technology.

It programs a profile, opened by a technological setup, to realize a door with a single star-shaped profile, mirrored on the top .

The parameters to be used are the following ones:

GEOMETRIC PARAMETERS

[Z] Zp	Depth coordinate.
[DL] Margin	Distance of the sides of the door in X and Y and from the edge of the piece. The development of the door adapts the dimension of length and height of the face.
[DH] Dome height	Measure along Y for the curved area of the doom development of the door

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[EM] Electrospindel	Number of the electric spindle
[T] Tool	Tool number.
[TP] Tool typology	Tool typology.
[F] Entry speed	Tool entry speed.
[S] Rotation speed	Tool rotation speed
[F] Movement speed	Interpolation speed

ADVANCED TECHNOLOGY DATA

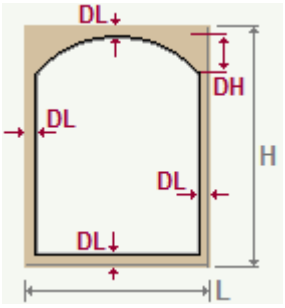
[DN] Compensation	It enables the compensation with side selection. • **Off**=no compensation; • **Left**= left side; • **Right**= right side.
[D] Compensation radius	Compensation radius It has to be set when a compensation different from the tool radius is required

While confirming the data, some custom errors can be displayed:

Custom errors

Custom Error 12: Invalid overall dimensions of the figure	The value set in **[DL] Margin** is less than the tool diameter (minimum value = 1 mm); or the minimum value set in **[DH] Doom height** is less the diameter of the tool (minimum value = 1 mm.

EXAMPLE:



DOOR

Working to construct the profile with allocation of technology.

It programs a profile, opened by a technological setup, to realize a door with a double star-shaped profile,mirrored along the height .

The parameters to be used are the following ones:

GEOMETRIC PARAMETERS

[Z] Zp	Depth coordinate.
[DL] Margin	Distance of the sides of the door in X and Y and from the edge of the piece. The development of the door adapts the dimension of length and height of the face.
[DH] Dome height	Measure along Y for the curved area of the doom development of the door

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[EM] Electrospindel	Number of the electric spindle
[T] Tool	Tool number.
[TP] Tool typology	Tool typology.
[F] Entry speed	Tool entry speed.
[S] Rotation speed	Tool rotation speed
[F] Movement speed	Interpolation speed

ADVANCED TECHNOLOGY DATA

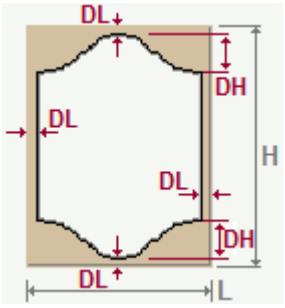
[DN] Compensation	It enables the compensation with side selection. • **Off**=no compensation; • **Left**= left side; • **Right**= right side.
[D] Compensation radius	Compensation radius It has to be set when a compensation different from the tool radius is required

While confirming the data, some custom errors can be displayed:

Custom errors

Custom Error 12: Invalid overall dimensions of the figure	The value set in **[DL] Margin** is less than the tool diameter (minimum value = 1 mm); or the minimum value set in **[DH] Doom height** is less the diameter of the tool (minimum value = 1 mm

EXAMPLE:



DOOR

Working to construct the profile with allocation of technology.

It programs a profile, opened by a technological setup, to realize a door with a single star-shaped profile,mirrored along the height.

The parameters to be used are the following ones:

GEOMETRIC PARAMETERS

[Z] Zp	Depth coordinate.
[DL] Margin	Distance of the sides of the door in X and Y and from the edge of the piece. The development of the door adapts the dimension of length and height of the face.
[DH] Dome height	Measure along Y for the curved area of the doom development of the door

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[EM] Electrospindel	Number of the electric spindle
[T] Tool	Tool number.
[TP] Tool typology	Tool typology.
[F] Entry speed	Tool entry speed.
[S] Rotation speed	Tool rotation speed
[F] Movement speed	Interpolation speed

ADVANCED TECHNOLOGY DATA

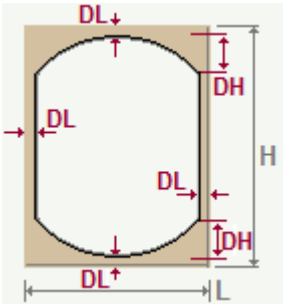
[DN] Compensation	It enables the compensation with side selection. • **Off**=no compensation; • **Left**= left side; • **Right**= right side.
[D] Compensation radius	Compensation radius It has to be set when a compensation different from the tool radius is required

While confirming the data, some custom errors can be displayed:

Custom errors

Custom Error 12: Invalid overall dimensions of the figure	The value set in **[DL] Margin** is less than the tool diameter (minimum value = 1 mm); or the minimum value set in **[DH] Doom height** is less the diameter of the tool (minimum value = 1 mm.

EXAMPLE:



TEXT

Working to generate writings with technology attribution

It programs the definition of a text profile. For further details reference is made to the TpaCAD manual Chapter ***Tools->Constructions->Text generation***
The parameter to be used are the following ones:

GEOMETRIC PARAMETERS

[Qx] X [Qy] Y [Zp] Z	X, Y, Z coordinates of application.
[EG] Relative	If selected, it indicates that the coordinates of all the enabled axes are assigned in relative values. A dimension as absolute can be forced by entering **"a;"** before the same dimension. For instance, if a Y dimension relative to the previous point but with absolute X dimension = 50 has to be programmed, the relative flag shall be enabled and X dimension shall be set = a;50.
Locate the extents rectangle	It locates coordinates of point of application according to overall rectangle dimensions. Possible options: • **Do not apply**= this option is not enabled • **Centre in XY**= it shifts the x,y coordinates making them coincide with the the center of the overall rectangle • **X-Y-**= it shifts the x,y coordinates making them coincide with the minimum x and y coordinates of the overall rectangle • **X-Y+**= it shifts the x,y coordinates making them coincide with the x coordinates at the minimum overall dimension and the y coordinates at the maximum overall dimension • **X+Y-**= it shifts the x,y coordinates making them coincide with the x coordinates at the maximum overall dimension and the y coordinates at the minimum overall dimension • **X+Y+**= it shifts the x,y coordinates making them coincide with the x and y coordinates at the maximum overall dimensions
[TX] Text	Text to be entered.
[FN] Font	Type of character to be applied to the text to be input. The list of the True Type fonts installed in the Pc is shown in a selection window.
[HC] Font height	It sets the character height.
[ML] Font spacing	Spacing mode between the single characters of the text. Possible options: • **Metric**: the space is determined by the rules defined for each single character of the font • **Geometric**: the space is determined by the overall rectangle of each single character.
[L] Font spacing	It sets the distance between two subsequent characters.
[SP] Space width	It sets the width given to spaces. Set a negative value to use the font width.
[IT] Italics	It applies the italics format to the text.
[BL] Bold	It applies the bold format to the text.
[RTL] RightToLeft	Select to invert the order of the characters in the text. The field is available for the compose layouts from right to left, for example like for the Arabic or the Jewish language.
[WLN] Element of line and page breaks	It sets the Name of the working that assigns the geometry for the text distribution. The working is searched before the current working and it must correspond to a linear segment or to an arc of circle or to an arc of conic section. Furthermore: • the compilation of the element must not have generated any errors • it cannot have selected the Comment field • if in piece-face, it must be applied to the same face of the current working

[LN] Alignment	It selects the alignment mode of the text in the four entries of the list: • **Left**: selection by default, always employable. The remaining three selections are applied only if the text is distributed along a geometric segment of the line, arc or conic: • **Centre**: the text is centred along the segment • **Right**: the text is aligned from the final part of the segment • **Automatic distribution**: it aligns the text both at the initial and at the final point of the segment and adds the necessary space among the characters in order to obtain an equal distribution of the text. The selection is not significant, if the text is made by only one character.
[A] Rotation angle	Angle of rotation, programmed in degrees. The rotation applies on xy plane only.
[EMX] Horizontal mirror	Mirror parameter. If selected, it sets a specular setting around the vertical axis on the face place. If selected at the same time with **Vertical Mirror**, it sets a symmetry against X and Y axes
[EMY] Vertical mirror	Mirror parameter. If selected, it sets a specular setting around the horizontal axis on the face place. If selected at the same time with **Horizontal Mirror**, it sets a symmetry against X and Y axes
[EINV] Invert	If selected, it inverts the execution of the subroutine: the last block becomes the first, etc. The transformed programming inverts also the tool correction settings (right or left) of every step.
[NOP] Element of reference for the Setup	The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a working programmed before; in this case the field assigns the whole setup of all the generated profiles and the settings of the setup in the **Technological parameters** node are ignored. (For further details, please read the manual of TpaCAD) If no NAME is assigned, the setup code by default is used, as set for the application face.
TECHNOLOGICAL PARAMETERS	
[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[EM] Electric spindle	Number of the electric spindle
[T] Tool	Tool number.
[TP] Tool typology	Tool typology.
[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed
[FI] Speed movement	Interpolation speed
ADVANCED TECHNOLOGY DATA	
[DN] Compensation	It enables the compensation with side selection: • **Off**=no compensation; • **Left**= left side; • **Right**= right side.
[D] Compensation radius	Compensation radius To be set if a different tool radius is required.

While confirming the data, some custom errors may be displayed:

Custom errors

Errore Custom 12: Invalid overall dimensions of the figure	value set in the field **[HC] Height character** is less than 10 mm

TEXT

Working to generate writings with technology attribution

It programs the definition of a text profile. For further details reference is made to the TpaCAD manual Chapter ***Tools->Constructions->Text generation***
The parameter to be used are the following ones:

GEOMETRIC PARAMETERS

[Qx] X [Qy] Y [Zp] Z	X, Y, Z coordinates of application.
[EG] Relative	If selected, it indicates that the coordinates of all the enabled axes are assigned in relative values. A dimension as absolute can be forced by entering **"a;"** before the same dimension. For instance, if a Y dimension relative to the previous point but with absolute X dimension = 50 has to be programmed, the relative flag shall be enabled and X dimension shall be set = a;50.
Locate the extents rectangle	It locates coordinates of point of application according to overall rectangle dimensions. Possible options: • **Do not apply**= this option is not enabled • **Centre in XY**= it shifts the x,y coordinates making them coincide with the the center of the overall rectangle • **X-Y-**= it shifts the x,y coordinates making them coincide with the minimum x and y coordinates of the overall rectangle • **X-Y+**= it shifts the x,y coordinates making them coincide with the x coordinates at the minimum overall dimension and the y coordinates at the maximum overall dimension • **X+Y-**= it shifts the x,y coordinates making them coincide with the x coordinates at the maximum overall dimension and the y coordinates at the minimum overall dimension • **X+Y+**= it shifts the x,y coordinates making them coincide with the x and y coordinates at the maximum overall dimensions
[TX] Text	Text to be entered.
[FN] Font	Type of character to be applied to the text to be input. The list of the True Type fonts installed in the Pc is shown in a selection window.
[HC] Font height	It sets the character height.
[ML] Font spacing	Spacing mode between the single characters of the text. Possible options: • **Metric**: the space is determined by the rules defined for each single character of the font • **Geometric**: the space is determined by the overall rectangle of each single character.
[L] Font spacing	It sets the distance between two subsequent characters.
[SP] Space width	It sets the width given to spaces. Set a negative value to use the font width.
[IT] Italics	It applies the italics format to the text.
[BL] Bold	It applies the bold format to the text.
[RTL] RightToLeft	Select to invert the order of the characters in the text. The field is available for the compose layouts from right to left, for example like for the Arabic or the Jewish language.
[WLN] Element of line and page breaks	It sets the Name of the working that assigns the geometry for the text distribution. The working is searched before the current working and it must correspond to a linear segment or to an arc of circle or to an arc of conic section. Furthermore: • the compilation of the element must not have generated any errors • it cannot have selected the Comment field • if in piece-face, it must be applied to the same face of the current working

[LN] Alignment	It selects the alignment mode of the text in the four entries of the list: • **Left**: selection by default, always employable. The remaining three selections are applied only if the text is distributed along a geometric segment of the line, arc or conic: • **Centre**: the text is centred along the segment • **Right**: the text is aligned from the final part of the segment • **Automatic distribution**: it aligns the text both at the initial and at the final point of the segment and adds the necessary space among the characters in order to obtain an equal distribution of the text. The selection is not significant, if the text is made by only one character.
[A] Rotation angle	Angle of rotation, programmed in degrees. The rotation applies on xy plane only.
[EMX] Horizontal mirror	Mirror parameter. If selected, it sets a specular setting around the vertical axis on the face place. If selected at the same time with **Vertical Mirror**, it sets a symmetry against X and Y axes
[EMY] Vertical mirror	Mirror parameter. If selected, it sets a specular setting around the horizontal axis on the face place. If selected at the same time with **Horizontal Mirror**, it sets a symmetry against X and Y axes
[EINV] Invert	If selected, it inverts the execution of the subroutine: the last block becomes the first, etc. The transformed programming inverts also the tool correction settings (right or left) of every step.
[NOP] Element of reference for the Setup	The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a working programmed before; in this case the field assigns the whole setup of all the generated profiles and the settings of the setup in the **Technological parameters** node are ignored. (For further details, please read the manual of TpaCAD) If no NAME is assigned, the setup code by default is used, as set for the application face.
TECHNOLOGICAL PARAMETERS	
[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[EM] Electric spindle	Number of the electric spindle
[T] Tool	Tool number.
[TP] Tool typology	Tool typology.
[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed
[FI] Speed movement	Interpolation speed
ADVANCED TECHNOLOGY DATA	
[DN] Compensation	It enables the compensation with side selection: • **Off**=no compensation; • **Left**= left side; • **Right**= right side.
[D] Compensation radius	Compensation radius To be set if a different tool radius is required.

While confirming the data, some custom errors may be displayed:

Custom errors

Errore Custom 12: Invalid overall dimensions of the figure	value set in the field **[HC] Height character** is less than 10 mm

TEXT EMPTYING

Working for the construction of text emptying

It programs the text emptying. The font used is chosen among the system fonts, installed in the computer. The development of the working does not include the assignment profile of the original text. For further details, please read the manual of TpaCAD, chapters ***Tools->Constructions->Text generation, Tools-> Constructions->Emptying of areas.***

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[Qx] X [Qy] Y	X, Y coordinate of application.
[EG] Relative	If selected, it indicates that the coordinates of all the enabled axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"** before the same dimension. For instance, if a Y dimension relative to the previous point but with absolute X dimension = 50 has to be programmed, the relative flag shall be enabled and X dimension shall be set = a;50.
Locate the extents rectangle	It locates coordinates of point of application according to overall rectangle dimensions. Possible options: • **Do not apply**= this option is not enabled • **Centre in XY**= it shifts the x,y coordinates making them coincide with the the center of the overall rectangle • **X-Y-**= it shifts the x,y coordinates making them coincide with the minimum x and y coordinates of the overall rectangle • **X-Y+**= it shifts the x,y coordinates making them coincide with the x coordinates at the minimum overall dimension and the y coordinates at the maximum overall dimension • **X+Y-**= it shifts the x,y coordinates making them coincide with the x coordinates at the maximum overall dimension and the y coordinates at the minimum overall dimension • **X+Y+**= it shifts the x,y coordinates making them coincide with the x and y coordinates at the maximum overall dimension
[TX] Text	Text to be entered.
[FN] Font	Type of character to be applied to the text to be entered. The list of the True Type fonts installed in the Pc is shown in a window selection.
[HC] Font height	It sets the character height.
[ML] Font spacing	Spacing mode between the single characters of the text. Possible options: • **Metric**: the space is determined by the rules defined for each single character of the font • **Geometric**: the space is determined by the overall rectangle of each single character.
[L] Font spacing	It sets the distance between two subsequent characters.
[SP] Space width	It sets the width given to spaces. Set a negative value to use the font width.
[IT] Italics	It applies the italics format to the text.
[BL] Bold	It applies the bold format to the text.
[RTL] RightToLeft	Select to invert the order of the characters in the text. The field is available for the compose layouts from right to left, for example like for the Arabic or the Jewish language.
[WLN] Element of line and page breaks	It sets the Name of the working that assigns the geometry for the text distribution. The working is searched before the current working and it must correspond to a linear segment or to an arc of circle or to an arc of conic section. Furthermore: • the compilation of the element must not have generated any errors • it cannot have selected the Comment field

- if in piece-face, it must be applied to the same face of the current working

[LN] Alignment — It selects the alignment mode of the text in the four entries of the list:
- **Left**: selection by default, always employable.

The remaining three selections are applied only if the text is distributed along a geometric segment of the line, arc or conic:
- **Centre**: the text is centred along the segment
- **Right**: the text is aligned from the final part of the segment
- **Automatic distribution**: it aligns the text both at the initial and at the final point of the segment and adds the necessary space among the characters in order to obtain an equal distribution of the text. The selection is not significant, if the text is made by only one character.

[A] Rotation angle — Angle of rotation, programmed in degrees. The rotation applies on xy plane only.

[EMX] Horizontal mirror — Mirror parameter. If selected, it sets a specular setting around the vertical axis on the face place. If selected at the same time with **Vertical Mirror**, it sets a symmetry against X and Y axes

[EMY] Vertical Mirror — Mirror parameter. If selected, it sets a specular setting around the horizontal axis on the face place. If selected at the same time with **Horizontal Mirror**, it sets a symmetry against X and Y axes.

EMPTYING

[NOP] Emptying setup — Setup working code to be assigned to the emptying profile. It can be set with direct edit or selecting the code from the setup list shown in the window. As an alternative to a working code and if it is permitted by the configuration of TpaCAD, you can set the NAME assigned to a working programmed before; in this case the field assigns the whole setup of the emptying profile. (For further details, please read the manual of TpaCAD)
If no code (or a Name) is assigned, the setup code by default is used , as set for the application face.

Emptying — It opens a dialogue window for the input of the parameters for the emptying application. For further details see the TpaCAD manual, chapter **Tools->Constructions->Emptying of areas.**

While confirming the data, some custom errors may be displayed:

Custom errors

Errore Custom 12: Invalid overall dimensions of the figure value set in the field **[HC] Height character** is less than 10 mm

GRAPHIC TEXT

Writings generation working with technology assignment.

