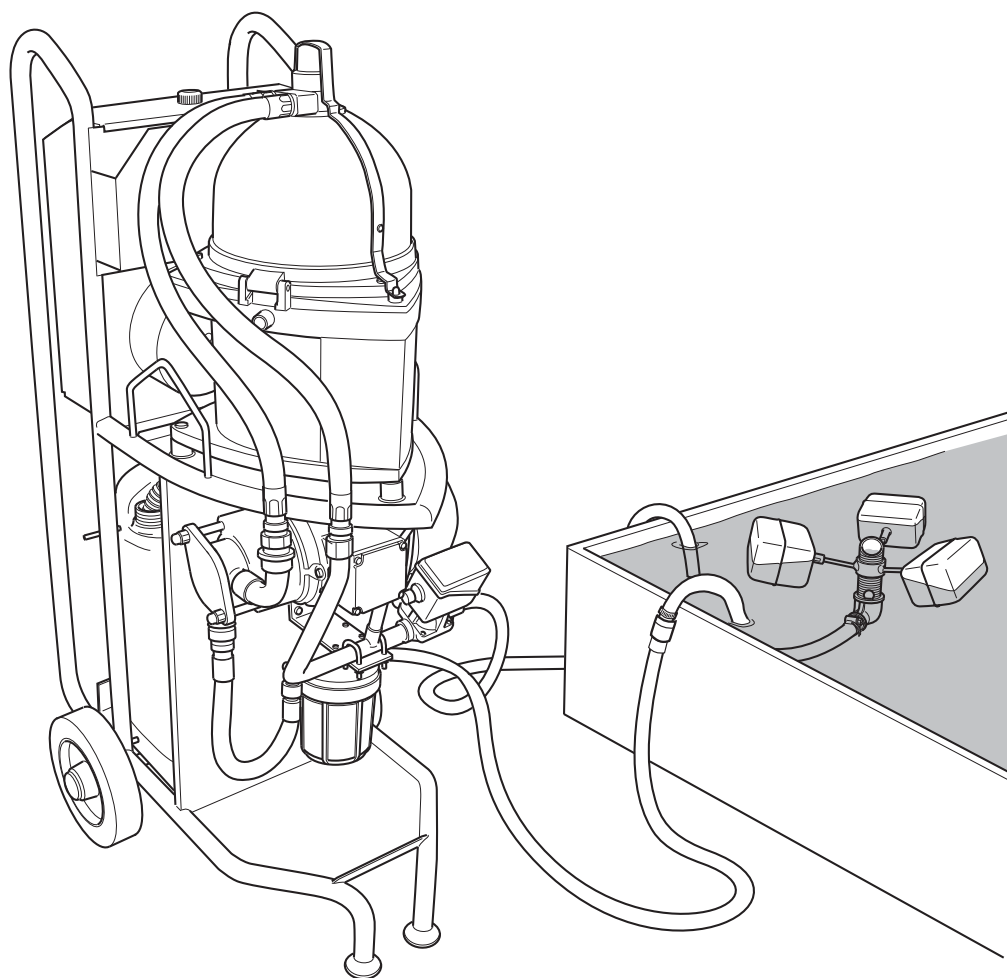


Alfa Laval Alfie

Cleaning system for liquids



Instruction Manual

Product No.: 9016086-80, -81
9016092-80, -81



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Book No.: 9017117-02 Rev. 8

Published By:

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Original instruction

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1 *Safety instructions*



Study this instruction manual and observe the warnings before installation, operation, service and maintenance. Not following the instructions can result in serious accidents.

The centrifugal separator, which is the major part of the cleaning unit, includes parts that rotate at high speed.

Incorrect operation and maintenance of the cleaning unit can result in serious damage and/or injury.

The following basic safety instructions therefore apply:

- **Use the cleaning unit only for the purpose and parameter range specified by Alfa Laval.**
- **Only use the cleaning unit in non-explosion environment.**
- **Strictly follow the instructions for installation, operation and maintenance.**
- **Ensure that personnel are competent and have sufficient knowledge of maintenance and operation.**
- **Use only Alfa Laval genuine spare parts and the special tools supplied.**



Electrocution risk

Switch off the power supply and remove the electric cable from the socket before opening the starter/control unit.



Disintegration hazard

The separator is supplied with a safety yoke and a magnetic safety switch. Modifications to the machine which put the safety devices out of operation can lead to serious injury or damage.

If excessive vibrations occur, **stop** the separator.