It programs one or more profiles, opened by a technological setup, to make a writing. The font used is chosen among the customized ones, which are installed in the TpaCAD Configuration.
To gain insight, refer to the TpaCAD manual at the chapter ***Tools->Constructions->Text generation.***

The parameter to be used are the following ones:

GEOMETRIC PARAMETERS

[Qx] X [Qy] Y [Zp] Z	X, Y, Z appliaction coordinates.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"**before the same dimension. For instance, if a Y dimension relative to the previous point but with absolute X dimension = 50 has to be programmed, the relative flag shall be enabled and X dimension shall be set = a;50.
Locate the extents rectangle	It locates coordinates of the application point according to overall rectangle dimensions. Possible options: • **Do not apply**=this option is not enabled • **Centre in XY**= it shifts the x,y coordinates making them coincide in the center of the overall rectangle • **X-Y-**= it shifts the x,y coordinates making them coincide with the minimum x and y coordinates of the overall rectangle • **X-Y+**= it shifts the x,y coordinates making them coincide with the x coordinates at hte minimum overall dimension and the y coordinates at the maximum overall dimension • **X+Y-**= it shifts hte x,y coordinates making them coincide with the x coordinates at the maximum overall dimension and the y coordinates at the minimum overall dimension • **X+Y+**= it shifts the x, y coordinates making them coincide with the x and y coordinates at the maximum overall dimension
[TX] Text	Text to be input.
[FN] Font	Font to use for the text. The list of the custom fonts installed in the TpaCAD Configuration is shown in a selection window.
[HC] Font height	Font height in upper case format.
[ML] Font spacing	Spacing mode between the single characters of the text. Possible options: • **Metric**: the space is determined by the rules defined for each single character of the font • **Geometric**: the space is determined by the overall rectangle of each single character.
[L] Font spacing	Spacing among the following characters of the text.
[SP] Space width	Space character width.
[RTL] RightToLeft	Select to *invert the order* of the characters in the text. The field is available for the compose layouts from right to left, for example like the Arabic or the Jewish language.
[WLN] Element of line and page breaks	It sets the Name of the working that assigns the geometry for the text distribution. The working is searched before the current working and it must correspond to a linear segment or to an arc of circle or to an arc of conic section. Furthermore: • the compilation of the element must not have generated any errors • it cannot have selected the Comment field • if in piece-face, it must be applied to the same face of the current working

[LN] Alignment	It selects the alignment mode of the text in the four entries of the list: • **Left**: selection by default, always employable. The remaining three selections are applied only if the text is distributed along a geometric segment of the line, arc or conic: • **Centre**: the text is centred along the segment • **Right**: the text is aligned from the final part of the segment • **Automatic distribution**: it aligns the text both at the initial and at the final point of the segment and adds the necessary space among the characters in order to obtain an equal distribution of the text. The selection is not significant, if the text is made by only one character. Select to require the processing of the profiles made by spline curve (Quadratic type of Bezier spline)
[A] Rotation angle	Angle of rotation, programmed in degrees. The rotation is applied only in xy plane.
[EMX] Horizontal mirror	Mirror parameter. If selected, it sets a specular setting around the vertical axis. If selected at the same time with **Vertical Mirror**, it sets a symmetry against X and Y axes
[EMY] Vertical Mirror	Mirror parameter. If selected, it sets a specular setting around the horizontal axis. If selected at the same time with **Horizontal Mirror**, it sets a symmetry against X and Y axes
[EINV] Invert	If selected, it inverts the execution and the direction of the profiles that compose the writing. The transform inverts also the tool correction settings (right or left) of each setup.
SPECIAL	
[DP] Apply to profiles	If selected, it applies the application to the only profile workings of those that verify a correspondence with the NAME field.
[NOP] Element of reference for the setup	The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a working programmed before; in this case the field assigns the whole setup of all the generated profiles and the settings of the setup in the **Technological parameters** node are ignored. (For further details, please read the manual of TpaCAD): If no NAME is assigned, the setup code by default is used, as set for the application face.
TECHNOLOGICAL PARAMETERS	
[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[EM] Electric spindle	Number of the electric spindle
[T] Tool	Tool number.
[TP] Tool typology	Tool typology.
[F] Entry speed	Tool entry speed.
[S] Rotation speed	Tool rotation speed
[FI] Speed speed	Interpolation speed
ADVANCED TECHNOLOGY DATA	
[DN] Compensation	It enables the compensation with side selection. • **Off**=no compensation • **Left**= left side • **Right**= right side
[D] Compensation radius	Compensation radius It has to be set when a compensation different from the tool radius is required

While confirming the data, some custom errors can be displayed:

Custom errors

Custom Error 12: Invalid figure overall dimensions	value set in the field **[HC] Height character** is less than 10 mm

STOOL

Working for the application of geometrical transforms

It programs the application of geometrical transformations to workings, called by name and programmed before the current working.

For further details about the use of the group of STOOL codes, please read the manual of TpaCAD, chapter **Workings->Programmed tools**

The parameter to be used are as follows:

IF (...)? (..) (...)	The subroutine call can be conditioned through the parameters of the ***IF (...)? (...)? (...).*** The working is carried out only if the required condition is checked as true. The condition is checked as true anyway if the corresponding parameters are not set. Up to 3 terms of logical conditioning can be assigned.
[ESP1] e1	Assignment parameters of the first term of comparison
[ESP2] e2	(e1) ? (e2)
[TST1] ?	with [TST1]? assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it solves TRUE value, if both the terms are verified. • **Or**: it solves TRUE value, if at least one term is verified
[ESP3]e3	Assignment parameters of the second term of comparison:
[ESP4]e4	(e3) ? (e4)
[TST2]?	with [TST2]? assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it solves TRUE value, if both the terms are verified. • **Or**: it solves TRUE value, if at least one term is verified
[ESP5] e5	Assignment parameters between the third term of comparison
[ESP6] e6	(e5) ? (e6)
[TST3] ?	with [TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)

GEOMETRIC PARAMETERS

[X] X1 [Y] Y1 [Z] Z1	X, Y, Z coordinate of application. They are significant individually. On the point the first point of working is translated. For non assigned coordinates no translation is applied with respect to the original development of the workings.
[HN] Workings	It lists the workings on which the code operates. A window containing the list of all the denominations (NAME field) assigned to the upstream-programmed workings is possible. A multiple selection is possible. In case of face-piece, the denominations corresponding to workings assigned on the same face of the STOOL code application are considered valid. To the same STOOL working a Name (NAME Field) can be assigned, so itself can be used to perform a following code of the STOOL group.
[EGL] Point hook	If selected, it hooks the current application to the previous point and it validates the continuity of the previous profile. It prevails on each further assignment of placement included the (**X1,Y1,Z1**) parameters. The placing on X, Y, Z is defined in relative with null displacements against the final point of application of the previous working. In case of hooking between milling operations, the elimination of the tool raising from / lowering to the point of hooking can be checked too.
[EG] Relative	If selected, the point of application is considered as relative to the final point of application of the previous working.

Locate the extents rectangle	It locates coordinates of point of application according to overall rectangle dimensions (considered only in the xy plane). Possible options: • **Do not apply**= this option is not enabled • **Centre in XY**= it shifts the x,y making them coincide in the centre of the overall rectangle • **X-Y-**= it shifts the x,y coordinates making them coincide with the minimum x and y coordinates of the overall rectangle • **X-Y+**= it shifts the x,y coordinates making them coincide with the x coordinates at the minimum overall dimension and the y coordinates at the maximum overall dimension • **X+Y-**= it shifts the x,y coordinates making them coincide with the x coordinates at the maximum overall dimension and the y coordinates at the minimum overall dimension • **X+Y+**= it shifts the x,y coordinates making them coincide with the x and y coordinates at the maximum overall dimension
[XI] initial X [YI] initial Y [ZI] initial Z	Coordinates of auxiliary point of application used as: • Rotation centre • Mirror axis
[A] Rotation angle	Angle of rotation, programmed in degrees. The rotation centre is in: (XI,YI) if assigned, otherwise in (X,Y)
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a specular setting around a vertical axis on the face place. The mirror axis is in: (XI) if assigned, otherwise in (X). If selected at the same time with **Vertical Mirror**, it sets a symmetry against X and Y axes
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around a horizontal axis on the face. The mirror axis is in: (YI) if assigned, otherwise in (Y). If selected at the same time with **Horizontal Mirror**, it sets a symmetry against X and Y axes
[EINV] Invert	If selected, it inverts the execution of the subroutine: the last one becomes the first... The transformed programming inverts also the tool correction settings (right or left) of every setyp.
SPECIAL	
[DP] Apply to profiles	If selected, it applies the application to the only profile workings of those that verify a correspondence with the NAME field.
STRETCH FACTOR	
[EFAT] Enable	If selected, it enables the modification of the dimension
[FAT] Factor	It sets the scale factor. The minimum value that can be set is 0.001. A value higher than 1 involves an amplification; a value lower than 1 involves a reduction; a value equal to 1 involves no transformation.
[ZFAT]3d scale	If selected, it applies the modification of the dimension also in depth. The selection is compulsory if the subroutine carries out arcs on planes different from XY.
REPETITIONS	
[NM] Matrix repetition mode	If selected, it repeats the selected workings according to a matrix diagram, otherwise it repeats the workings according a scheme of free placement.
[RONLY] Keep repetitions only	If selected, it excludes the original workings from the repetition development.
[NGO]Rel <-	If selected, it applies the offsets of placement with respect to the initial point of the previous repetition. In case of repetition with matrix placement we mean with respect to the previous row/column.
	Repetition settings with scheme of free placement:
[NN] Repetitions	Number of repetitions.
[NX] Offset X	It assigns an X offset of placing.
[NY] Offset Y	It assigns an Y offset of placing.
[NZ] Offset Z	It assigns an Z offset of placing.
[NGRL]Point hook	If selected, it hooks each repetition to the final point of the repetition. The parameters of [NX,NY,NZ] Offset and [EGO] point hook are ignored.

[NA]Offset A()	It sets the angle increase for each working against the previous repetition.
	Repetition settings with scheme of matrix placement:
[NL] Rows	Number of rows: minimum value is 1. The rows are assigned along the y axis
[NC] Columns	Number of rows: minimum value is 1. The rows are assigned along the x axis
[NTY] Row distance	It assigns the distance between successive rows.
[NTX] Column distance	It assigns the distance between subsequent columns.

STOOL - EMPTY

Working for the application of a programmed emptying processes

It programs the application of emptyings for closed profiles called by name and programmed before the current working. The development of the working does not imply the original workings.

The parameters to be used are as follows:

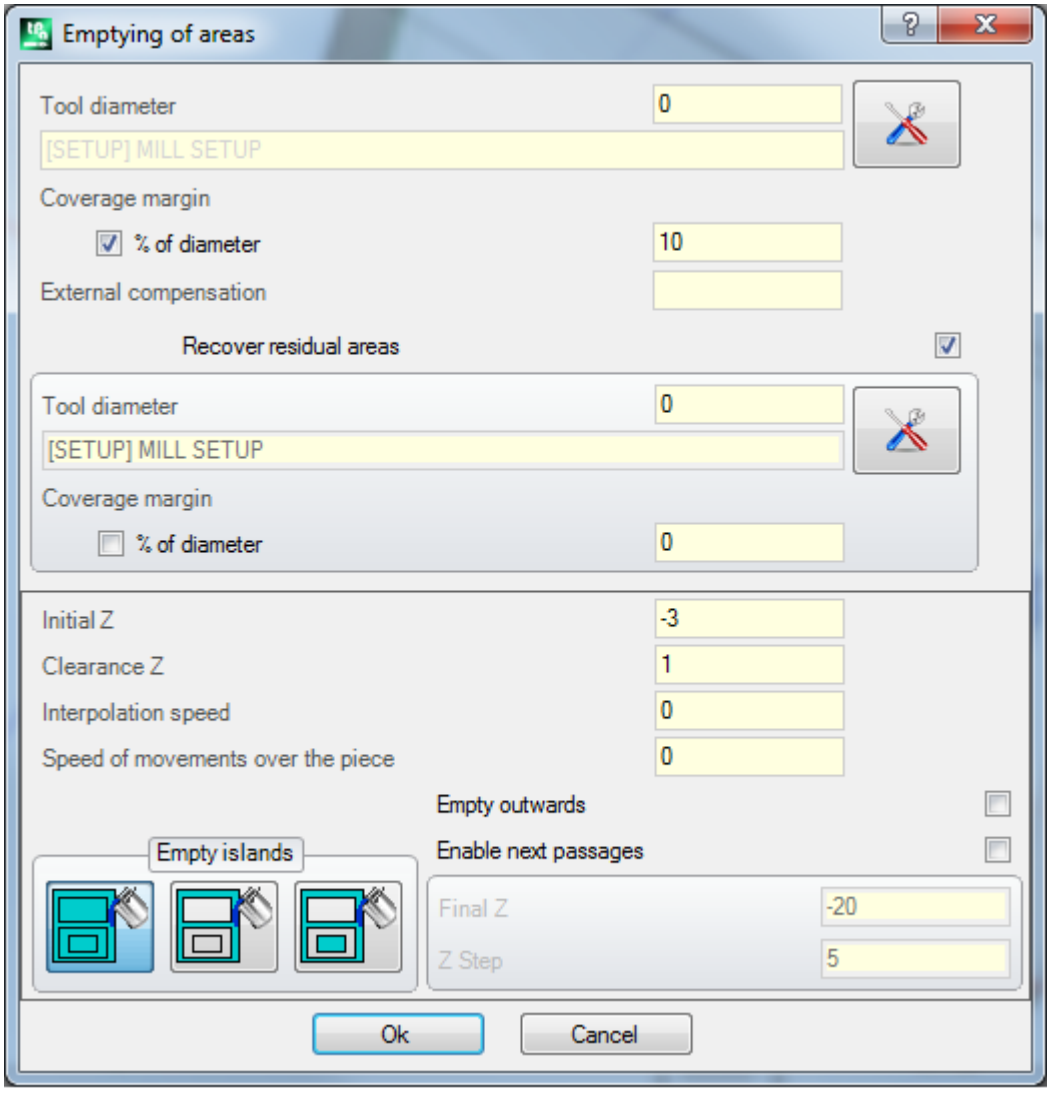
IF (...)? (...)? (...)	The execution of the working can be conditioned through the parameters of the IF (...)? node. (...)? (...). The working is carried out only if the required condition is verified as true. The condition is always verified as true, if the corresponding parameters are not set. Up to three terms of logic conditioning can be assigned.
[ESP1] e1	Assignment parameter of the first comparison term
[ESP2] e2	(e) ? (e2)
[TST1] ?	with [TST1]? assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	logical condition among the first two comparison terms: • **And** resolves the value TRUE, if both the terms are verified • **Or** resolves the value TRUE, if one term at least is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: (e3) ? (e4) with [TST2]? assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result from the logical condition applied to the first two terms and the third comparison term: • **And** resolves the value TRUE, if both the terms are verified • **Or** resolves the value TRUE, if one term at least is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: (e5) ? (e6) with [TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)

GEOMETRIC PARAMETERS

[X] X1 [Y] Y1 [Z] Z1	X, Y, Z application coordinates. They are significant singularly. The first working point is translated on the point. For non assigned coordinates, the translation can't be assigned, with respect to the original development of the workings.
[HN] Workings	It lists the workings on which the code works. Only the workings that identify the closed profiles are considered within the indicated workings. A window containing the list of all the Names (NAME Field) assigned to the workings programmed before can be opened and a multiple selection is possible. In case of face-piece, the Names corresponding to workings assigned on the same face of the STOOL application code are considered valid. The same STOOL working can have a Name (NAME Field): then, it can be used to carry out a subsequent code of the STOOL group
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values.
[A] Angle of rotation	Angle of rotation programmed in degrees.
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a mirror around a vertical axis on the face plane. If selected contemporaneously with the parameter **Vertical Mirror** it sets a symmetry against X and Y axes.
[EMY] Vertical mirror	Mirror parameter If selected, it sets a mirror around a horizontal axis on the face plane. If selected contemporaneously with the parameter **Horizontal Mirror** it sets a symmetry against X and Y axes.
[EINV] Invert	If selected, it inverts the execution of the workings: the last one becomes the first one, etc. The transformed programming inverts also the tool correction settings (right or left) of every setup.

[NOP] Emptying setup	Setup working code. It can be set by a direct editing or by selecting the code from the list of setup in the window. As an alternative to a working code and if it is permitted by the configuration of TpaCAD, you can set the NAME assigned to a working programmed before; in this case the field assigns the whole setup of the emptying profile. (For further details, please read the manual of TpaCAD). If no code (or a Name) is assigned, the setup code by default is used as set for the application face.
Emptying	It opens the setting window of the area emptying parameters. For further details, please read the manual of TpaCAD, chapter **Tools->Constructions->Emptying of areas**

The window below does not show some parameters with respect of the Area Emptying window:



STOOL - SPLINE

Working for spline generation

It programs the creation of spline curves into polylines, called by name and programmed before the current working. The development of the working does not imply the original workings.
For further details, please read the TpaCAD manual, chapter **Tools->Constructions->Generate spline from polyline**

The parameters to be used are the following ones:

IF (...)? (...)? (...)	Up to three terms of logical conditioning can be assigned IF (...)? node (...)? (...). The working is carried out only if the required condition is verified as true. The condition is always verified as true, if the corresponding parameters are not set. Up to three terms of logical conditioning can be assigned
[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: (e1) ? (e2) with [TST1]? assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it resolves TRUE value, if both the terms are verified. • **Or**: it resolves TRUE value, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: (e3) ? (e4) with [TST2]? assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it resolves TRUE value, if both the terms are verified. • **Or**: it resolves TRUE value, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: (e5) ? (e6) with [TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)
GEOMETRIC PARAMETERS	
[X] X1 [Y] Y1 [Z] Z1	X, Y, Z application coordinates They are significant individually. The first working point is translated on the point. For non assigned coordinates, the translation can't be assigned, with respect to the original development of the workings
[HN] Workings	It lists the workings on which the code operates. among the indicated working, only those that define the profiles are considered. It is possible to open a window containing the list of all the Names (NAME field) that assigned to the workings programmed before. A multiple selection is possible. In case of face-piece, only the Names corresponding to workings assigned on the same face of the STOOL are considered valid. To the same STOOL working a Name (NAME field) can be assigned: this one can be used to carry out a following code of the STOOL group
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values.
[A] Rotation angle	Angle of rotation, programmed in degrees.
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a specular setting around a vertical axis on the face plane. If selected at the same time with **Vertical Mirror**, it sets a symmetry against X and Y axes
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time with **Horizontal Mirror**, it sets a symmetry against X and Y axes
[EINV] Invert	If selected, it inverts the execution of the subroutines, so the last becomes the first

[NOP] Element of reference for the Setup	The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a working programmed before; in this case the field assigns the whole setup of all the generated profiles. (For further details, please read the manual of TpaCAD). If no NAME is assigned, the setup code by default is used, as set for the application face. In this case, a setup is added for the original profiles only without setup.

SPLINE

[MS] Curve type	It selects among the curve typologies of available curve: . Quadratic B-spline . Cubic B-spline . Cardinal Spline
[DZ] Apply in 3d	Select to enable the curve solution also according to the depth coordinate: in this way it generates a curve in the space. If the field is not selected, the generated curves set the Z coordinate of the setup.
[DT] Curve tension	It sets the tension of the curve, used in case of a *Cardinal spline curve* Values between 0.0 and 1.0 are valid (an invalid setting is related to the interval): · 1.0 corresponds to the maximum tension: the calculated curve correspond to the original profile, broken on the indicated segments; · 0.0 corresponds to the minimum tension: the calculated curve correspond to the max. deviations with respect to the original profile
[MD] Sample on the curve length	select to apply a sampling base on the length of the segments into which the longest segment of the original profile can be divided.
[NS] Sampled lines between two points	It sets the number of sampled segments between two reference points. Value by default: 8 Values between 8 and 100 are accepted. The value is significant, if the option **Sample on the curve length** is not selected
[EPS] Length of the line	It sets the max. length into which the longest segment of the original profile can be divided. The value is significant, if the option **Sample on the curve length** is selected
[EF] Movement speed	It sets the interpolation speed during the execution of the spline curve.

STOOL - RADIUS

Working for the programmed creation of a compensated profile

It programs the creation of profiles for the compensation of profiles called by name and programmed before the current working. The development of the working does not imply the original workings.
For further details, please read the TpaCAD manual, chapter **Tools->Constructions->Correct profile.**

The parameters to define the working are:

IF (...)? (...)? (...)	The execution of the working can be conditioned through the parameters of the IF (...)? node. (...)? (...). The working is carried out only if the required condition is verified as true. The condition is always verified as true, if the corresponding parameters are not set. Up to three terms of logic conditioning can be assigned
[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: (e1) ? (e2) with [TST1]? assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it resolves TRUE value, if both the terms are verified. • **Or**: it resolves TRUE value, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: (e3) ? (e4) with [TST2]? assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it resolves TRUE value, if both the terms are verified. • **Or**: it resolves TRUE value, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: (e5) ? (e6) with[TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)

GEOMETRIC PARAMETERS

[X] X1 [Y] Y1 [Z] Z1	X, Y, Z application coordinates They are significant individually. The first working point is translated on the point. For non assigned coordinates, the translation can't be assigned, with respect to the original development of the workings
[HN] Workings	It lists the workings on which the code works: of the listed workings, only those that identify profiles are considered. A window containing the list of all the denominations (NAME field) assigned to the upstream-programmed workings is possible, with also a possible multiple selection. In case of face-piece, only the denominations to workings assigned on the same face of the STOOL are considered valid. To the same STOOL working a Name (NAME Field) can be assigned: so itself can be used to perform a following code of the STOOL group.
[EG] Relative	If selected, it indicates that the coordinates of all the enabled are assigned in relative values.
[A] Rotation angle	Angle of rotation, programmed in degrees.

[EMX] Horizontal mirror	Mirror parameter If selected, it sets a specular setting around the vertical axis on the face plane. If selected at the same time with **Vertical Mirror**, it sets a symmetry against X and Y axes
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time with **Horizontal Mirror**, it sets a symmetry against X and Y axes
[EINV] Invert	If selected, it inverts the execution of the workings: the last one becomes the first.
[NOP] Element of reference for the setup	The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a working programmed before; in this case the field assigns the whole setup of all the generated profiles. (For further details, please read the manual of TpaCAD). If no NAME is assigned, the setup code by default is used, as set for the application face. In this case, a setup is added for the original profiles only without setup.

ADVANCED TECHNOLOGY DATA

[D] Compensation radius	It sets the compensation radius to be applied to the original profiles The value set must be al least equal to the *epsilon* of coordinate resolution (as set in the TpaCAD configuration)
[DN] Compensation	Invert compensation side • **Left**= left side; • **Right**= right side.
[DNC] Contouring	Select the solution mode in the external compensation of an edge: • **Default**= it applies as defined in the configuration of TpaCAD • **Fillets**= it inserts a fillet • **Edges**= it comes down to intersection
[DNR] Reduce the profile	Enables the removal of segments in correct profile with respect to the original one, in consideration of geometric overall dimensions exceeding the compensation itself. For further details, please read the manual of TpaCAD, chapter**Workings->Profile->Tool compensation.**

STOOL - FILLET PROFILE

Working for the programmed creation of a profile with chamfered profiles.

It programs the creation of profiles with the application of a junction on the edge points to profiles called by name and programmed before the current working. The development of the working does not imply the original workings.
For further details please read the TpaCAD manual, chapter **Tools->Profile tools->Fillet profile**

The parameters to define the working are:

IF (...)? (...)? (...)	Up to three terms of logic conditioning can be assigned ***IF (...)? node (...)? (...).*** The working is carried out only if the required condition is verified as true. Anyway, the condition is verified as true, if the corresponding parameters are not set. Up to **three terms** of logical conditioning can be assigned
[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: · **And** solves a value as TRUE , if both terms are verified · **Or** solves a value as TRUE, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: · **And** solves a value as TRUE , if both terms are verified · **Or** solves a value as TRUE, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: **(e5) ? (e6)** with **[TST3]?** with[TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)

GEOMETRIC PARAMETERS

[X] X1 [Y] Y1 [Z] Z1	X, Y, Z application coordinates They are significant individually. The first working point is translated on the point. For non assigned coordinates, the translation can't be assigned, with respect to the original development of the workings
[HN] Workings	It lists the workings on which the code works: of the listed workings, only those that identify profiles are considered. It possible to open a window containing the list of all the Names (NAME field) assigned to the workings programmed before. A multiple selection is possible. In case of face-piece, only the Names corresponding to workings assigned on the same face of the STOOL are considered valid. To the same STOOL working a Name (NAME field) can be assigned: this one can be used to carry out a following code of the STOOL group
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values.
[A] Rotation angle	Angle of rotation, programmed in degrees.
[EMX] Horizontal mirror	Mirror parameter. If selected, it sets a specular setting around a vertical axis on the face plane. If selected at the same time as the **Vertical Mirror** parameter, it sets a symmetry with regard to the X and Y axes.

[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time as **Horizontal Mirror**, it sets a symmetry with regard to the X and Y axes.
[EINV] Invert	If selected, it inverts the execution of the workings, so the last becomes the first
[NOP] Element of reference for the setup	The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a working programmed before; in this case the field assigns the whole setup of all the generated profiles. (For further details, please read the manual of TpaCAD) If no NAME is assigned, the setup code by default is used, as set for the application face. In this case, a setup is added for the original profiles only without setup.

ADVANCED TECHNOLOGY DATA

[R] Fillet	It sets the radius of the junction radius inserted into the edges. The value set must be al least equal to the epsilon of coordinate resolution (as set in the TpaCAD configuration)
[TA] Apply to acute angles	If selected, this option enables the application of the fillet only to the edges within a right angle (<90°)
[TR] Apply only to vertices with arc	If selected, it enables the application of the fillet only to the vertices assigned between line-arc, arc-line, arc-arc. So, the selection excludes the situations assigned between line-line.

STOOL - CHAMFER PROFILE

Working for the programmed creation of a profile with chamfered edges.

It programs the creation of profiles with the application of a chamfer on the edge points to profiles called by name and programmed before the current working. The development of the working does not imply the original workings.
For further details please read the TpaCAD manual, chapter **Tools->Profile tools->Chamfer profile**

The parameters to define the working are:

IF (...)? (...)? (...)	Up to three terms of logic conditioning can be assigned ***IF (...)? node (...)? (...).*** The working is carried out only if the required condition is verified as true. Anyway, the condition is verified as true, if the corresponding parameters are not set. Up to **three terms** of logical conditioning can be assigned
[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: · **And** resolves TRUE value, if both terms are verified · **Or** solves a value as TRUE, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: · **And** solves a value as TRUE , if both terms are verified · **Or** solves a value as TRUE, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: **(e5) ? (e6)** with **[TST3]?** with[TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)

GEOMETRIC PARAMETERS

[X] X1 [Y] Y1 [Z] Z1	X, Y, Z application coordinates They are significant individually. The first working point is translated on the point. For non assigned coordinates, the translation can't be assigned, with respect to the original development of the workings
[HN] Workings	It lists the workings on which the code works: of the listed workings, only those that identify profiles are considered. It possible to open a window containing the list of all the Names (NAME field) assigned to the workings programmed before. A multiple selection is possible. In case of face-piece, only the Names corresponding to workings assigned on the same face of the STOOL are considered valid. To the same STOOL working a Name (NAME field) can be assigned: this one can be used to carry out a following code of the STOOL group
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values.
[A] Rotation angle	Angle of rotation, programmed in degrees.
[EMX] Horizontal mirror	Mirror parameter. If selected, it sets a specular setting around a vertical axis on the face plane. If selected at the same time as the **Vertical Mirror** parameter, it sets a symmetry with regard to the X and Y axes.

[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time as **Horizontal Mirror**, it sets a symmetry with regard to the X and Y axes.
[EINV] Invert	If selected, it inverts the execution of the workings, so the last becomes the first
[NOP] Element of reference for the setup	The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a working programmed before; in this case the field assigns the whole setup of all the generated profiles. (For further details, please read the manual of TpaCAD) If no NAME is assigned, the setup code by default is used, as set for the application face. In this case, a setup is added for the original profiles only without setup.

ADVANCED TECHNOLOGY DATA

[U] Chamfer	Length of the chamfer or length of the segment at the vertex according to the value set for the **Typology** parameter. The value set must be al least equal to the epsilon of coordinate resolution (as set in the TpaCAD configuration). We remind you that a chamfer can be applied only to situations of an edge assigned between line-line.
[TN] Typology	it assigns the kind of chamfer to be applied. **Chamfer**= the value assigned to the **Chamfer** parameter is the length of the chamfering segment. **Lines to vertex=** the value assigned to the **Chamfer** parameter is the length of the linear segments available on the two lines from the edge on which the chamfering is required.
[TA] Apply to acute angles	If selected, this option enables the application of the fillet only to the edges within a right angle (<90°)

STOOL - APPLY CONNECTORS

Working for the programmed creation of profiles with connectors or interruptions

It programs the creation of profiles for the application of connection or interruption points to profiles called by name and programmed before the current working. The development of the working does not imply the original workings.
For further details please read the TpaCAD manual, chapter **Tools->Constructions->Apply profile connections.**

The parameters to define the working are:

IF (...)? (...)? (...)	The execution of the working can be conditioned through the parameters of the IF (...)? (...)? (...) node. The working is carried out only if the required condition is verified as true. The condition is always verified as true, if the corresponding parameters are not set. Up to three terms of logic conditioning can be assigned
[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: (e1) ? (e2) with [TST1]? assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it resolves TRUE value, if both the terms are verified. • **Or**: it resolves TRUE value, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: (e3) ? (e4) with [TST2]? assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it resolves TRUE value, if both the terms are verified. • **Or**: it resolves TRUE value, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: (e5) ? (e6) with [TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)
GEOMETRIC PARAMETERS	
[X] X1 [Y] Y1 [Z] Z1	X, Y, Z application coordinates They are significant individually. The first working point is translated on the point. For non assigned coordinates, the translation can't be assigned, with respect to the original development of the workings
[HN] Workings	It lists the workings on which the code works: of the listed workings, only those that identify profiles are considered. A window containing the list of all the denominations (NAME field) assigned to the upstream-programmed workings is possible, with also a possible multiple selection. In case of face-piece, only the denominations to workings assigned on the same face of the STOOL are considered valid. To the same STOOL working a Name (NAME Field) can be assigned: so itself can be used to perform a following code of the STOOL group.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values.
[A] Rotation angle	Angle of rotation, programmed in degrees.
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a specular setting around the vertical axis on the face plane. If selected at the same time with **Vertical Mirror**, it sets a symmetry against X and Y axes
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time with **Horizontal Mirror**, it sets a symmetry against X and Y axes
[EINV] Invert	If selected, it inverts the execution of the workings: the last one becomes the first, ...The transform inverts also the tool correction settings (right or left) of each setup.

TECHNOLOGICAL PARAMETERS

[AI] Apply interruptions	Select to apply interruptions.
[AN] Number of connectors	it sets the number of the connectors to be distributed along the profile Values between 2 and 255 are accepted The real number of connectors distributed along each profile depends also on the total development of the same profile (total length and its fragmentation) and can be less than the value set.
[DN] Distance of succeeding connectors	It sets the linear distance of succeeding connectors and it is significant if it is greater than (epsilon*10.0). This setting is an alternative to **Number of connectors,** if the number of the connectors set is less than 2. If the **Number of connectors** exceeds 2, it supplements it usage:the distance set here can be recalculated in order to distribute at least the number of the connectors required. The minimum number of the distributed connectors is 2.
[AL] Length of the connectors	it sets the length of the connector (in the xy plane of the face) The value used is at least equal to the 2.0**epsilon* of coordinate resolution (as set in the TpaCAD configuration)
[AZ] Residual thickness	It sets the thickness that the tool leaves in the connector execution piece The value used is at least equal to the 2.0**epsilon* of coordinate resolution (as set in the TpaCAD configuration)
[AD] Tool compensation	Select to modify the actual length of the connector, taking into account the overall dimension of the tool. • **Unmanaged**: it does not change the length of the connector • **Internal Compensation**: the connector created is narrower than the tool diameter • **External Compensation**: the connector created is wider than the tool diameter

STOOL - Z FEEDS

Working for programmed creation of profiles with progressive feeds in the depth plane on a development axis (feed depth).

It programs the creation of profiles with depth feeds for profiles called by name and programmed before the current working. The development of the working does not imply the original workings.
For further details please read the TpaCAD manual, chapter **Tools->Constructions->Apply Z feed**

The parameters to define the working are:

IF (...)? (...)? (...)	The execution of the working can be conditioned through the parameters of the IF (...)? (...)? (...) node. The working is carried out only if the required condition is verified as true. The condition is always verified as true, if the corresponding parameters are not set. Up to three terms of logic conditioning can be assigned
[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: · **And**: it resolves TRUE value, if both the terms are verified. · **Or**: it resolves TRUE value, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: · **And**: it resolves TRUE value, if both the terms are verified. · **Or**: it resolves TRUE value, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: **(e5) ? (e6)** with**[TST3]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
GEOMETRIC PARAMETERS	
[X] X1 [Y] Y1 [Z] Z1	X, Y, Z application coordinates They are significant individually. The first working point is translated on the point. For non assigned coordinates, the translation can't be assigned, with respect to the original development of the workings
[HN] Workings	It lists the workings on which the code works: of the listed workings, only those that identify profiles are considered. A window containing the list of all the denominations (NAME field) assigned to the upstream-programmed workings is possible, with also a possible multiple selection. In case of face-piece, only the denominations to workings assigned on the same face of the STOOL are considered valid. To the same STOOL working a Name (NAME Field) can be assigned: so itself can be used to perform a following code of the STOOL group.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values.
[A] Rotation angle	Angle of rotation, programmed in degrees.
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a specular setting around a vertical axis on the face plane. If selected at the same time with **Vertical Mirror**, it sets a symmetry against X and Y axes
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around a horizontal axis on the face plane. If selected at the same time with **Horizontal Mirror**, it sets a symmetry against X and Y axes

[EINV] Invert	If selected, it inverts the execution of the workings: the last one becomes the first, ...The transform inverts also the tool correction settings (right or left) of each setup.
[NOP] Element of reference for the setup	The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a working programmed before; in this case the field assigns the whole setup of all the generated profiles. (For further details, please read the manual of TpaCAD) If no NAME is assigned, the setup code by default is used, as set for the application face. In this case, a setup is added for the original profiles only without setup.

TECHNOLOGICAL PARAMETERS

[AX] Development axis	It selects the development axis of the passes on one of the three coordinated axes of the face (Z, X, Y)
[RDN] It assigns the number of passes	If selected, this option requires the assignment of the number of passes. Otherwise, the number of the passes is automatically determined by the value of the final **[RZ] Final position** required.
[RZ] Final position	It sets the final required depth along the development axis. The assignment is significant and obligatory, if the option Assign the number of passes is not selected.
[RNN] Number of passes	It assign the required number of passes. The assignment is significant, if the option Assign the number of passes is selected. Values between 1 and 1000 are accepted
[RZL] Z feed step	It sets the Z feed step of the depth applied to each development. The value to be set must be at least equal to the 10.0*_epsilon_* of coordinate resolution (as set in the TpaCAD configuration) Assigning the final depth, the setting is significant without sign: the procedure applies the (+/-) feed necessary to reach the final depth. The setting instead is significant with the sign in case of assignment of the number of passes.
[DNR] Manages the inversion into closed profiles	If selected, it manages the inversion at each pass of the execution of those profiles, that are geometrically closed In case of non-closed profile: the inversion of the profile is automatically carried out.
[DSIDE] Change compensation side	If selected, it manages the side change of the tool compensation and it is applied to the profiles that are carried out with inversion of the segment. The setting is significant, if the development is along the Z axis. This option may be not available, according to the configuration of TpaCAD.

STOOL - PROFILE REPETITION

Working for the programmed creation of profiles with progressive repetitions on the development axis of the original profile.

It programs the creation of profiles with repetition along the axis of the original development and applies to profiles called by name and programmed before the current working. The development of the working does not imply the original workings.
For further details please read the TpaCAD manual, chapter **Tools->Constructions->Apply repetition of profile.**

The parameters to define the working are:

IF (...)? (...)? (...)	Up to three terms of logic conditioning can be assigned ***IF (...)? node (...)? (...).*** The working is carried out only if the required condition is verified as true. Anyway, the condition is verified as true, if the corresponding parameters are not set. Up to **three terms** of logical conditioning can be assigned
[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** when **[TST1]?** is assigned among three conditions of relation: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the two first comparison terms: • **And** resolves TRUE value, if both terms are verified • **Or** resolves TRUE value, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And** resolves TRUE value, if both terms are verified • **Or** resolves TRUE value, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: **(e5) ? (e6)** with **[TST3]?** with[TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)

GEOMETRIC PARAMETERS

[X] X1 [Y] Y1 [Z] Z1	X, Y, Z application coordinates They are significant individually. The first working point is translated on the point. For non assigned coordinates, the translation can't be assigned, with respect to the original development of the workings
[HN] Workings	It lists the workings on which the code works: of the listed workings, only those that identify profiles are considered. It possible to open a window containing the list of all the Names (NAME field) assigned to the workings programmed before. A multiple selection is possible. In case of face-piece, only the Names corresponding to workings assigned on the same face of the STOOL are considered valid. To the same STOOL working a Name (NAME field) can be assigned: this one can be used to carry out a following code of the STOOL group
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values.
[A] Rotation angle	Angle of rotation, programmed in degrees.
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a specular setting around a vertical axis on the face plane. If selected at the same time with

	Vertical Mirror, it sets a symmetry against X and Y axes
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time with **Horizontal Mirror**, it sets a symmetry against X and Y axes
[EINV] Invert	If selected, it inverts the execution of the workings: the last one becomes the first, ...The transform inverts also the tool correction settings (right or left) of each setup.
[NOP] Element of reference for the setup	The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a working programmed before; in this case the field assigns the whole setup of all the generated profiles. (For further details, please read the manual of TpaCAD) If no NAME is assigned, the setup code by default is used, as set for the application face. In this case, a setup is added for the original profiles only without setup.
TECHNOLOGICAL PARAMETERS	
[AX] Development axis	It selects the development axis of the passes on one of the three coordinated axes of the face (Z, X, Y). The application of the programmed tool with adjustment of the original profile depends on the check on the original profile, with relation to the selected **Development axis** : • If Z axis: the profile must be closed on the XY plane and develop a modification along Z between the beginning and the end. • If X axis: the profile must be closed on the YZ plane and develop a modification along X between the beginning and the end. • If Y axis: the profile must be closed on the XZ plane and develop a modification along Y between the beginning and the end.
[RDN] Assigns the number of passes	If selected, this option requires the assignment of the number of passes. Otherwise: **[RZ] Finale position** it assigns the final depth of the execution of the last feed.
[RZ] Final position	It sets the final required depth. The assignment is significant and obligatory, if the option **Assign the number of passes** is not selected
[RNN] Number of passes	It assign the required number of passes. The assignment is significant, if the option **Assign the number of passes** is selected. Values between 1 and 1000 are accepted
[DNR] End with a pass with a constant depth	If selected, it ends the modification of the profile by adding a pass with a constant depth. If you set a null **Number of passes** or a **Final position** that is not distinguished from the position of the final development of the original profile, only the constant depth pass is added to the profile. The execution of the final pass always depends on the check on the original profile, with relation to the selected **Development axis** : • if Z axis: it must not develop arches in a plane different from xy • if X axis: it must not develop arches in a plane different from yz • if Y axis: it must not develop arches in a plane different from xz.

STOOL - FEED IN Z + CONNECTIONS

Working for the programmed creation of profiles with progressive feeds on the depth axis and final pass with connections.

It programs the creation of profiles with feed in depth and possible final pass with connections. It applies to the profile called by name and programmed before the current working. The development of the working does not imply the original workings.
The execution of the final pass, generating connections, is optional.
If generating connections is not enabled, the workings only executes a *Feed in depth* to the*Final position* of the depth set Otherwise:

- The *Feed in depth* is executed at the depth position that corresponds to the *Residual thickness* set
- At the end a pass is generated for the *Final position* of the depth set and connections in correspondence to the *Residual thickness* set.

This working can work on one only profile and it does not manage the side change of tool compensation.

For further details, please read the manual of TpaCAD **chapters Tools->Constructions->Apply feed in depth** and Tools->Constructions->Apply connections to the profile.

The parameters to define the working are:

IF (...)? (...)? (...)	Up to three terms of logic conditioning can be assigned ***IF (...)? node (...)? (...).*** The working is carried out only if the required condition is verified as true. Anyway, the condition is verified as true, if the corresponding parameters are not set. Up to **three terms** of logical conditioning can be assigned
[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And** solves a value as TRUE , if both terms are verified • **Or** solves a value as TRUE, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And** solves a value as TRUE , if both terms are verified • **Or** solves a value as TRUE, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: **(e5) ? (e6)** with **[TST3]?** with[TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)
GEOMETRIC PARAMETERS	
[X] X1 [Y] Y1 [Z] Z1	X, Y, Z application coordinates They are significant individually. The first working point is translated on the point. For unassigned coordinates, the translation cannot be assigned, with respect to the original development of the workings
[HN] Geometric profile	It sets the NAME of the profile to which apply the construction. It is possible to indicate one profile only. If the profile is closed, a path is created which goes in the same direction, the same as the original profile. If the profile is open, the path reverses the direction for each feed in depth. Any variations in depth of the original profile are reaffirmed at every pass of the generated path.
[EG] Relative	If selected, it shows that the positions of the axes are assigned in relative.
[A] Rotation angle	Angle of rotation, programmed in degrees.
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a specular setting around a vertical axis on the face plane. If selected at the same time as the **Vertical Mirror** parameter, it sets a symmetry with regard to the X and Y axes.

[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time as **Horizontal Mirror**, it sets a symmetry with regard to the X and Y axes.
[EINV] Invert	If selected, it reverses the execution of the workings: the last one becomes the first, ...The transform reverses also the tool correction settings (right or left) of each setup.
[NOP] Element of reference for the setup	The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a working programmed before; in this case the field assigns the whole setup of all the generated profiles. (For further details, please read the manual of TpaCAD) If no NAME is assigned, the setup code by default is used, as set for the application face. In this case, a setup is added for the original profiles only without setup.
TECHNOLOGICAL PARAMETERS OF FEED IN DEPTH	
[RZ] Final position	It sets the final required depth along the depth axis. This assignment is significant and it always obligatory.
[RDN] It assigns the number of passages	If selected, this option requires the assignment of the number of passes. Otherwise, the number of the passages is automatically determined by the value of the final required [RZ] Z **Final position**)
[RNN] Number of passes	It assign the required number of passes. The assignment is significant, if the option ***Assign the number of passes*** is selected. Values between 1 and 1000 are accepted
[RZL] Feed pitch	It sets the Z feed pitch of the depth applied to each development. The value to be set must be at least equal to the 10.0*_epsilon_* of coordinate resolution (as set in the TpaCAD configuration) The setting is significant without a sign: the procedure applies the (+/-) feed necessary to reach the final depth.
TECHNOLOGICAL PARAMETERS FOR CONNECTORS	
[AI] Apply connectors	Select to enable the execution of the final pass with the generation of connectors.
[AN] Number of connectors	it sets the number of the connectors to be distributed along the profile Values between 2 and 255 are accepted. The real number of connectors distributed along each profile depends also on the total development of the same profile (total length and its fragmentation) and can be less than the value set.
[DN] Distance of succeeding connectors	It sets the linear distance of succeeding connectors and the value is significant if greater than (epsilon*10.0). This setting offers an alternative option to **Number of connectors** , if the number set for the connectors is less than 2. If **Number of connectors** is greater than 2, it completes his use: the distance set here can be recalculated in order to distribute at least the number of the connectors required. Minimum number of distributed connectors: 2
[AL] Length of the connectors	it sets the length of the connector (in the xy plane of the face) The value used is at least equal to the 2.0*_epsilon_* of coordinate resolution (as set in the TpaCAD configuration)
[AZ] Residual thickness	sets the thickness that the tool leaves in the connector execution piece The value used is at least equal to the 2.0*_epsilon_* of coordinate resolution (as set in the TpaCAD configuration)
[AD] Tool compensation	Select to modify the actual length of the connector, taking into account the overall dimension of the tool. • **Unmanaged** : it does not change the length of the connector • **Internal compensation** : the connector is generated narrower than the tool diameter • **External compensation** : the connector is generated enlarged according to the tool diameter .