Entrapment hazard

Make sure that rotating parts inside the separator have come to a **complete standstill** before moving the cleaning unit or starting any dismantling work.

To avoid accidental start, switch off the power supply and remove the electric cable from the socket before starting **any** dismantling work.

Warning labels

A warning label is placed on the separator hood.
The interpretation of the label is: **STOP!** Read the instruction manual before installation, operation and maintenance. Consider inspection intervals. Another warning label is placed on the door for the heater control unit. The interpretation of the label is: Switch off the power before opening the cover.



Warning label located on separator hood

2 Application

The *Alfa Laval Alfie 500* cleaning system is restricted to the removal of solids and oil from liquids with a temperature range between +15 and +70 °C.



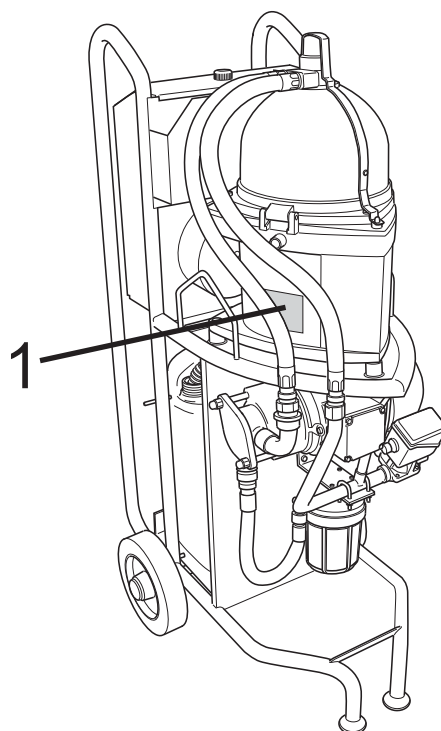
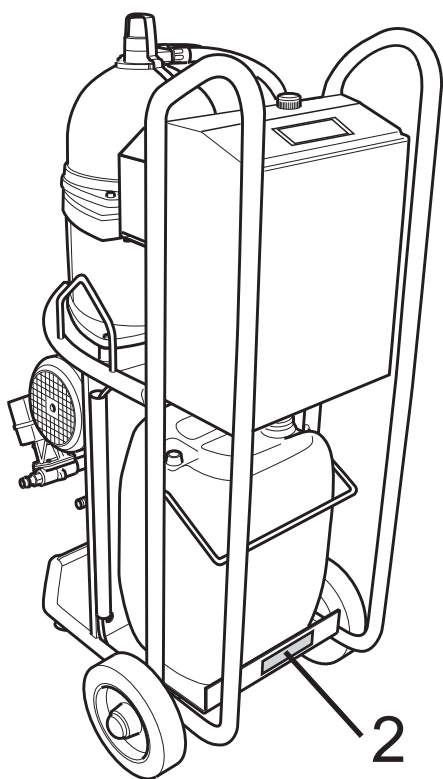
Disintegration hazard

The cleaning system must not be operated in an explosion environment.

3 Machine plates

The cleaning unit has two different machine plates.

1. One for the separator only
2. One for the complete unit



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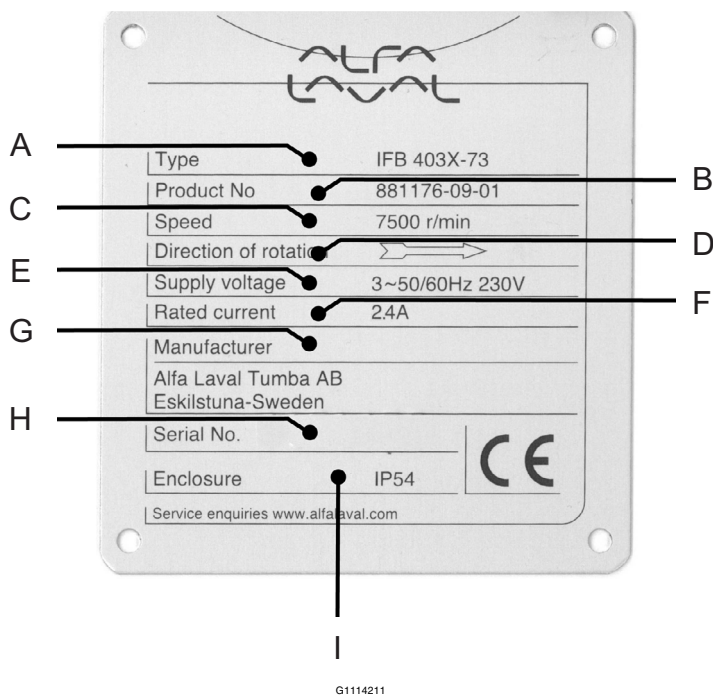
NOTE

When ordering spare parts for the cleaning unit (except the separator) please specify the article and serial numbers stamped on the machine plate (1) for the complete unit.