STOOL - LINEARIZE IN Z

Working for programmed creation of profiles with linearized variation of the depth

It programs the creation of profiles for the linearization of depth for profiles called by name and programmed before the current working. The development of the working does not imply the original workings.
For further details please read the TpaCAD manual, chapter **Tools->Profile tools->Linearize Z.**

The parameters to define the working are:

IF (...)? (...)? (...)	Up to three terms of logic conditioning can be assigned IF (...)? (...)? (...) node. The working is carried out only if the required condition is verified as true. The condition is always verified as true, if the corresponding parameters are not set. Up to **three terms** of logical conditioning can be assigned
[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it resolves TRUE value, if both the terms are verified. • **Or**: it resolves TRUE value, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it resolves TRUE value, if both the terms are verified. • **Or**: it resolves TRUE value, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: **(e5) ? (e6)** with **[TST3]?** with [TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)

GEOMETRIC PARAMETERS

[X] X1 [Y] Y1 [Z] Z1	X, Y, Z application coordinates They are significant individually. The first working point is translated on the point. For non assigned coordinates, the translation can't be assigned, with respect to the original development of the workings
[HN] Workings	It lists the workings on which the code works: of the listed workings, only those that identify profiles are considered. It possible to open a window containing the list of all the Names (NAME field) assigned to the workings programmed before. A multiple selection is possible. In case of face-piece, only the Names corresponding to workings assigned on the same face of the STOOL are considered valid. To the same STOOL working a Name (NAME field) can be assigned: this one can be used to carry out a following code of the STOOL group
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values.
[A] Rotation angle	Angle of rotation, programmed in degrees.
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a specular setting around a vertical axis on the face plane. If selected at the same time with **Vertical**

	Mirror, it sets a symmetry against X and Y axes
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time with **Horizontal Mirror**, it sets a symmetry against X and Y axes
[EINV] Invert	If selected, it inverts the execution of the workings, so the last becomes the first The transform inverts also the tool compensation settings (right or left) of each setup.
[NOP] Element of reference for the setup	The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a working programmed before; in this case the field assigns the whole setup of all the generated profiles. (For further details, please read the manual of TpaCAD) If no NAME is assigned, the setup code by default is used, as set for the application face. In this case, a setup is added for the original profiles only without setup.

TECHNOLOGICAL PARAMETERS

[DLZ] It sets the depths	Select to enable the set of the extreme depth of each profile. If the field is not selected, the linearization occurs by keeping unchanged the extreme depths programmed for the original profiles.
[LZ1] Initial Z	It sets the initial depth (significant if **Set the depth** is selected).
[LZ2] Final Z	It sets the final depth (significant if **Set the depth** is selected). If the field is not set, the value of the ***initial Z*** is applied: in this case each profile is entirely brought to the same depth coordinate.

STOOL - FRAGMENT AND LINEARIZE

Working for the programmed creation of fragmented and linearized profiles

It programs the creation of profiles for the fragmentation and the linearization of profiles called by name and programmed before the current working. The development of the working does not imply the original workings.
For further details please read the TpaCAD manual, chapter **Tools->Profile tools->Fragment profile.**

The parameters to define the working are:

IF (...)? (...)? (...)	The execution of the working can be conditioned through the parameters of the IF (...)? (...)? (...) node. The working is carried out only if the required condition is verified as true. The condition is always verified as true, if the corresponding parameters are not set. Up to three terms of logic conditioning can be assigned
[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it resolves TRUE value, if both the terms are verified. • **Or**: it resolves TRUE value, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it resolves TRUE value, if both the terms are verified • **Or**: it resolves TRUE value, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: **(e5) ? (e6)** with**[TST3]?** assigned among six relation conditions: (<,<=,>,>=,=,#)

GEOMETRIC PARAMETERS

[X] X1 [Y] Y1 [Z] Z1	X, Y, Z application coordinates They are significant individually. The first working point is translated on the point. For non assigned coordinates, the translation can't be assigned, with respect to the original development of the workings
[HN] Workings	It lists the workings on which the code works: of the listed workings, only those that identify profiles are considered. A window containing the list of all the denominations (NAME field) assigned to the upstream-programmed workings is possible, with also a possible multiple selection. In case of face-piece, only the denominations to workings assigned on the same face of the STOOL are considered valid. To the same STOOL working a Name (NAME Field) can be assigned: so itself can be used to perform a following code of the STOOL group.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values.
[A] Rotation angle	Angle of rotation, programmed in degrees.
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a specular setting around the vertical axis on the face plane. If selected at the same time with **Vertical Mirror**, it sets a symmetry against X and Y axes
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time with **Horizontal Mirror**, it sets a symmetry against X and Y axes

[EINV] Invert	If selected, it inverts the execution of the workings: the last one becomes the first, ...The transform inverts also the tool correction settings (right or left) of each setup.
[NOP] Element of reference for the setup	The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a working programmed before; in this case the field assigns the whole setup of all the generated profiles. (For further details, please read the manual of TpaCAD) If no NAME is assigned, the setup code by default is used, as set for the application face. In this case, a setup is added for the original profiles only without setup.

TECHNOLOGICAL PARAMETERS

Maximum length of the segments	It sets the maximum lenght in which the profile (significant in absolute value) is set. The value to be set must be at least equal to the 2.0*epsilon* of coordinate resolution (as set in the TpaCAD configuration)
[DEC] Apply chordal error	Select for the fractioning of the arcs assigning the ***Chordal Error*** set. In this case the Maximum length of the segments is applied only to the splitting up of the linear segments
[EC] Chordal error	Chordal error: significant in absolute value The value to be set must be at least equal to the 5.0*epsilon* of coordinate resolution (as set in the TpaCAD configuration)
[DRES] Allocate residuals	Select to distribute the residual part of the fragmentation of each single profile segment. Example: if a linear segment is 52 mm long and a ***max. length of the segment is*** equal to 10 mm: • if the option is not selected, the linear segment is split up into 6 segments: 5 pcs 10 mm long and 1 (the last) 2 mm long. • If the option is not selected, the linear segment is split up into 6 segments, all with the same length. La length of each segment is recalculated equal to (52/6) mm
[DA] Fragment arcs only	Select to split the curved segments only
[DL] Linearize arcs	Select to convert the split arcs into linear segments
[DZ] Apply in 3d	the fragmentation of the segments is applied also on the depth component.

STOOL - CONNECT PROFILES

Working for programmed creation of profiles for the union of specific profile

It programs the creation of profiles for the union of specific profiles called by name and programmed before the current working. The development of the working does not imply the original workings.
For further details please read the TpaCAD manual, chapter **Tools->Profile tools->Join profiles**

The parameters to be used are the following ones:

IF (...)? (...)? (...)	Up to three terms of logic conditioning can be assigned IF (...)? (...)? (...) node. The working is carried out only if the required condition is verified as true. The condition is always verified as true, if the corresponding parameters are not set. Up to three terms of **logic** conditioning can be assigned
[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it resolves TRUE value, if both the terms are verified. • **Or**: it resolves TRUE value, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it resolves TRUE value, if both the terms are verified. • **Or**: it resolves TRUE value, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: **(e5) ? (e6)** with**[TST3]?** assigned among six relation conditions: (<,<=,>,>=,=,#)

GEOMETRIC PARAMETERS

[X] X1 [Y] Y1 [Z] Z1	X, Y, Z application coordinates They are significant individually. The first working point is translated on the point. For non assigned coordinates, the translation can't be assigned, with respect to the original development of the workings
[HN] Workings	It lists the workings on which the code works: of the listed workings, only those that identify profiles are considered. A window containing the list of all the denominations (NAME field) assigned to the upstream-programmed workings is possible, with also a possible multiple selection. In case of face-piece, only the denominations to workings assigned on the same face of the STOOL are considered valid. To the same STOOL working a Name (NAME Field) can be assigned: so itself can be used to perform a following code of the STOOL group.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values.
[A] Rotation angle	Angle of rotation, programmed in degrees.
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a specular setting around the vertical axis on the face plane. If selected at the same time with

	Vertical Mirror, it sets a symmetry against X and Y axes
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time with **Horizontal Mirror**, it sets a symmetry against X and Y axes
[EINV] Invert	If selected, it inverts the execution of the workings: the last one becomes the first, ...The transform inverts also the tool correction settings (right or left) of each setup.
[NOP] Element of reference for the setup	The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a working programmed before; in this case the field assigns the whole setup of all the generated profiles. (For further details, please read the manual of TpaCAD) If no NAME is assigned, the setup code by default is used, as set for the application face. In this case, a setup is added for the original profiles only without setup.

TECHNOLOGICAL PARAMETERS

[DN]Shift profiles	If selected, it translates the profiles so that the initial point of the following profile coincide with the final point of the previous profile, otherwise it connects the profiles with a linear segment. The union of the profiles occurs without changing the order and the original direction.
[DZ] Tipology	In the case where the profiles are jointed by linear segment, the selection specifies theyr development typology: • **Unique segment**: the segment is unique and cumulates the displacements required in all the coordinated axes • **Dxy + Dz**: the segment is divided in two and first it performs the displacement in xy plane, then in x plane • **Dxy + Dz**: the segment is divided in two and first it performs the displacement in z plane, then in xy plane

STOOL - ROTATION ON CARTESIAN PLANE

Working for programmed creation of profiles for rotation on Cartesian plane

It programs the creation of profiles for the rotation on specific profiles plane called with name and programmed at the beginning of the current working. The development of the working does not imply the original workings.
For further details see the TpaCAD manual, chapter **Tools->Constructions->Profile rotation on Cartesian plane.**

The parameters to define the working are:

IF (...)? (...)? (...)	The run of the working can be conditioned through the parameters of the IF (...)? (...)? (...) node. The working is carried out only if the required condition is checked as true. The condition is checked as true anyway if the corresponding parameters are not set. Up to three **terms of logic conditioning** can be assigned
[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned through six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it solves TRUE value if both the terms are verified. • **Or**: it solves TRUE value if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it solves TRUE value if both the terms are verified. • **Or**: it solves TRUE value if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: **(e5) ? (e6)** with **[TST3]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
GEOMETRIC PARAMETERS	
[X] X1 [Y] Y1 [Z] Z1	X, Y, Z application coordinates They are significant singularly. The first working point is translated on the point. For non assigned coordinates, the translation can't be assigned, with respect to the original development of the workings
[HN] Workings	It lists the workings on which the code works: of the listed workings, only those that identify profiles are considered. A window containing the list of all the denominations (NAME field) assigned to the upstream-programmed workings is possible, with also a possible multiple selection. In case of face-piece, only the denominations to workings assigned on the same face of the STOOL are considered valid. To the same STOOL working a Name (NAME Field) can be assigned: so itself can be used to perform a following code of the STOOL group.
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values.
[A] Rotation angle	Angle of rotation, programmed in degrees.
[EMX] Horizontal mirror	Mirror parameter. If selected, it sets a specular setting around the vertical axis on the face plane. If selected at the same time with **Vertical Mirror**, it sets a symmetry against X and Y axes
[EMY] Vertical Mirror	Mirror parameter. If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time with **Horizontal Mirror**, it sets a symmetry against X and Y axes

[EINV] Invert
If selected, it inverts the execution of the workings: the last one becomes the first, ...The transform inverts also the tool correction settings (right or left) of each setup.

[NOP] Element of reference for the setup
The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a working programmed before; in this case the field assigns the whole setup of all the generated profiles. (For further details, please read the manual of TpaCAD)
If no NAME is assigned, the setup code by default is used, as set for the application face. In this case, a setup is added for the original profiles only without setup.

TECHNOLOGICAL PARAMETERS

[DP] keep one only rotation point
The selection is effective only in case of application on more than one profile: select the entry to assign only one rotation point for all profiles, coinciding with the start point of the first profile that is rotated.
If the entry is not selected: each profile is rotated around its start point

[DPL] Plane
The selection is on two values:
- **Zx**: the rotation is around the X face axis
- **Yz**: the rotation is around the Y face axis.

How the coordinates of each segment have been changed:

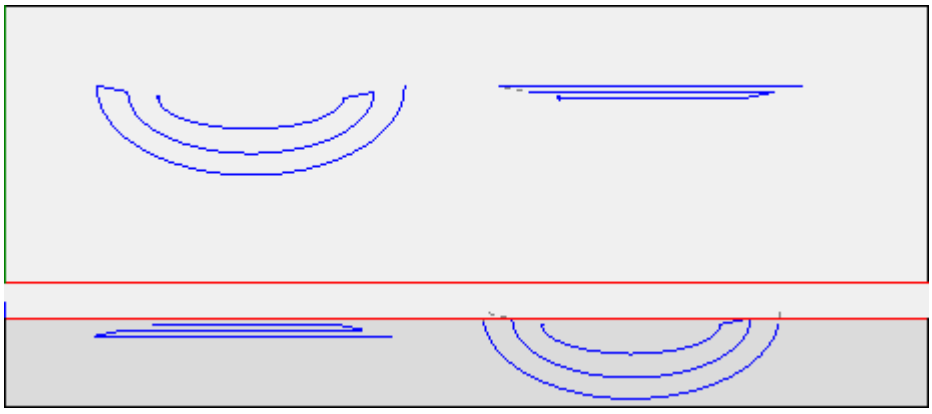
the coordinates along the axis	if Zx plane	if Yz plane
X	remain assigned in X	reported in Z
Y	reported in Z	remain assigned in X
Z	reported in Y	reported in X

[DAX] Sign variation on rotated axis
Select among the two proposed entries, to show the exchange mode of the variations of the coordinates interested in the exchange:
- **Concordant**: the variations are exchanged maintaining the sign;
- **Discordant**: the variations are exchanged inverting the sign.

The application of the selection considered the schedule mode of the depth axis. For example, with rotation plane Zx: positive variations along Y imply variations along Z axis.

EXAMPLE:

The working can rotate an emptying profile on two planes. The picture proposes:
· the beginning of an elliptic emptying, programmed on the face plane (left profile)
· on the right side, the profile is rotated on the Zx plane.
Above it's shown a 2D face view; below it's shown a front face view (depth axis is vertical displayed).



STOOL - VALIDATE THE PROFILE

Working for the programmed generation of (closed) profiles by moving the setup in neutral points.

It programs the creation of closed profiles where the initial point is moved in a neutral position of profiles called by name and programmed before the current working. The development of the working does not imply the original workings.
For further details please read the TpaCAD manual, chapter **Tools->Overall Program tools->Validate the profiles**

The parameters to define the working are:

IF (...)? (...)? (...)	Up to three terms of logic conditioning can be assigned ***IF (...)? node (...)? (...).*** The working is carried out only if the required condition is verified as true. Anyway, the condition is verified as true, if the corresponding parameters are not set. Up to **three terms** of logical conditioning can be assigned.
[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And** solves a value as TRUE , if both terms are verified • **Or** solves a value as TRUE, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And** solves a value as TRUE , if both terms are verified • **Or** solves a value as TRUE, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: **(e5) ? (e6)** with **[TST3]?** with[TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)

GEOMETRIC PARAMETERS

[X] X1 [Y] Y1 [Z] Z1	X, Y, Z application coordinates They are significant individually. The first working point is translated on the point. For non assigned coordinates, the translation can't be assigned, with respect to the original development of the workings
[HN] Workings	It lists the workings on which the code works: of the listed workings, only those that identify profiles are considered. It possible to open a window containing the list of all the Names (NAME field) assigned to the workings programmed before. A multiple selection is possible. In case of face-piece, only the Names corresponding to workings assigned on the same face of the STOOL are considered valid. To the same STOOL working a Name (NAME field) can be assigned: this one can be used to carry out a following code of the STOOL group

[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values.
[A] Rotation angle	Angle of rotation, programmed in degrees.
[EMX] Horizontal mirror	Mirror parameter. If selected, it sets a specular setting around a vertical axis on the face plane. If selected at the same time as the **Vertical Mirror** parameter, it sets a symmetry with regard to the X and Y axes.
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time as **Horizontal Mirror**, it sets a symmetry with regard to the X and Y axes.
[EINV] Invert	If selected, it inverts the execution of the workings: the last one becomes the first, ...The transform inverts also the tool correction settings (right or left) of each setup.
[NOP] Element of reference for the setup	The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a working programmed before; in this case the field assigns the whole setup of all the generated profiles. (For further details, please read the manual of TpaCAD) If no NAME is assigned, the setup code by default is used, as set for the application face. In this case, a setup is added for the original profiles only without setup.

TECHNOLOGICAL PARAMETERS

[AD] Tool compensation	If selected, in the evaluation of the minimum length of each individual segment of profile, the overall dimensions of the tool is taken into account. In this case, the minimum length required is equal to the diameter *3.0.
[AL] Privilege the linear segments	Select to move the point of setup on a linear segment, if it is possible. If not, the setup is moved on the first segment, line or arc, that have the minimum length.
[AG] Tolerance angle	It sets the angular value of tolerance to recognize the condition of continuity on the original setup. It sets a value not exceeding 45° (if the value set is null, it evaluates the continuity of tangency with a tolerance of 0.001 °).
[AM] Minimum length of the segments	It sets a minimum length for the choice of the profile segment on which the setup should be moved.

INSERTION

Insertion working

It programs an insertion working

The parameters to be used are as follows:

GEOMETRIC PARAMETERS

[X] Qx [Y] Qy [Z] Qz	Coordinates of the application
[EG] Relative	If selected, it indicates that the coordinates of all the enabled axes are assigned in relative values. A dimension as absolute can be forced by entering **"a;"**before the same dimension. For instance, if a Y coordinate relative to the previous point but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate = a;50 shall be set.

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[T] Tool	Tool number
[TP] Tool typology	Tool typology.
[F] Speed entry	Tool entry speed

PLATE

Insertion working

It programs the insertion of a plate

The parameters to be used are as follows:

GEOMETRIC PARAMETERS

[X] Qx [Y] Qy [Z] Qz	Coordinates of the application
[EG] Relative	If selected, it indicates that the coordinates of all the enabled axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"**before the same dimension. For instance, if a Y coordinate relative to the previous point but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate = a;50 shall be set.

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[T] Tool	Tool number
[TP] Tool typology	Tool typology
[F] Speed entry	Tool entry speed

BUSH

Insertion working

It programs the insertion of a bush

The parameters to be used are as follows:

GEOMETRIC PARAMETERS

[X] Qx [Y] Qy [Z] Qz	Coordinates of the application
[EG] Relative	If selected, it indicates that the coordinates of all the enabled axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"**before the same dimension. For instance, if a Y coordinate relative to the previous point but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate = a;50 shall be set.

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[T] Tool	Tool number
[F] Entry speed	Tool entry speed

HINGE

Insertion working

It programs the insertion of a hinge

The parameters to be used are as follows:

GEOMETRIC PARAMETERS

[X] Qx [Y] Qy [Z] Qz	Coordinate of the application
[EG] Relative	If selected, it indicates that the coordinates of all the enabled axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"**before the same coordinate. For instance, if a Y coordinate relative to the previous point but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate = a;50 shall be set.

TECHNOLOGICAL PARAMETERS

[TMC]Machine	Machine number
[TR] Group	Group number on the machine
[T] Tool	Tool number
[F] Entry speed	Tool entry speed

PLANE SUPPORT

Insertion working

It programs the insertion of a plane support

The parameters to be used are as follows:

GEOMETRIC PARAMETERS

[X] Qx [Y] Qy [Z] Qz	Coordinate of the application
[EG] Relative	If selected, it indicates that the coordinates of all the enabled axes are assigned in relative values. A dimension as absolute can be forced by entering **"a;"**before the same dimension. For instance, if a Y coordinate relative to the previous point but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate = a;50 shall be set.

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[T] Tool	Tool number
[F] Entry speed	Tool entry speed

PIN

Insertion working

It programs the insertion of a pin

The parameters to be used are as follows:

GEOMETRIC PARAMETERS

[X] Qx [Y] Qy [Z] Qz	Coordinates of the application
[EG] Relative	If selected, it indicates that the coordinates of all the enabled axes are assigned in relative values. A dimension as absolute can be forced by entering **"a;"**before the same dimension. For instance, if a Y coordinate relative to the previous point but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate = a;50 shall be set.

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[T] Tool	Tool number
[F] Entry speed	Tool entry speed

GLUE

Insertion working

It programs the insertion of glue

The parameters to be used are as follows:

GEOMETRIC PARAMETERS

[X] Qx [Y] Qy [Z] Qz	Application of coordinates
[L] Length (glue)	Length of the segment in which the glue has to be inserted
[Cn] Tn Glue dispenser	It enables or disables the tool for the glue insertion
[EG] Relative	If selected, it indicates that the coordinates of all the enabled axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"**before the same dimension. For instance, if a Y coordinate relative to the previous point but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate = a;50 shall be set.

TECHNOLOGICAL PARAMETERS

[TMC]Machine	Machine number
[TR] Group	Group number on the machine
[T] Tool	Tool number
[F] Entry speed	Tool entry speed

DRAWER RAIL

Insertion working

It programs the insertion of a drawer rail

The parameters to be used are as follows:

GEOMETRIC PARAMETERS

[X] Qx [Y] Qy [Z] Qz	Coordinate of the application
[DN] Rail side	Side of the application of the rail: **Right** or **Left**.
[EG] Relative	If selected, it indicates that the coordinates of all the enabled axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"** before the same dimension. For instance, if a Y coordinate relative to the previous point but with absolute X coordinate = 50 has to be programmed, the relative flag shall be enabled and X coordinate = a;50 shall be set.

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[T] Tool	Tool number
[F] Entry speed	Tool entry speed

IF

Logical instruction for opening of IF cycle

The **IF** instruction sets forth a conditioning formula which, if it results
- **true**, determines the execution of one or more workings specified after IF
- **false**, determines the non-execution of the concerned workings

The **ELSE-IF**/ **ELSE**/ **ENDIF**instruction marks the workings conditioned by **IF**.
An **IF** instruction must always be closed by an **ENDIF** instruction, unless the **open IF flag option is selected.**
Between an **IF** and an **ENDIF** instruction you can interpose an **ELSE** instruction which denies the condition assessed by **IF.**

The **IF...ELSE...ENDIF** form can be paraphrased as: "if the condition expressed on **IF** is valid, perform the workings specified after **IF**; otherwise, perform the workings specified after **ELSE**".

A more complex form can be expressed as **IF... ELSEIF.. ELSEIF.. ELSE.. ENDIF** can assign conditions which may alternate with each other: the first condition verified as true resolves the alternative form, where no condition is possibly verified. If the complex form ends with an **ELSE** branch, this one is verified as alternative by default, if no condition before is verified.

For IF up to **three logical conditioning terms can be assigned.**

Parameters:
IF (...)? (...)? (...)

[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** **[TST1]?** is assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two comparison terms • **And** resolves the value TRUE, if both the terms are verified • **Or** revolves the value TRUE, if one term at least is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** **[TST2]?** is assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the logical condition applied to the first two terms and the third comparison term: • **And** resolves the value TRUE, if both the terms are verified • **Or** revolves the value TRUE, if one term at least is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: **(e5) ? (e6)** **[TST3]?** is assigned among six relation conditions: (<,<=,>,>=,=,#)
[OPEN] IF open	If selected, the IF flag is not closed by an ENDIF.

No, one, two or three conditioning terms can be set.
If no term is set, IF results to be always verified. In this case, if "IF" assigns also an ELSE, the ELSE proposition shall be never verified. In general, the managed logical formalism for an IF cycle is represented as follows:

IF (((...)) ? (..)) ? (...))
..
.. istructions carried out in case of condition on IF = True
..
ELSE-IF (((...)) ? (..)) ? (...))
..
.. instructions carried out if the condition on IF = False and condition of ELSE-IF = True
..
ELSE-IF (((...)) ? (..)) ? (...))
..

.. instructions carried out if the condition on previous IF and ELSE-IF = False and conditions on ELSE-IF = True
..
ELSE
..
.. instructions carried out if the conditions on IF an all the ELSE-IF = False

Case of **IF not closed by ENDIF (open IF):** the managed logical formalism can be represented as follows:

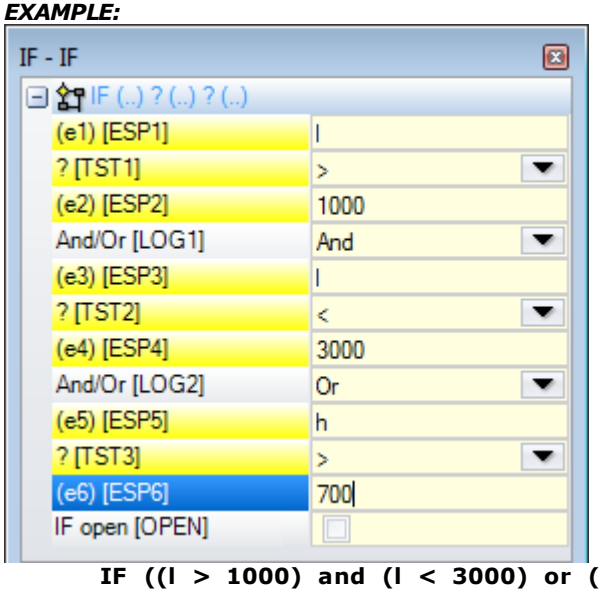
IF (((...) ? (...) ? (...)); open If =(selected)
single conditioned instruction

In this case, IF conditions only the working that follows, which cannot be

- a profile or setup working
- a logical instruction (IF, ELSE-IF, ELSE, ENDIF) or an Application point (in subroutine)

Should the working that follows an open IF be not valid, an error is reported in the phase of application of the logical conditions.
For further details please read the TpaCAD manual, chapter **The workings->Logical Instructions**

EXAMPLE:



IF ((l > 1000) and (l < 3000) or (h > 700))

with: l=2000, h=500

(l > 1000) TRUE
(l < 3000) TRUE
(h > 700) FALSE

=> it validates: (TRUE and TRUE) or FALSE = TRUE or FALSE = TRUE.

The *minimum form* with non-empty assignments is on one only term.
EXAMPLE:
IF (r5)
validates: TRUE if r5#0; FALSE if r5=0.

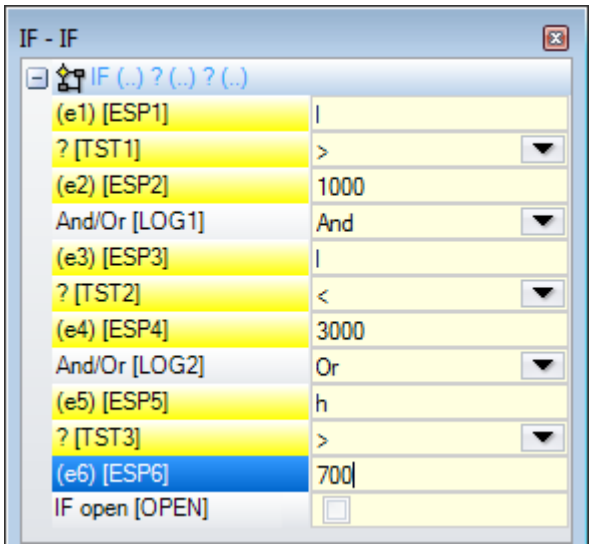
Conditions of comparison of numbers (equality,....) are always carried out by means of an *epsilon*=0.001. Values that deviate for less than epsilon are taken as equal.

ENDIF

Logical instruction for closure of IF cycle

It programs the closure of a block of instructions conditioned by an IF instruction.
The instruction cannot close an IF, which has been declared open and it does not require any assignments.
Fur further details please read the TpaCAD manual, chapter **Workings->Logical Instructions**

EXAMPLE:




```
IF ((I > 1000) and (I < 3000) or (h > 700))
        ... instruction ...
        ... instruction ...
ENDIF
```

ELSE

Logical instruction for the branching of IF cycle

It programs an alternative branch by default for the execution of an **IF cycle**.
This instruction cannot close an **IF** which has been declared open and it does not require any assignment.
The **ELSE** instruction can be used to assign the closure branch of a **IF..ENDIF branch**
To further details, please read the manual of TpaCAD, chapter **Workings->Logical instructions.**

EXAMPLE:

```
IF  (r0=0)
.
ELSE-IF (r0=1)
.
ELSE-IF (r0=2)
.
ELSE
.
ENDIF
```

The example proposes an **IF cycle** made of by four branches, evaluated testing the value of the (r0) variable:
· the first branch is the instruction **IF** of the opening of the cycle : the branch is run if r0 is set to 0 and then it directly passes to the ENDIF of closure; otherwise it passes to the next branch;
· the second branch is an instruction **ELSE-IF:** the branch is run if r0 is set to 1 and then it directly passes to the ENDIF of closure; otherwise it passes to the next branch;
· the third branch is an instruction **ELSE-IF:** the branch is run if r0 is set to 2 and then it directly passes to the ENDIF of closure; otherwise it passes to the next branch;
· the closure branch is an instruction **ELSE**: the branch is run if no-one of the previous branches has been run.

ELSE-IF

Logical instruction for branching of IF cycle

It programs an alternative branch for the execution of an **IF cycle**.
The instruction can't be related to an IF declared open.

The instruction **ELSE-IF** expresses a condition that is:
- **true**: it determines the execution of one or more workings specified downstream of **ELSE-IF**
- **false**: it determines the non-execution of the concerned workings

An instruction **ELSE-IF** is evaluated only if no-one branch assigned at the beginning of the belonging IF **cycle** is verified.
An instruction **ELSE-IF**/ **ELSE**/ **ENDIF** defines the workings conditioned by **ELSE**-**IF**.

Even for the **ELSE-IF** a maximum of three logical conditioning terms **can be assigned.**
Parameters:

IF (...)? (...)? (...)

[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned through six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it solves TRUE value if both the terms are verified. • **Or**: it solves TRUE value if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it solves TRUE value if both the terms are verified. • **Or**: it solves TRUE value if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: **(e5) ? (e6)** with **[TST3]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[OPEN] IF open	If selected, the IF cycle is not closed by an ENDIF.

No, one, two or three conditioning terms can be set.
Conditions of comparison of numbers (equality,....) are always carried out by means of an *epsilon*=0.001. Values that deviate for less than epsilon are considered as equal.

If no term is set, the **ELSE-IF** is always verified.
The general logical formalism managed for an **IF cycle** with branches **ELSE-IF** is shown as follows:

IF (((...)) ? (..)) ? (...))
..
.. instructions run if the condition on IF = True
..
ELSE-IF (((...)) ? (..)) ? (...))
..
.. instructions run if the condition on IF = False and the condition on ELSE-IF = True
..
ELSE-IF (((...)) ? (..)) ? (...))
..

.. instructions run if the condition on IF and previous ELSE-IF = False and the condition on ELSE-IF = True
..
ELSE
..
.. instructions run if the condition on IF and all the ELSE-IF = False
..
ENDIF

To gain insight, refer to the TpaCAD manual at the chapter **Workings->logical instructions.**

EXAMPLE:

- **IF (r0=0)**
- **ELSE-IF (r0=1)**
- **ELSE-IF (r0=2).**
- **ELSE**
- **ENDIF**

The example proposes an **IF cycle** composed by four branches, evaluated testing the value of the (r0) variable:
- the first branch is the instruction **IF** of the opening of the cycle : the branch is run if r0 is set to 0 and then it directly passes to the ENDIF of closure; otherwise it passes to the next branch;
- the second branch is an instruction **ELSE-IF:** the branch is run if r0 is set to 1 and then it directly passes to the ENDIF of closure; otherwise it passes to the next branch;
- the third branch is an instruction **ELSE-IF:** the branch is run if r0 is set to 2 and then it directly passes to the ENDIF of closure; otherwise it passes to the next branch;
- the closure branch is an instruction **ELSE**: the branch is run if no-one of the previous branches has been run.

ERROR

Logical instruction of a serious reporting

It programs the creation of an error situation.
The instruction **ERROR** expresses a condition that, if it is:
· **true**, it determines the error condition
. **false,** it has no effect

If the condition of error occurred in a subroutine or in a macro, its development is ended. If it is verified in a program, during the execution process, the interpretation of the program is interrupted and its execution is not allowed.

For the ERROR **instruction** up to three logical conditioning terms **can be assigned.**
Parameters:

IF (...)? (...)? (...)

[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned through six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it solves TRUE value, if both the terms are verified. • **Or**: it solves TRUE value, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it solves TRUE value, if both the terms are verified. • **Or**: it solves TRUE value, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: (e5) ? (e6) with [TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)
[ERR] Error	Error number The list of the selected errors is displayed in a window.

WARNING

Logical instruction of non-serious reporting

It programs the creation of an alert situation.
The instruction **WARNING** expresses a condition that is:

- **true**: it determines the reporting of an alert message
- **false**: it has no-one effect

If the alert situation is verified, a processing phase is never stopped: it's produced a message, whose evaluation is left to the machine operator.
For the WARNING **instruction** a maximum of three logical conditioning terms **can be assigned.**
Parameters:

IF (...)? (...)? (...)

[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned through six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it solves TRUE value if both the terms are verified. • **Or**: it solves TRUE value if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it solves TRUE value if both the terms are verified. • **Or**: it solves TRUE value if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: (e5) ? (e6) with [TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)
[ERR] Error	Error number, used for the reporting. The list of the selected errors is displayed in a window.
[RET] Execution FAILED	Check the box to turn the warning into ERROR: the field is interpreted during the execution.

EXIT

Logical instruction of direct exit from IF cycle

The instruction **EXIT**expresses a condition that is:

- **true**: it determines a jump forward while executing the programmed test, with direct exit after the IF cycle at the nearest nesting level If the instruction is carried out outside an IF cycle, if implies jumps to the end of the face program
- **false**, the instruction does not have any effect.

Anyway, you can force the jump to the end of the face program, if you select the RETURN field.
The jump condition expressed by the instruction is evaluated only during the application of the logical conditions, like the condition expressed for the IF instruction. If the conditioning of the instruction is TRUE, for all the programmed workings in the IF cycle branch after the EXIT instruction, the FALSE condition is forced.
The result of the test is TRUE anyway, if there is no logical condition.

Even for the**ELSE-IF** up to three logical conditioning terms **can be assigned.**
Parameters:

IF (...)? (...)? (...)

[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it solves TRUE value, if both the terms are verified. • **Or**: it solves TRUE value, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it resolves TRUE value, if both the terms are verified. • **Or**: it resolves TRUE value, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: (e5) ? (e6) with [TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)
[RET] Return	If selected, it imposes the jump to the end of the program

NOP

Instruction of NOT OPERATION

The instruction does not involve any interpretation, both in TpaCAD and during the execution of the program in the machine.
The instruction can be inserted automatically during the recovery of the source texts of the TCN program with invalid format.
A sign of the instruction is the multi-line view of the Description field: the height of the field adapts automatically up to display the string set.

This instruction can be used also to insert and to display effectively some program comments.

POINT OF APPLICATION

Logical instruction to assign the application point of a subroutine

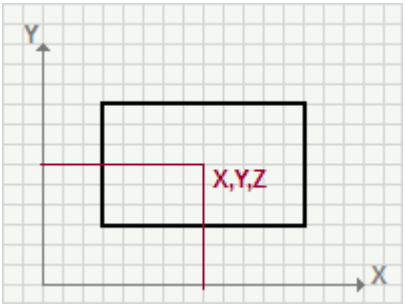
The instruction is significant in the programming of subroutine or macro-program and it assigns the initial application point on the set of three xyz coordinates in a subroutine o in a macro. The programming is interpreted in absolute coordinates and, for the non-assigned axes value 0.0 is taken on anyway. If more than one application point is assigned, **only the first point verified by the logical conditions is recognised as significant.**
The point of application is the reference to apply the same subroutine (or macro). It is the point to which the placing specified in the subroutine (or macro) call is applied and it cannot correspond to any working point.
The initial application point by default, applying a subroutine (or macro) is the first programmed working position: the instruction Point of application changes this position by default.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[X] X1	X coordinate of application
[Y] Y1	Y coordinate of application
[Z] Z1	Z coordinate of application.

EXAMPLE:
The point of application is positioned at the center of the figure. In this way the subroutine is placed by setting the position of the rectangle center; this position, as you can see, does not correspond to any point of the working .



FINAL APPLICATION POINT

Logical working for the assignment of the application point of a subroutine

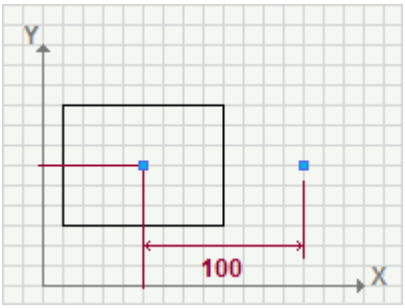
The instruction is significant in programming a subroutine or a macro-program. It assigns the final application point on the set of three xyz coordinates in a subroutine o in a macro. The programming is interpreted in absolute coordinates and, for the non-assigned axes value 0.0 is taken on anyway. If more than one point of application is assigned, only the first point verified by the logical conditions is recognised as significant.
The point of application is the same subroutine (or macro) reference. It is the point to which the placing specified in the subroutine (or macro) call is applied and it cannot correspond to any working point.
The final application point by default, in the application of a subroutine (or macro) is the last programmed working: the instruction **Final application point** changes this position automatically.

The parameter to be used are as follows:

GEOMETRIC PARAMETERS

[X] X1	X coordinate of final application
[Y] Y1	Y coordinate of final application
[Z] Z1	Z coordinate of final application

EXEMPLE:
Subroutine with a hole and a construct rectangle around the hole. The FINAL APPLICATION POINT is set up, so that it coincides with the hole. In this way the call, for example, in relative of the same subroutine, that was programmed with displacement in X equal to 100, determines its displacement in respect to the hole. In this way recalling the following working line of a drilling in relative with displacement in X equal to 100, determines its displacement with respect to the hole of the subroroutine.



ASSIGN Jnn

Logical instruction for the assignment of program variables

It programs one or more J global variables (from 0 to 99).
The instruction expresses a condition that:
. **true**: it performs the assignments set for the variables
. **false**, the instruction does not have any effect.
The <J> variables can only be used on this face. They are 100 variables (identified by name: from j0 to j99) or numerical type. At the beginning of a face programming, the <j> variables are all assigned at zero.
Inside the face, the <j> variables are visible at each expansion level: applying a subroutine you can test and use the assignment made before, just like you can modify the variables itself, returning actually the information, when the application itself returns.

Parameters:

IF (...)? (...)? (...)

[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned through six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it solves TRUE value, if both the terms are verified. • **Or**: it solves TRUE value, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it solves TRUE value, if both the terms are verified. • **Or**: it solves TRUE value, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: (e5) ? (e6) with [TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)

j0=..; j1=..	the node groups the assignments field of the first 20 variables (from j0 to j19); it is possible as well for the first 10 to assign a describing field
...[MV0]	Assign a comment to the J0 variable.
[V0] J0	Assign a value to the J0 variable.
...[MV1]	Assign a comment to the J1 variable.
[V1] J1	Assign a value to the J1 variable.
...[MV9]	Assign a comment to the J9 variable.
[V9] J9	Assign a value to the J9 variable.
[V10] j10	Assign a value to the J10 variable.
..[V19] j19	Assign a value to the J19 variable.

Jnn=..	The node groups the assignment fields of a j generic variable, indicating: • [MVNN*] describing field • [VNN*] index of the variable (to be assigned between 0 and 99) • [DVNN*] assigned value
...[MVNN]	It assigns a comment to the Jnn1 variable

[VNN] nn1	Index of the variable to be assigned. Set a value between 0 and 99.
[DVNN] =	It assigns a value to the indicated variable.

Jnn=..

...	...

To further details, please read the manual of TpaCAD, chapter **Workings->Logical instructions.**

ASSIGNS Jnn WITH CONDITION (..?..?..)