NOTE

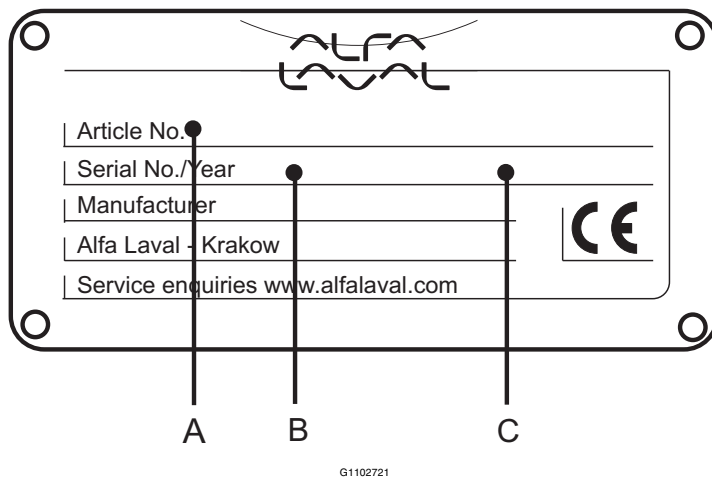
When ordering spare parts for the separator itself, please specify the type, product and serial numbers stamped on the machine plate (2) for the separator.

3 Machine plates



Example of machine plate (separator only)

- | | |
|---------------------------|------------------------------------|
| A. Type: | F. Rated current: (for separation) |
| B. Product No.: | G. Manufacturer: |
| C. Speed: | H. Serial No.: |
| D. Direction of rotation: | I. Enclosure: |
| E. Supply voltage: | |



Example of machine plate (complete unit)

- A. Article No.
- B. Serial No.
- C. Manufacturing Year

Note that the illustrations are examples of a machine plates. Values shown on the illustrations are not valid for all machines.

4 *Description of main parts*

4.1 System overview

The *Alfa Laval Alfie 500* cleaning system consists of the following parts (numbered in process order):

1. Suction device

Feed inlet with adjustable height setting. For tanks with a depth min. 100 mm.

2. Hoses

For in- and outlet of feed between the cleaning unit and the liquid tank.

3. Strainer

Greater particles are removed here before the feed enters the separator.

4. Pump

Feed pump for the liquid. The pump speed is raised until the counter pressure in the outlet line passes 50 kPa.

5. Separator

Removes oil and solids from the liquid. The separator has a bowl hood interlock(•) over the hood and connection housing. A magnetic switch indicates if the interlock is in correct position. If not, the control system prohibits the unit from starting.

6. Pressure sensor at separator outlet

If the counter pressure after the separator does not reach at least 50 kPa within 35 seconds after start the pump is stopped.

7. **Motorised regulating valve**

For maintaining the correct counter pressure in the outlet line (ca. 100 - 180 kPa). The valve is regulated by the control unit (9).