Logical instruction for the conditioned assignment of program variables

It programs one or more J global variables (from 0 to 99).
The instruction expresses a condition that:

- **true**: it carries out the assignments set for the variables in the fields corresponding to "***(True)=***"
- **false**: it carries out the assignments set for the variables in the fields corresponding to "***(False)=***"

The functioning corresponds to the *ternary operator*, which is a synthetic form of the if-else-endif instruction.

The J variables can only be used in this face. They are 100 variables (identified by name: from j0 to j99) or numerical type. At the beginning of a face programming, the <j> variables are all assigned at zero. Inside the face, the <j> variables are visible at each expansion level: applying a subroutine you can test and use the assignment made before, just like you can modify the variables itself, returning actually the information, when the application itself returns.

Parameters:

IF (...)? (...)? (...)

[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it solves TRUE value, if both the terms are verified. • **Or**: it solves TRUE value, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it solves TRUE value, if both the terms are verified. • **Or**: it solves TRUE value, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: (e5) ? (e6) with [TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)
Jnn= .. ? .. : ..	The node groups the fields assigning a generic j variable, indicating: • [MVNN*] description field • [NN*] variable index (to be assigned between 0 and 99) • [TNN*] value assigned if the conditioning is TRUE • [FNN*] value assigned if the conditioning is FALSE
...[MVNN1]	Assign a comment to the Jnn variable
[NN1] nn1	Number of the variable to be assigned. Set a value between 0 and 99.
[TNN1] True=	It assigns a value to the indicated variable if "IF" is verified = True.
[FNN1] False=	It assigns a value to the indicated variable if "IF" is verified = False.
Jnn= .. ? .. : ..	
...	...

To further details, please read the manual of TpaCAD, chapter **Workings->Logical instructions.**

ASSIGN Jnn (0-99)

Logical instruction for the assignment of program variables

It initializes all the J variables (from 0 to 99) or a specific group.

The instruction expresses a condition that:
. **true**: it performs the assignments set for the variables
. **false**, the instruction does not have any effect.

The J variables can only be used on this face. They are 100 variables (identified by name: from j0 to j99) or numerical type. At the beginning of a face programming, the <j> variables are all assigned at zero. Inside the face, the <j> variables are visible at each expansion level: applying a subroutine you can test and use the assignment made before, just like you can modify the variables itself, returning actually the information, when the application itself returns.

Parameters:

IF (...)? (...)? (...)

[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned through six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it solves TRUE value, if both the terms are verified. • **Or**: it solves TRUE value, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it solves TRUE value, if both the terms are verified. • **Or**: it solves TRUE value, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: (e5) ? (e6) with [TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)

Jnn= ..

[NN1] nn1	Index of the first variable to be written (to be assigned between 0 and 99).
[NN2] nn2	Index of the last variable to be written (to be assigned between 0 and 99)
[DVNN] =	Value to be assigned to the variables.

To further details, please read the manual of TpaCAD, chapter**Workings->Logical instructions.**

EXAMPLE:

The (nn1, nn2) fields are not set: the value [DVNN]=10 is assigned to all the variables.

[NN1] nn1
[NN2] nn2

[DVNN] = 10

The (nn1, nn2) fields not set: the value [DVNN]=10 is assigned to the variables between j50 and j75.

[NN1] nn1 50
[NN2] nn2 75
[DVNN] = 10

CREATE AUTOMATIC FACE

Logical working

It programs an automatic face in piece-face.
The numbering of the faces in managed from 101 to 500 automatically: so, it is possible to assign up to 400 automatic faces. The automatic faces can be only seen on piece-face.
For further details please read the manual of TpaCAD in chapter ***Workings>Automatic faces.***

The instruction expresses a condition that:
- **true**: it creates the plane of working.
- **false**, the instruction does not have any effect.

Parameters:

IF (...)? (...)? (...)

[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: (e1) ? (e2) with [TST1]? assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it resolves TRUE value, if both the terms are verified. • **Or**: it resolves TRUE value, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: (e3) ? (e4) with [TST2]? assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it resolves TRUE value, if both the terms are verified. • **Or**: it resolves TRUE value, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: (e5) ? (e6) with [TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)
[Z] Z	Z axis orientation: select to enable a left-handed coordinate system.
[SF] Sf	Face thickness: to be set, if it is not equal to the thickness of the piece
[BF] Construction face	It sets the automatic face as a face used only as a a reference for the construction of other faces. A face construction cannot be programmed and it is not part of the piece geometry.
PO { } P1 { } P2 { }	It opens a dialog box equal to the dialog box assigning the fictive faces to determine the edges of the automatic face • reference face • three coordinates of the assignment points of the plane (P0, P1, P2) • Z axis direction • thickness

To further details, please read the manual of TpaCAD, chapter **Assignments->Fictive faces**

FOR - FOR

Logical instruction to open a FOR loop

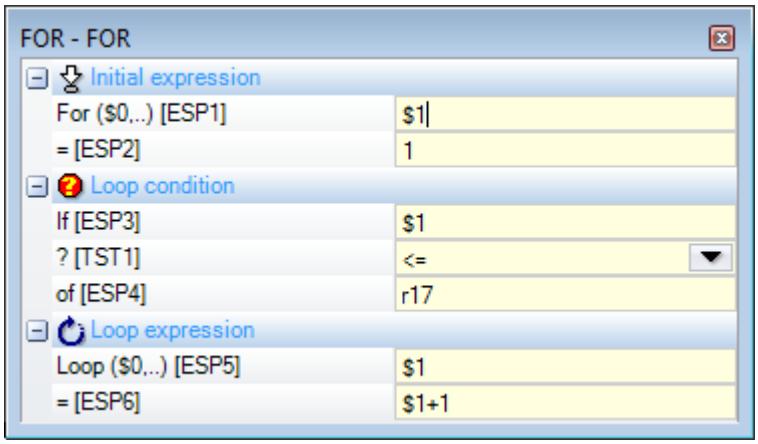
It programs the repetition of one or more lines programmed for a number of times.
The instruction can be used in macro-programming program.
A **FOR** instruction must always be closed by an **ENDFOR** instruction, which marks out the workings conditioned by **FOR**.
The FOR instruction is performed from zero to a variable number of times, until the result of the set condition is TRUE.
The execution is brought to an end, when the set condition returns FALSE.
If the cycle condition is not assigned, the cycle must be managed through a BREAK instruction.
FOR.....**ENDFOR** structures can be nested without limits.
To avoid infinite loops, it is instead controlled the maximum number of iterations that are carried out in application of a macro-program: after exceeding the number of 20000, the development of the macro program is interrupted and an error is reported.

Parameters:

STARTING EXPRESSION	assigns a value to an initial counter
For ($0...) [ESP1]	Counter. If set, it should present a single name of $ variable (example: $0,$54)
= [ESP2]	Starting value, that is assigned to the counter. It can be a numerical or parametric value.
LOOP CONDITION	It indicates the condition enabling to carry on in the FOR cycle
if [ESP3]	Variable to use for comparison. If set, a single name of $ variable should appear:(example: $0,$54)
? [TST1]	Parameter assigning for the comparison (<,<=,>,>=,=,#)
of [ESP4]	Assignment of comparison value
LOOP EXPRESSION	It performs an assignment operation, that is repeated at each cycle
Loop ($0,...) [ESP5]	Variable to assign. If set, a single name of $ variable should appear: (example: $0,$54)
= [ESP6]	Assignment value

No term is obligatory. Terms, that are not assigned, are not evaluated.

EXAMPLE:



The logic expression assigned in the figure above is equivalent to:
FOR $1=1 to $1<=r17; $1=$1+1
{
.....instruction
.....instruction
}
ENDFOR
To the $1 counter an initial value equal to 1 is assigned. The instructions inside the FOR cycle are repeated until the value of the $1 counter remains less or equal (<=) to the r17 comparison value. However, the assignment of $1 counter could not verify the comparison test. Therefore, the number of

the performed repetitions in this case will be null. At every cycle repetition the $1 counter value increases by 1 (($1=$1+1).

ENDFOR

Logical instruction to close a FOR loop

It programs the ending of a block of instructions conditioned by a FOR instruction.
The instruction can be used in macro-programming program.
The instruction doesn't require assignments.

BREAK

Logical instruction for the direct exit from FOR loop

The **BREAK** instruction works in two ways:
- it forces the exit from the nearest external **FOR** cycle. The execution is carried out from the line after the **ENDFOR** instruction. In the event that the instruction is executed outside a FOR loop, it involves the jump at the end of the face program.
- it programs error situation in the same way as the **ERRORE** instruction.

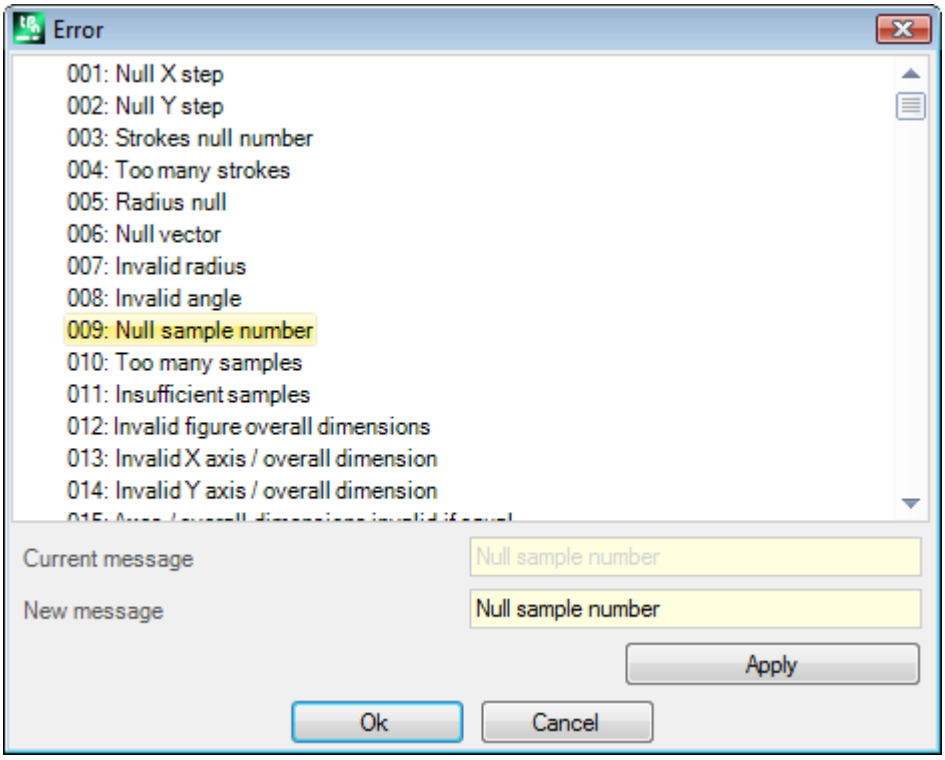
The instruction can be used in macro-programming program.

The instruction expresses a condition that if it is:
• true: enables the operation set for the BREAK
• false: the instruction has no effect.
The test result is however TRUE if it is not set a logical condition.

Parameters:
IF (...)? (...)? (...)

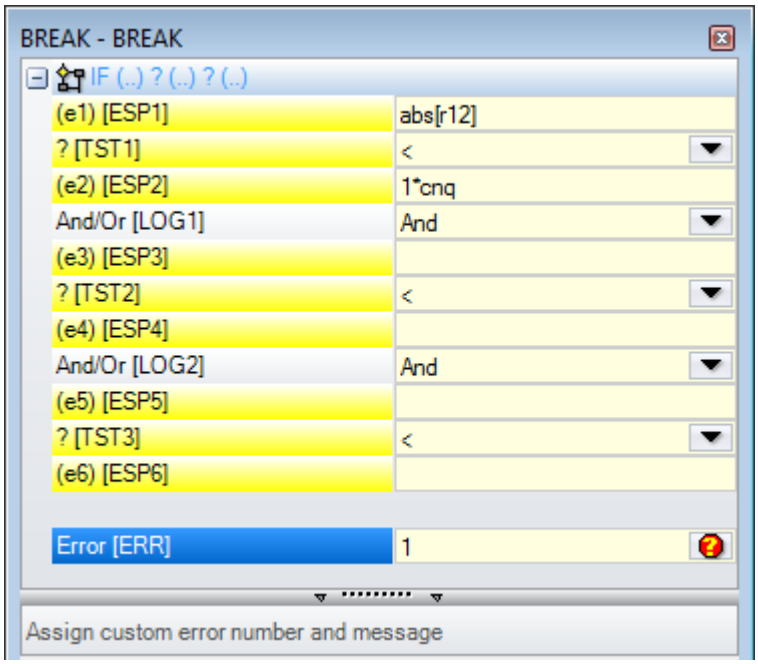
[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first term of comparison **(e1)? (e2)** with **[TST1]?** assigned between six conditions of comparison: (<, <=,>,>=, =, #)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it solves the value TRUE if both terms have occurred • **Or**: it solves the value TRUE if at least one term has occurred
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second term of comparison **(e3)? (e4)** with **[TST2]?** assigned between six conditions of comparison: (<, <=,>,>=, =, #)
[LOG2] And/or	Logical condition between the third term and the result deriving from the logical condition applied to the first two terms: • **And**: it solves the value TRUE if both terms have occurred • **Or**: it solves the value TRUE if at least one term has occurred
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: **(e5) ? (e6)** with **[TST3]?** assigned between six conditions of comparison: (<, <=,>,>=, =, #)
[ERR] Error	Error number. The list of the selectable errors is displayed in a window.

Use of the BREAK instruction to program an error condition
In order to program error situations a positive non-null value should be assigned to the Error field. The selection of the **ERROR** option shows a list, where the assigned errors are displayed (number + message).



At manufacturer level, a new message can be entered or an existing one can be modified.

Example:



A BREAK instruction programming an error condition is shown in the figure above. If during the macro-program development the abs[r12] < 1*cnq condition occurs, the macro-program development is canceled and the number 1 custom error is signaled.

Use of the BREAK instruction to program a break condition inside a FOR...ENDFOR cycle.
If condition term is TRUE or is not set up, a break to the nearest nest level is set and determines the exit from the FOR cycle.
If the cycle instruction is not performed in a FOR cycle, at the end of the program of the face a break is applied.

Example of structure FOR.. BREAK ... ENDFOR:

```
FOR (..)
      instruction...
      FOR ($0=0; $0<=r12; $0=$0+1)
            instruction...
            BREAK ($0=r5 or $0=r6) ; if the condition is verified, it jumps to the instruction which
    follows the ENDFOR.
            instruction..
      ENDFOR
      instruction...
ENDFOR
instruction...
```

CONTINUE

Logical instruction for the direct recycle from FOR loop

The instruction expresses a condition that if it is:
• true: It enables a jump back into the text of the program to the nearest FOR. In the event that the instruction is executed outside a FOR loop, it involves the jump to the start of face program.
• false: The instruction has no effect.
The test result is however TRUE if it is not placed no logical condition.
The instruction can be used in macro-programming program.

Parameters:
IF (...)? (...)? (...)

[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first term of comparison **(e1)? (e2)** with **[TST1]?** assigned between six conditions of comparison: (<, <=,>,>=, =, #)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it solves the value TRUE if both terms have occurred • **Or**: it solves the value TRUE if at least one term has occurred
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second term of comparison **(e3)? (e4)** with **[TST2]?** assigned between six conditions of comparison: (<, <=,>,>=, =, #)
[LOG2] And/or	Logical condition between the third term and the result deriving from the logical condition applied to the first two terms: • **And**: it solves the value TRUE if both terms have occurred • **Or**: it solves the value TRUE if at least one term has occurred
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: **(e5) ? (e6)** with **[TST3]?** assigned between six conditions of comparison: (<, <=,>,>=, =, #)

EXAMPLE of FOR..CONTINUE...ENDFOR structure:

```
FOR (..)
      instruction..
      FOR ($0=0; $0<=r12; $0=$0+1)
            instruction...
            CONTINUE ($0=r5 or $0=r6)          if the condition is verified, it jumps to the FOR($0=0;
    $0<=r12; $0=$0+1) instruction
            instruction..
      ENDFOR
      instruction...
ENDFOR
instruction...
```

ASSIGN $nn

Logical instruction of assignment of macro-program variables

It programs one or more global variables $ (0 to 299).
The instruction expresses a condition that if it is:
• **true**: carries out assignments that you set for the variables
• **false**: the instruction has no effect
The <$> variables are local to each macro-program development. They are 300 variables (identified by name from $0 to $299) or numeric type. At the beginning of a macro-program development, the <$> variables are all assigned to zero and die at the end of the same development.
<$> variables can be used in each working applied to a face of the macro-program. A <$> variable can be used to fix hole diameter, or a working coordinate, or a logic conditioning. Inside the face, the visibility of variables is local at any level of application. If the application of the macro-program, in its turn, carries out the application of another macro-program, this sees its own local and fully independent set of <$> variables.

The parameter to be used are as follows:

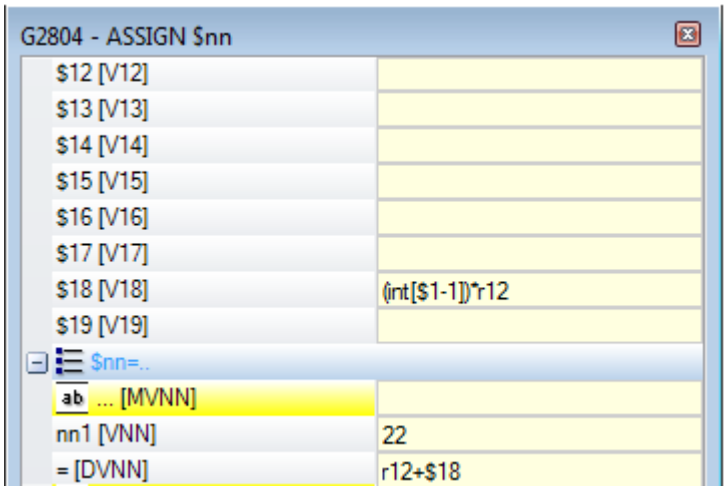
IF (...)? (...)? (...)

[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first term of comparison **(e1)? (e2)** with **[TST1]?** assigned between six conditions of comparison: (<, <=,>,> =, =, #)
[LOG1] And/Or	Logical condition between the first two terms of comparison: • **And**: it solves the value TRUE if both terms have occurred • **Or**: it solves the value TRUE if at least one term has occurred
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second term of comparison **(e3)? (e4)** with **[TST2]?** assigned between six conditions of comparison: (<, <=,>,> =, =, #)
[LOG2] And/or	Logical condition between the third term and the result deriving from the logical condition applied to the first two terms: • **And**: it solves the value TRUE if both terms have occurred • **Or**: it solves the value TRUE if at least one term has occurred
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: **(e5)? (e6)** with **[TST3]?** assigned between six conditions of comparison: (<, <=,>,> =, =, #)

$0= ..;$1=..	The node groups the fields of assignment of the first 20 variables (from $ 0 to $ 19), with the possibility, for the first 10, to assign a descriptive field
...[MV0]	Assign a comment to the variable $0.
[V0] $0	Assign a value to the variable $0.
...[MV9]	Assign a comment to the variable $9.
[V10] $10	Assign a value to the variable $10.
..[V19] $19	Assign a value to the variable $19.

$nn=..	The node groups the fields of allocation of a generic variable j should be: [MVNN *] description field [VNN *] index of variable (to be assigned between 0 and 299) [DVNN *] attributed value
...[MVNN]	Assign a comment to the variable $nn1
[VNN] nn1	The index of the variable to be assigned. Set a value between 0 and 299.
[DVNNn] =	Assign a value to the indicated variable.

EXAMPLE:



To the $nn1 variable the index 22 is assigned and it is interpreted as follows: $22=r12+$18, where $18 is a variable that is previously assigned in the same instruction.

ASSIGN $nn WITH CONDITION (..?..:..)

Logical instruction of conditioning assignment of macro-program variables

It programs one or more global variables $(0 to 299).
The instruction expresses a condition that if it is:
• **true**: carries out assignments that you set for the variables in the corresponding fields to "(True) ="
• **false**: carries out assignments that you set for the variables in the corresponding fields to "(False) ="

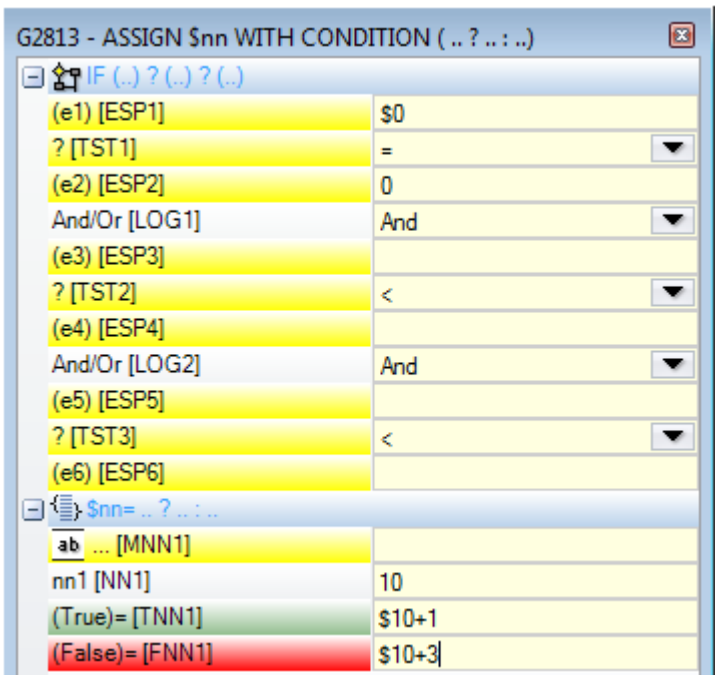
The <$> variables are local to each macro-program development. They are 300 variables (identified by name from $0 to $299) or numeric type. At the beginning of a macro-program development, the <$> variables are all assigned to zero and die at the end of the same development.
<$> variables can be used in each working applied to a face of the macro-program. A <$> variable can be used to fix hole diameter, or a working coordinate, or a logic conditioning. Inside the face, the visibility of variables is available at any level of application. If the application of the macro-program, in its turn, carries out the application of another macro-program, this sees its own local and fully independent set of <$> variables.

The parameter to be used are as follows:

IF (...)? (..) (...)

[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first term of comparison **(e1)? (e2)** with **[TST1]?** assigned between six conditions of comparison: (<, <=,>,> =, =, #)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it solves the value TRUE if both terms have occurred • **Or**: it solves the value TRUE if at least one term has occurred
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second term of comparison **(e3)? (e4)** with **[TST2]?** assigned between six conditions of comparison: (<, <=,>,> =, =, #)
[LOG2] And/or	Logical condition between the third term and the result deriving from the logical condition applied to the first two terms: • **And**: it solves the value TRUE if both terms have occurred • **Or**: it solves the value TRUE if at least one term has occurred
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: **(e5) ? (e6)** with **[TST3]?** assigned between six conditions of comparison: (<, <=,>,> =, =, #)
$nn= ..?..:..	The node groups the fields of allocation of a generic variable j, with indication of: [MVNN*] description field [VNN*] index of variable (to be assigned between 0 and 299) [DVNN*] attributed value
...[MVNN1]	Assign a comment to the variable $nn
[NN1] nn1	Number of the variable to be assigned. Set a value between 0 and 299.
[TNN1] True=	It assigns value to the indicated variable if "IF" is verified = True.
[FNN1] False=	It assigns value to the indicated variable if "IF" is verified = False.

EXAMPLE:



The imposed condition ($0=0):

- if it is TRUE → $10=$10+1
- if it is FALSE → $10=$10+3

SETMX

Writing instruction for an information row in a piece matrix

Instruction to write considerable information in piece matrix: this is an advanced use and for drawing up custom macro-programs only.
This instruction can be used in programming of macro-programs.
The meaning of the written information should be defined when the specifications of the application are drawn up.

The instruction expresses a condition that, if it is
- **true**: writes the information in the matrix
- **false**: the instruction does not produce any effect.

The test result is TRUE anyway, if no logical condition is required.

Let us see the parameters:

IF (...)? (...)? (...)

[ESP1] e1 [ESP2] e2	Assignment parameters of the first comparison term: **(e1) ? (e2)**
[TST1] ?	when **[TST1]?** is assigned among three conditions of relation: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the two first comparison terms: • **And** resolves TRUE value, if both terms are verified • **Or** resolves TRUE value, if at least one term is verified
[ESP3] e3 [ESP4] e4	Assignment parameters of the second comparison term: (e3) ? (e4)
[TST2] ?	when [TST2]? is assigned among three conditions of relation: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the logical condition applied to the first two terms and the third comparison term: • **And** resolves TRUE value, if both terms are verified • **Or** resolves TRUE value, if at least one term is verified
[ESP5] e5 [ESP6] e6	Assignment parameters of the third comparison term: (e5) ? (e6)
[TST3] ?	when [TST3]? is assigned among three conditions of relation: (<,<=,>,>=,=,#)
Cnn=..:..	The node groups the assignment fields of a matrix column, giving evidence of: • [Mnn] description field • [Cnn] value given to the column (nn)
...[M11]	Assigns a comment to write the column 11
c11 [C11]	Value to be written in the column 11
… …	
C41 [C41]	Value to be written in the column 41.

G4: DWELL TIME - NOTICE

Instruction to program the waiting and/or alert time

Instruction to be used to program a waiting time and a warning message
This instruction works only as the program is being executed: the meaning and the real terms of use of the programmed information must be defined as the specification of the application is being written.

The instruction expresses a condition that, if it is
- **true**: it determines the interpretation of the settings
- **false:** the instruction does not have any effect.

The test result is TRUE anyway, if no logical condition is required.

Let us see the parameters:

IF (...)? (...)? (...)

[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** when **[TST1]?** is assigned among three conditions of relation: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the two first comparison terms: • **And** resolves TRUE value, if both terms are verified • **Or** resolves TRUE value, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And** resolves TRUE value, if both terms are verified • **Or** resolves TRUE value, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: **(e5) ? (e6)** with **[TST3]?** with[TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)
..	The node contains the assignment fields of the instruction:
[TIME] Dwell time	Time expressed in units of [sec] and thousands of seconds
[MSG] Message	Message to display during the interpretation of the instruction

RAPID

Instruction to translate the axes and/or to execute the control custom cycles in a rapid way.

Instruction to be used to program a rapid movement of the axes where it is possible to call operational custom cycles on the plant control.
This instruction works only as the program is being executed: the meaning and the real terms of use of the programmed information must be defined as the specification of the application is being written.

The instruction expresses a condition that, if it is
- **true**: it determines the interpretation of the settings
- **false**, the instruction does not have any effect.

The test result is TRUE anyway, if no logical condition is required.

Let us see the parameters:

IF (...)? (...)? (...)

[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And** solves a value as TRUE , if both terms are verified • **Or** solves a value as TRUE, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And** solves a value as TRUE , if both terms are verified • **Or** solves a value as TRUE, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: **(e5) ? (e6)** with **[TST3]?** with[TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Number of the machine
[TR] Group	Group number on the machine
[EM] Electrospindel	Number of the electric spindle
[T] Tool	Tool number.
[H] Function	Number of function: it finds a specific functionality on the plant Assigned parameter of several typologies follows, according to the functionality required:
[TAGI] TagItem	Custom parameter of integer typology
[TAGI1] TagItemA	Custom parameter of integer typology
[TAGD] TagValue	Custom parameter of double typology
[TAGD1] TagValueA	Custom parameter of double typology
[TAGM] TagText	Custom parameter of string typology
[TAGM1] TagTextA	Custom parameter of string typology

BARCODE

Working to place a barcode label

Working to be used to apply on the piece a label that identifies a barcode. The use or the working is associated to the following scanning of the label.

The instruction expresses a condition that, if it is
- **true**: it determines the interpretation of the settings
- **false**, the instruction does not have any effect.

The test result is TRUE anyway, if no logical condition is required.

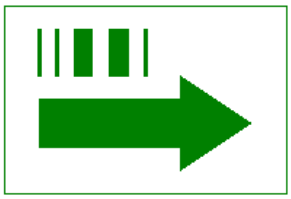
Let us see the parameters:

IF (...)? (...)? (...)

[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And** solves a value as TRUE , if both terms are verified • **Or** solves a value as TRUE, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And** solves a value as TRUE , if both terms are verified • **Or** solves a value as TRUE, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: **(e5) ? (e6)** with **[TST3]?** with[TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)

GEOMETRIC PARAMETERS

[X] Qx [Y] Qy	Coordinates of the centre of the rectangle of the label.
[DL] Length	Length of the label (dimension along the x axis).
[DH] Height	Height of the label (dimension along the y axis).
[DS] File	Name of the file that assigns the label It can be directly edited or it can be assigned by opening the file Open box. In this last event the research is set in the standard storage folder as defined by the application program (example: product\barcode)
[A] Rotation angle	Angle of rotation, programmed in degrees. The rotation is applied only in xy plane.
[EMX] Horizontal mirror	Mirror parameter. If selected, it sets a specular setting around a vertical axis on the face plane. If selected at the same time as the Vertical Mirror parameter, it sets a symmetry with regard to the X and Y axes.
[EMY] Vertical mirror	Mirror parameter. If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time as Horizontal Mirror, it sets a symmetry with regard to the X and Y axes.



The graphics associated with the instruction represents a rectangle (assigned with the dimensions shown) in which there are:

- the stylided representation of a barcode;
- an arrow that indicates the direction assigned to the label position.

5 AXES CURVE

Working for ISO curve application

It programs one or more profiles by loading them from an external file in ISO format, selected by name.
This working can be programmed on the Face 1 only.
The parameters to define the profile are the following ones:

GEOMETRIC PARAMETERS

[ABSX] absolute X coordinate	if selected, it indicates that the value assigned to the X-field should be interpreted as a coordinate. If not selected, it indicates that the value should be interpreted as an offset.
[X] X: offset/coordinate [X]	In accordance with the selection of **Absolute X-Coordinate**, it is: • X offset of translation, applied to the initial point of the ISO profile • absolute X coordinate to which the initial point of the ISO profile is translated
[ABSY] absolute Y coordinate	If selected, it indicates that the value assigned to the Y-field should be interpreted as a coordinate. If not selected, it indicates that the value should be interpreted as an offset.
[Y] Y: offset/coordinate [Y]	In accordance with the selection of **Absolute Y-Coordinate**, it is: • Y offset of translation, applied to the initial point of the ISO profile • absolute Y coordinate to which the initial point of the ISO profile is translated
[ABSZ] absolute Z coordinate	If selected, it indicates that the value assigned to the Z-field should be interpreted as a coordinate. If not selected, it indicates that the value should be interpreted as an offset.
[Z] Z: offset/coordinate [Z]	In accordance with the selection of **Absolute Z-Coordinate,** it is: • Z offset of translation, applied to the initial point of the ISO profile • absolute Z coordinate to which the initial point of the ISO profile is translated
[HISO] ISO File	Name of the ISO program It can be directly edited or it can be assigned by opening the file Open box. In this last case the research is set in the standard storage folder of the subroutines (SUB)
[NOP] Element of reference for the Setup	This field is available if allowed by the TpaCAD configuration and sets the NAME assigned to a previous programmed working; in this case, the filed assigns the whole setup of all the generated profiles and the settings related to the setup in the node of **Technological parameters** are ignored.

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[EM] Electric spindle	Number of the electric spindle
[T] Tool	Tool number.
[TP] Tool typology	Tool typology.
[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed

This working adjusts the application of an ISO file to the piece geometry of TpaCAD.

5 AXES CURVE

Working of ISO curve application

It programs a profile by loading it from an external file in ISO format.
This working can be programmed on the Face 1 only.
The parameters to define the profile are the following ones:

GEOMETRIC PARAMETERS

[ABSX] absolute X coordinate	if selected, it indicates that the value assigned to the X-field should be interpreted as a coordinate. If not selected, it indicates that the value should be interpreted as an offset.
[X] X: offset/coordinate [X]	In accordance with the selection of **Absolute X-Coordinate**, it is: • X offset of translation, applied to the initial point of the ISO profile • absolute X coordinate to which the initial point of the ISO profile is translated
[ABSY] absolute Y coordinate	If selected, it indicates that the value assigned to the Y-field should be interpreted as a coordinate. If not selected, it indicates that the value should be interpreted as an offset.
[Y] Y: offset/coordinate [Y]	In accordance with the selection of **Absolute Y-Coordinate**, it is: • Y offset of translation, applied to the initial point of the ISO profile • absolute Y coordinate to which the initial point of the ISO profile is translated
[ABSZ] absolute Z coordinate	If selected, it indicates that the value assigned to the Z-field should be interpreted as a coordinate. If not selected, it indicates that the value should be interpreted as an offset.
[Z] Z: offset/coordinate [Z]	In accordance with the selection of **Absolute Z-Coordinate**, it is: • Z offset of translation, applied to the initial point of the ISO profile • absolute Z coordinate to which the initial point of the ISO profile is translated
[HN] File ISO	Univocal number representing the ISO file name where the working is described. The file is stored under the CURVE subfolder from the standard storage folder of the subroutines (SUB)
[NOP] Element of reference for the Setup	This field is available if allowed by the TpaCAD configuration and sets the NAME assigned to a previous programmed working; in this case, the filed assigns the whole setup of all the generated profiles and the settings related to the setup in the node of **Technological parameters** are ignored.

TECHNOLOGICAL PARAMETERS

[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[EM] Electric spindle	Number of the electric spindle
[T] Tool	Tool number.
[TP] Tool typology	Tool typology.
[F] Entry speed	Tool entry speed
[S] Rotation speed	Tool rotation speed

This working adjusts the application of an ISO file to the piece geometry of TpaCAD.

ISO SUBPROGRAM

Working of ISO format subprogram recall.

It programs the call of a subprogram assigned in ISO format. This application manages the basic geometric transforms and the multiple application with free repetition. In addition, compared to a general working of subprogram application this application can assign the technology of the resolved setups.

If the subprogram recall is programmed in piece-face, the face on which the subprogram is applied is assigned in the 'F' field of the working.

The parameters to be used are the following ones:

IF (...)? (...)? (...)	Up to three terms of logic conditioning can be assigned IF (...)? node (...)? (...). The working is carried out only if the required condition is verified as true. Anyway, the condition is verified as true, if the corresponding parameters are not set. Up to three terms of logical conditioning can be assigned
[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: (e1) ? (e2) with [TST1]? assigned among six relation conditions: (<,<=,>,>=,=,#).
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And** resolves a value as TRUE , if both terms are verified • **Or** resolves a value as TRUE, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: (e3) ? (e4) with [TST2]? assigned among six relation conditions: (<,<=,>,>=,=,#).
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And** resolves a value as TRUE, if both terms are verified • **Or** resolves a value as TRUE, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: (e5) ? (e6) with [TST3]? with[TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#).
GEOMETRIC PARAMETERS	
[HISO] ISO File	Name of the ISO program It can be directly edited or it can be assigned by opening the file Open box. In this last case the research is set in the standard storage folder of the subroutines (SUB)
[X] X1 [Y] Y1 [Z] Z1	X, Y, Z application coordinates They are significant individually. The application point (programmed with the Application Point working), if assigned, or the first work point of the subprogram are translated on the point. For unassigned coordinates, the translation cannot be assigned, with respect to the original development of the subprogram.
[ER] Position the overall rectangle	It places the coordinates of the application point according to overall rectangle dimensions (considered in the xy plane only). Possible options: • **Do not apply**=this option is not enabled • **Centre in XY**= it shifts the x,y coordinates making them coincide in the centre of the overall rectangle • **X-Y-**= it shifts the x,y coordinates making them coincide with the minimum x and y coordinates of the overall rectangle • **X-Y+**= it shifts the x,y coordinates making them coincide with the x coordinates at hte minimum overall dimension and the y coordinates at the maximum overall dimension • **X+Y-**= it shifts the x,y coordinates making them coincide with the x coordinates at the maximum overall dimension and the y coordinates at the minimum overall dimension • **X+Y+**= it shifts the x, y coordinates making them coincide with the x and y coordinates at the maximum overall dimension
[EG] Relative	If selected, it is assessed with the **Rel<-[EGI]** parameter. If also this last is selected and precedes a complex working (example: invoking the

	subprogram), the application point is considered relative to the initial application point of the previous working, otherwise the application point is considered relative to the point of the application end of the previous working.
[EGL] Point hook	If this option is selected, it hooks the current application to the previous point and evaluates the possibility to carry on a profile started before. It prevails on any other assignment of placing, including the (X1,Y1,Z1) parameters. The placing in X, Y, Z is defined in relative mode with null displacements in relation to the point of end application of the previous working. In the case of hooking between milling operations, you may check that raising and lowering tool processing in the hooking point have been deleted.
[EGI] Rel <-	It is assessed only if the Relative[EG] parameter is enabled.
[A] Rotation angle	Angle of rotation, programmed in degrees. The rotation applies on xy plane only. The rotation centre is the application point applied to the development of the subprogram.
[EMX] Horizontal mirror	Mirror parameter If selected, it sets a specular setting around a vertical axis on the face plane. If selected at the same time as the **Vertical Mirror** parameter, it sets a symmetry with regard to the X and Y axes.
[EMY] Vertical mirror	Mirror parameter If selected, it sets a specular setting around the horizontal axis on the face plane. If selected at the same time as **Horizontal Mirror**, it sets a symmetry with regard to the X and Y axes.
[EINV] Invert	If selected, it inverts the execution of the subroutine: the last block becomes the first, etc. The transform inverts also the tool correction settings (right or left) of each setup.
[NOP] Element of reference for the setup	The field is available, if it is permitted by the configuration of TpaCAD and it sets the NAME assigned to a working programmed before; in this case the field assigns the whole setup of all the generated profiles and the settings of the setup in the **Technological parameters** node are ignored.
TECHNOLOGICAL PARAMETERS	
[TMC] Machine	Machine number
[TR] Group	Group number on the machine
[EM] Electrospindel	Number of the electric spindle
[T] Tool	Tool number.
[TP] Tool typology	Tool typology.
[F] Entry speed	Tool entry speed.
[S] Rotation speed	Tool rotation speed
STRECH FACTORS	
[EFAT] Enable	
[FAT] Factor	
[ZFAT]3d scale	
REPETITIONS	
[NR] Repetitions	It sets the number of the repetitions to be added to the basic application. The minimum significant value is 1.
[NX] X Offset	It sets the X positioning offset applied to each repetition. It is interpreted in relative.
[NY] Y Offset	It sets the Y positioning offset applied to each repetition. It is interpreted in relative.
[NZ] Z Offset	It sets the Z positioning offset applied to each repetition. It is interpreted in relative.
[EGO] Rel ←	If it is selected, it applies the positioning offsets in relation to the initial point of the previous repetition.
[EGLR] Point hook	If it is selected, it hooks each repetition to the final point of the previous repetition. The [NX,NY,NZ] Offset and [EGO] Point hook parameters are ignored.
[E1A] A Offset	It sets the angle increase for every repetition in relation to the previous repetition.

FUNCTION: POLAR SYSTEM

Instruction of a polar geometric solution

It programs a global function as a solution of a polar geometry; it determines the (x,y) coordinates that correspond to polar coordinates (pole, vector, angle).

We remind you that global functions are special logical instructions which allow you to perform a more or less complex calculation procedure and to assign directly results in <j> variables. A global function has:
· a list of known arguments
· one or more return values written in <j> variables.

The instruction expresses a condition that:
- **true**, proceeds to solve the geometric problem and assigns the <j> variables, as requested
- **false**, the instruction does not have any effect.

For further details reference is made to the TpaCAD manual, chapters ***Workings->Logical instructions-> J Variables, Workings->Logical instructions->Global functions.***

Parameters:

IF (...)? (...)? (...)

[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned through six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it solves TRUE value if both the terms are verified • **Or**: it solves TRUE value if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it solves TRUE value if both the terms are verified • **Or**: it solves TRUE value if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: (e5) ? (e6) with [TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)

Arg..	The node gathers the assignment fields of the function arguments
[I] X Centre [J] Y Centre	(X,Y) coordinates of the polar system centre (pole)
[A] Angle	Angle on xy plane against X axis (in degrees)
[U] Module	Distance from the pole along the direction set in A
ret..	The node gathers the assignment fields of the function returns:
[XP] Xp =>j..	It sets the J variable index returning the x coordinate
[YP] Yp =>j..	It sets the J variable index returning the y coordinate

FUNCTION: ROTATE PLANE GEOMETRY

Instruction for the solution of a rotation in a plane geometry

It programs a global function as a solution of the rotation of a point in the plane; it determines the (x,y) coordinates that correspond to the rotation around a centre on an assigned angular position.

We remind you that global functions are special logical instructions which allow you to perform a more or less complex calculation procedure and to assign directly results in <j> variables. A global function has:

- a list of known arguments
- one or more return values written in <j> variables.

The instruction expresses a condition that:

- **true**, proceeds to solve the geometric problem and assigns the <j> variables, as requested
- **false**, the instruction does not have any effect.

For further details reference is made to the TpaCAD manual, chapters ***Workings->Logical instructions-> J Variables, Workings->Logical instructions->Global functions.***

Parameters:

IF (...)? (...)? (...)

[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned through six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it solves TRUE value if both the terms are verified. • **Or**: it solves TRUE value if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it solves TRUE value if both the terms are verified. • **Or**: it solves TRUE value if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: (e5) ? (e6) with [TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)

Arg..	The node gathers the assignment fields of the function arguments
[X] Qx [Y] Qy	Original coordinates
[I] X Centre [J] Y Centre	(X,Y) coordinates of the centre of the polar system (pole)
[A] Angle	Final angle on xy plane against X axis (in degrees)

ret..	The node gathers the assignment fields of the function returns:
[XP] Xp =>j..	It sets the J variable index returning the x coordinate
[YP] Yp =>j..	It sets the J variable index returning the y coordinate

FUNCTION: MIRROR PLANE GEOMETRY

Instruction for the solution of a mirror on a plane geometry

It programs a global function as a solution of a mirror for a point around an axis; it determines the (x,y) coordinates that correspond to the mirrored position of the point.

We remind you that global functions are special logical instructions which allow you to perform a more or less complex calculation procedure and to assign directly results in <j> variables. A global function has:

- a list of known arguments
- one or more return values written in <j> variables.

The instruction expresses a condition that:

- **true**, proceeds to solve the geometric problem and assigns the <j> variables, as requested
- **false**, the instruction does not have any effect.

For further details reference is made to the TpaCAD manual, chapters ***Workings->Logical instructions-> J Variables, Workings->Logical instructions->Global functions.***

Parameters:

IF (...)? (...)? (...)

[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned through six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it solves TRUE value if both the terms are verified. • **Or**: it solves TRUE value if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it solves TRUE value if both the terms are verified. • **Or**: it solves TRUE value if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: (e5) ? (e6) with [TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)

Arg..	The node gathers the assignment fields of the function arguments
[X] Qx [Y] Qy	Original coordinates
[X1] X1 [Y1] Y1	(X,Y) coordinates of the first assignment point of the mirror axis
[X2] X2 [Y2] Y2	(X,Y) coordinates of the first assignment point of the mirror axis

ret..	The node gathers the assignment fields of the function returns:
[XP] Xp =>j..	It sets the J variable index returning the x coordinate:
[YP] Yp =>j..	It sets the J variable index returning the y coordinate:

FUNCTION: OFFSET GEOMETRY IN THE PLANE

Instruction for the Solution of an offset applied to a linear segment

It programs a global function as a solution of the offset of a linear segment; it determines the (x,y) coordinates that correspond to the position of the compensated segment extreme points.

We remind you that global functions are special logical instructions which allow you to perform a more or less complex calculation procedure and to assign directly results in <j> variables. A global function has:

- a list of known arguments
- one or more return values written in <j> variables.

The instruction expresses a condition that:

- **true**, proceeds to solve the geometric problem and assigns the <j> variables, as requested
- **false**, the instruction does not have any effect.

For further details reference is made to the TpaCAD manual, chapters ***Workings->Logical instructions-> J Variables, Workings->Logical instructions->Global functions.***

Parameters:

IF (...)? (...)? (...)

[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned through six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it solves TRUE value if both the terms are verified. • **Or**: it solves TRUE value if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it solves TRUE value if both the terms are verified. • **Or**: it solves TRUE value if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: (e5) ? (e6) with [TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)
Arg..	The node gathers the assignment fields of the function arguments
[X1] X1 [Y1] Y1	(X,Y) coordinates of the first assignment point of the linear segment
[X2] X2 [Y2] Y2	(X,Y) coordinates of the second assignment point of the linear segment
[D] Compensation radius	Distance between the original segment and the compensated one.
[DN] Compensation	It selects the compensation side of the segment (against the direction of the segment, form the (X1, Y1) point to the (X2,Y2) point
ret..	The node gathers the assignment fields of the function returns:
[RET] funoffset =>j..	It sets the J variable index returning the compensation result: 1 (#0) if OK; 0 otherwise (invalid arguments)

[X1P] X1p =>j..	It sets the J variable index returning the compensated x coordinate of the first point
[Y1P] Y1p =>j..	It sets the J variable index returning the compensated y coordinate of the first point
[X2P] X2p =>j..	It sets the J variable index returning the compensated x coordinate of the second point
[Y2P] Y2p =>j..	It sets the J variable index returning the compensated y coordinate of the second point

FUNCTION: UNIT VECTOR LINES

Instruction of solution of LINEAR SEGMENT VECTORS

It programs a global function as a determination of a linear segment unit vectors; it determines the unit vectors for the three directions of the segment in the space.

We remind you that global functions are special logical instructions which allow you to perform a more or less complex calculation procedure and to assign directly results in <j> variables. A global function has:

- a list of known arguments
- one or more return values written in <j> variables.

The instruction expresses a condition that, if:

- **true**, proceeds to solve the geometric problem and assigns the <j> variables, as requested
- **false**, the instruction does not have any effect.

For further details reference is made to the TpaCAD manual, chapters ***Workings->Logical instructions-> J Variables, Workings->Logical instructions->Global functions.***

Parameters:

IF (...)? (...)? (...)

[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned through six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it solves TRUE value if both the terms are verified. • **Or**: it solves TRUE value if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it solves TRUE value if both the terms are verified. • **Or**: it solves TRUE value if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: (e5) ? (e6) with [TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)
Arg..	The node gathers the assignment fields of the function arguments
[X1] X1 [Y1] Y1 [Z1] Z1	(X,Y,Z) coordinates of the first assignment point of the linear segment
[X2] X2 [Y2] Y2 [Z2] Z2	(X,Y,Z) coordinates of the second assignment point of the linear segment
ret..	The node gathers the assignment fields of the function returns:
[RET] funversore =>j..	It sets the J variable index returning the compensation result: 1 (#0) if OK; 0 otherwise (invalid arguments)
[U] vet =>j..	It sets the J variable index returning the vector length

[CX] cosa =>j..	It sets the J variable index returning the unit vector associated to the X axis
[CY] cosb =>j..	It sets the J variable index returning the unit vector associated to the Y axis
[CZ] cosc =>j..	It sets the J variable index returning the unit vector associated to the Z axis

FUNCTION: MULTIPLE AND/OR

Instruction for the solution of multiple logical conditions

It programs a global function as a solution of multiple logical conditions calculated in the And/Or application

We remind you that global functions are special logical instructions which allow you to perform a more or less complex calculation procedure and to assign directly results in <j> variables. A global function has:

- a list of known arguments
- one or more return values written in <j> variables.

The instruction expresses a condition that:

- **true**, proceeds to solve the geometric problem and assigns the <j> variables, as requested
- **false**, the instruction does not have any effect.

For further details reference is made to the TpaCAD manual, chapters ***Workings->Logical instructions-> J Variables, Workings->Logical instructions->Global functions.***

Parameters:

IF (...)? (...)? (...)

[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned through six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it solves TRUE value if both the terms are verified. • **Or**: it solves TRUE value if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it solves TRUE value if both the terms are verified. • **Or**: it solves TRUE value if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: (e5) ? (e6) con [TST3]? assegnato tra sei condizioni di relazione: (<,<=,>,>=,=,#)
Arg..	The node gathers the assignment fields of the function arguments
[E11] e11 [E12] e12 [T1] ?	Assignment parameters of the first comparison term: **(e11) ? (e12)** with **[T1]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
…	… until five comparison terms are assigned
ret..	The node gathers the assignment fields of the function returns:
[AND] AND =>j..	It sets the index of the J variable returning the (logical AND) condition among the five terms
[ORZ] OR =>j..	It sets the index of the J variable returning the (logical OR) condition among the five terms

FUNCTION: DETERMINANT OF 3*3 MATRIX

Instruction for the solution of the 3*3 matrix determinant

It programs a global function as a solution of the determinant of a 3*3 square matrix.

We remind you that global functions are special logical instructions which allow you to perform a more or less complex calculation procedure and to assign directly results in <j> variables. A global function has:
- a list of known arguments
- one or more return values written in <j> variables.

The instruction expresses a condition that:
- **true**, proceeds to solve the geometric problem and assigns the <j> variables, as requested
- **false**, the instruction does not have any effect.

For further details reference is made to the TpaCAD manual, chapters ***Workings->Logical instructions-> J Variables, Workings->Logical instructions->Global functions.***

Parameters:

IF (...)? (...)? (...)

[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned through six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And**: it solves TRUE value if both the terms are verified. • **Or**: it solves TRUE value if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And**: it solves TRUE value if both the terms are verified. • **Or**: it solves TRUE value if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: (e5) ? (e6) with [TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)

Arg..	The node gathers the assignment fields of the function arguments
[A11] a11 [A12] a12 [A13] a13	Elements of the first matrix row
[A21] a21 [A22] a22 [A23] a23	Elements of the second matrix row
[A31] a31 [A32] a32 [A33] a33	Elements of the third matrix row
ret..	The node gathers the assignment fields of the function returns:

[DET] fundet =>j.. It sets the J variable index returning the matrix determinant

GEOMETRIC HOLE

Drilling geometric working

It programs a drilling geometry with assigned coordinates in a Cartesian reference system. The working does not assign technology information, with the exception of the drilling diameter.
The working may result from an import process from an external format (for example: DXF format conversion) and to bore you may need to replace it by a working technological code.
For further details reference is made to the TpaCAD manual, chapter ***Tools->Overall program tools-> Apply technology.***

The parameters to define the working are:

GEOMETRIC PARAMETERS

[TD] Diameter	Drilling diameter
[X] Qx [Y] Qy	Dimensions of application on XY plane of the face.
[Z] Qz	Dimension of depth perpendicular to the face plane.

GEOMETRIC SETUP

Setup geometric working

It programs a setup geometry with [X, Y] assigned coordinates in a Cartesian reference system. The working does not assign any technological information.
The working may result from an import process from an external format (for example: DXF format conversion) and to bore you may need to replace it by a working technological code.
For further details reference is made to the TpaCAD manual, chapter ***Tools->Overall program tools-> Apply technology.***

The parameters to define the working are:

GEOMETRIC PARAMETERS

[X] Qx [Y] Qy	Dimensions of application on XY plane of the face.
[Z] Qz	Dimension of depth perpendicular to the face plane.

MEASURING

Working of measuring

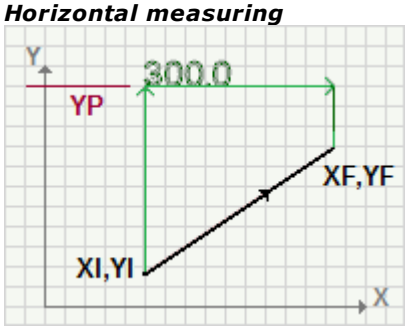
It programs measuring elements, applied to acquired positions. The working is applied through an interactive wizard of utility, recallable from TpaCAD, that doesn't implies an execution.
To gain insight, refer to the TpaCAD manual at the chapter ***Tools->Utility tools->Measuring.***

The parameters to be used are the following ones:

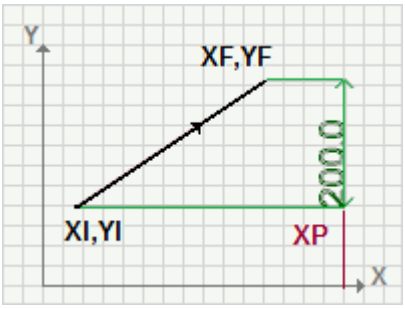
GEOMETRIC PARAMETERS

[XI] X coordinate of the initial point [YI] Y coordinate of the initial point	Coordinate of the first acquired point
[XF] X coordinate of the final point [YF] Y coordinate of the final point	Coordinate of the second acquired point
[SEL] Typology	Select the required measuring typology • **Horizontal** = distance along X between two points • **Vertical** = distance along Y between two points • **Horizontal + Vertical** = distance along X and Y between two points • **Diagonal** = distance XY between two points
[XP] X coordinate of application	X coordinate used for the measuring impersonation. The field has not meaning in case of Horizontal typology.
[YP] Y coordinate of application	Y coordinate used for the measuring impersonation. The field has not meaning in case of Vertical typology;
[HC] Font height	Height of the characters
[DEC] Number of decimal places	Number of the decimal places on the measure writings. Set an integer value between 0 (without decimal places) and 4. if the field is not set, there are: - 2 decimal places each prg in [mm] - 3 decimal places each prg in [inch]

EXAMPLE:
Horizontal measuring



Vertical measuring


Y
XF,YF
200.0
XI,YI
XP
X

L24: Path

Working that programs a single path element

It programs a curvilinear segment from the current point, directly defining the final point dimensions and the segment directions on the extremities. A single L24 segment solves a broken line of micro-linear segments, a sampling of the theoretical curve that solves the geometric conditions set.
To gain insight, refer to the TpaCAD manual at the chapter ***Workings->Profile->Path*.**

The parameters to be used are the following ones:

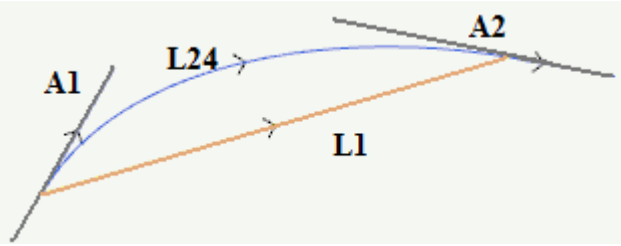
GEOMETRIC PARAMETERS

[XI] Initial X [YI] Initial Y [ZI] Initial Z	Coordinates of the starting point. If **all** the coordinates are not defined, the profile assigned before is carried on, otherwise an open profile starts (without setup).
[X] Final X [Y] Final Y [Z] Final Z	Coordinates of the final point. It is the point of application
[EG] Relative	If selected, it indicates that the coordinates of all the axes are assigned in relative values. A coordinate can be forced as absolute by entering **"a;"** before the same dimension. For instance, if a Y dimension relative to the previous point but with absolute X dimension = 50 has to be programmed, the relative flag shall be enabled and X dimension shall be set = a;50.
[A] Start tangent	Angle of inclination of the curve, on the start point.
[A2] Arrival tangent	Angle of inclination of the curve, on the arrival point.

TECHNOLOGICAL PARAMETERS

[DVAR] Compensation	The tool compensation changes in the interpolated segment. The choice is among: • **Unchanged=** it carries on the current status; • **Restart=**if the status is in interruption or suspension, the compensation is restarted. The resumption applies the setting values of setup (side and radius of compensation); • **Break=**it interrupts the compensation of the current segment: the downstream segments shall not be corrected until the next resumption • **Suspend=**it suspends the compensation: the segments with suspended compensation are not corrected and the compensation is calculated on the first downstream segment on which the compensation is resumed. To gain insight, refer to the TpaCAD manual at the chapter ***Workings->Tool compensation*.**
[DSIDE] Change compensation side	It inverts the compensation side (from left to right or vice versa). The activation of this selection is subject to limitations, as follows: • the request may correspond to a resumption of correction after an interruption; or • the previous segments, corresponding to the request, may calculate an intersection of the compensated segments; or • the previous segments, corresponding to the request, assign an inverted geometry. This option is available only in **Professional mode only.**
[F] Movement speed	It sets a movement speed value different from the settings in the previous profile blocks.

EXAMPLE:
The picture shows the associated development to a Path element.



L1 is the linear segment joining the extreme points of the segment (the segment is the comparison term with the generated curve)
L24 is the generated curve matching the L1 segment:

- A1 is the starting tangency of the curve
- A2 is the closing tangency of the curve.

SUBNEST

Working of subprogram recalling with positioning overall dimensions

It programs the call of a subprogram assigning the overall dimensions and positioning of the subprogram.
This working is primarily used to create a "nesting" where the recall of programs is required and where it is possible to work the top face only and with the requirement that each program is developed on the basis of a placement and sizing that does not depend on the program of "nesting" but on the program itself.

You can insert the working only in the face 1 and recall the face 1 of the subprogram, totally excluding the induced calls.
Furthermore:
- the working cannot be used in development of program or macro; it can only be used at the level of the main program.
- the interpretation of a planned or deducted application point is excluded in the program applied
- any possibility of hooking to a previous working is excluded

Managing the generation and printing of labels may be combined with the management of a "nesting" program. This working assigns a parameter identifying a label file.
When the parameter *Label file* is assigned:
- if the application of the subprogram assigns a BARCODE working the setting is applied to the corresponding parameter
- otherwise, it adds a BARCODE working to the development

The parameters to be used are the following ones:

IF (...)? (...)? (...)	Up to three terms of logic conditioning can be assigned IF (...)? node (...)? (...). The working is carried out only if the required condition is verified as true. Anyway, the condition is verified as true, if the corresponding parameters are not set. Up to three logical conditioning terms can be assigned.
[ESP1] e1 [ESP2] e2 [TST1] ?	Assignment parameters of the first comparison term: **(e1) ? (e2)** with **[TST1]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG1] And/or	Logical condition between the first two terms of comparison: • **And** solves a value as TRUE , if both terms are verified • **Or** solves a value as TRUE, if at least one term is verified
[ESP3] e3 [ESP4] e4 [TST2] ?	Assignment parameters of the second comparison term: **(e3) ? (e4)** with **[TST2]?** assigned among six relation conditions: (<,<=,>,>=,=,#)
[LOG2] And/or	Logical condition between the result of the applied logical condition and the first two terms and the third comparison term: • **And** solves a value as TRUE , if both terms are verified • **Or** solves a value as TRUE, if at least one term is verified
[ESP5] e5 [ESP6] e6 [TST3] ?	Assignment parameters of the third comparison term: **(e5) ? (e6)** with **[TST3]?** with[TST3]? assigned among six relation conditions: (<,<=,>,>=,=,#)

GEOMETRIC PARAMETERS

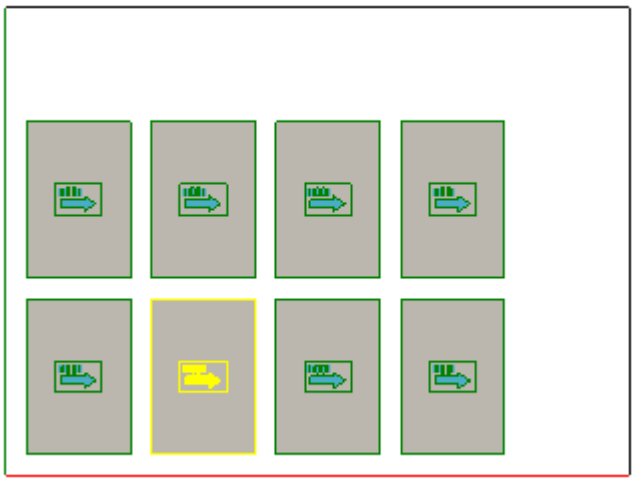
[H] Subroutine	Name of the subprogram It can be edited in parameter or assignation form, opening the file opening window. In this last case the research is set in the standard storage folder of the subroutines (SUB). If the fiels is not assigned, no error is reported.

Rnnn	It sets the reassignable r variables of the subprogram, opening a window for this purpose. It does not works, if the subprogram does not have riassignable variables.
[X] X1 [Y] Y1 [Z] Z1	X, Y, Z application coordinates A point to positions (0;0;0) of the subprogram is translated on the point.
[DS] Label file	Path of the file assigning the label.
[LF] Length [HF] Heigh [SF] Thickness	Dimensions assigned to the piece for the development of the subprogram. Length and height define the overall rectangle assigned for the application of the subprogram: if you use a "nesting" program, the overall dimension corresponds to the cutting path appointed to the cut of the panel. If the field is not set: • Length, Height: they use the corresponding value as read by the subprogram (if it is assigned valid, otherwise it uses the corresponding value of the main program). • Thickness: it uses the correponding value of the main program
[A] Rotation angle	Angle of rotation, programmed in degrees. The rotation is applied only in xy plane. The rotation centre is the application point applied to the development of the subprogram.
[EMX] Horizontal mirror	Mirror parameter. If selected, it sets a specular setting around the vertical axis on the face place. If selected at the same time as the **Vertical Mirror** parameter, it sets a symmetry with regard to the X and Y axes.

Cases of error:

- The use of the working in the development of the subprogram or of a macro involves an error.
- Requiring a geometric transform involves an error if the development of the subroutine has determined the application of a complex code to which a limitation in the application of the current transform is applied. This report can concern the rotation transforms (**Rotation angle [A]**), symmetry (**Mirror [EMX]**).
- In the event of a development outside the assigned overall rectangle, a WARNING is assigned.

EXAMPLE:



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