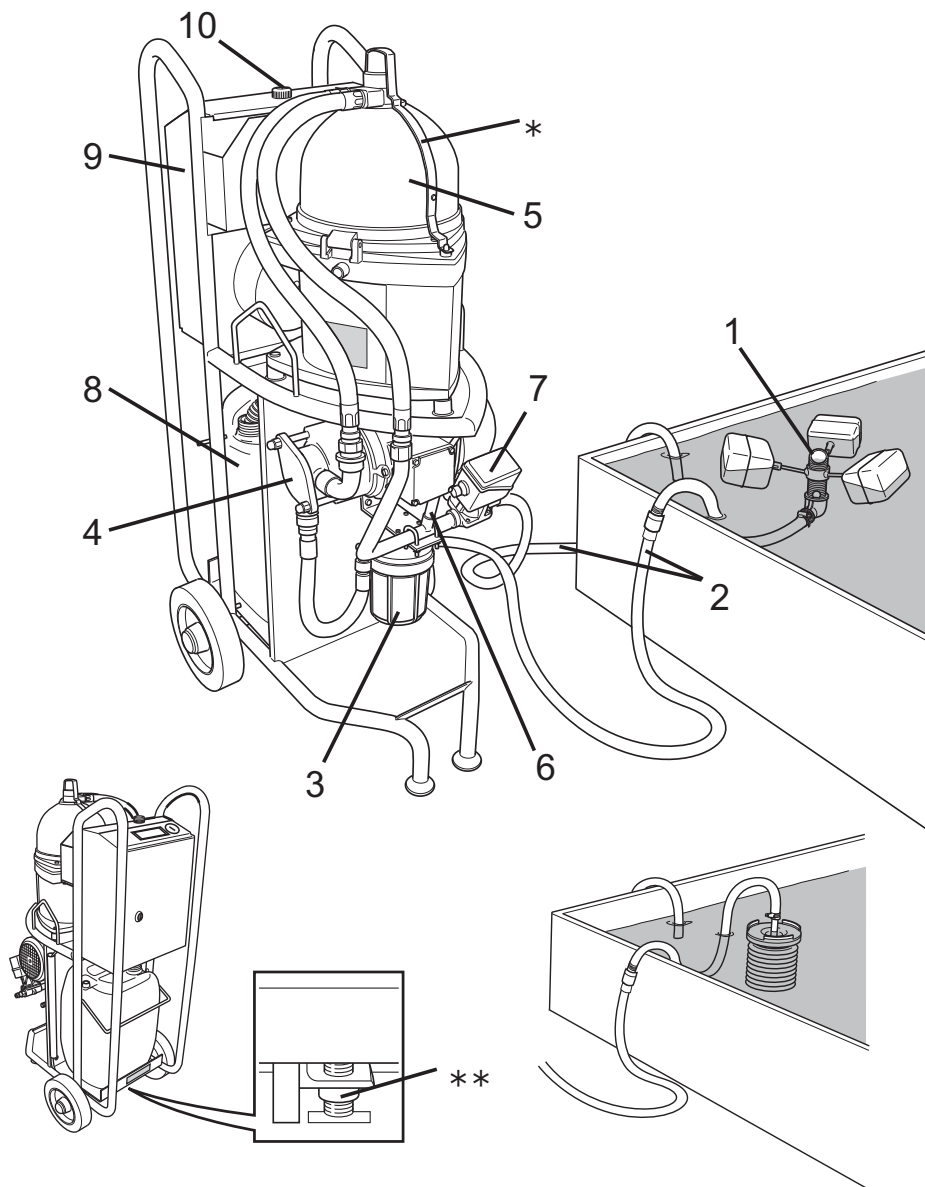
8. **Collecting tank (20 litres)**

Collects the oil separated out from the liquid. The tank stands on a support under the separator which is held in its upper position by a spring with adjustable tension (••). This spring is adjusted by the handle on the underside of the support. When the collecting tank is nearly full the weight will overcome the spring tension and a limit switch is actuated. The signal goes to the control unit (9) which stops the pump (4). An alarm alerts the operator.

9. **Control cabinet**(further described in chapter [6 Control Cabinet on page 21](#)). The control system supervises the starting and stopping of the cleaning unit. It also supervises system functions such as:

- frequency converters, one for the separator and one for the pump.
- motor load
- bowl hood interlock
- amount of liquid in the collecting tank
- counter pressure at outlet

The red alarm light on top of the Control cabinet (10) indicates if there is any problem with the supervised functions. Detailed information of the problem is presented on the operator panel. See [6.3 Alarm light pattern on page 28](#)

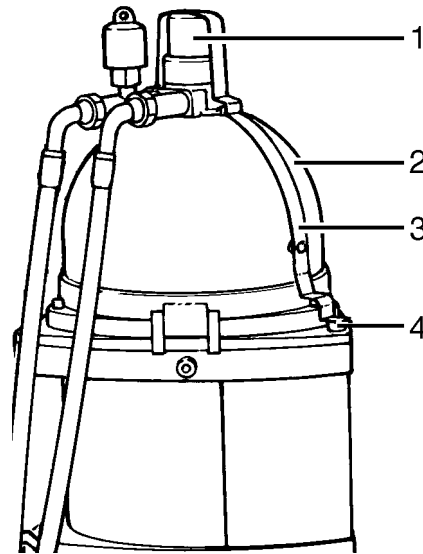


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A suction device of bellows type can preferably be used in shallow tanks (55-100 mm).

4.2 Separator

The separator has a bowl hood interlock (3) over the hood (2) and connection housing (1). A magnet (4) in contact with a safety switch indicates if the yoke is in correct position. If not, no power is supplied to the motor. For a description of the separator function, see [5 Working principle of the separator on page 19](#).



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4.3 Pump

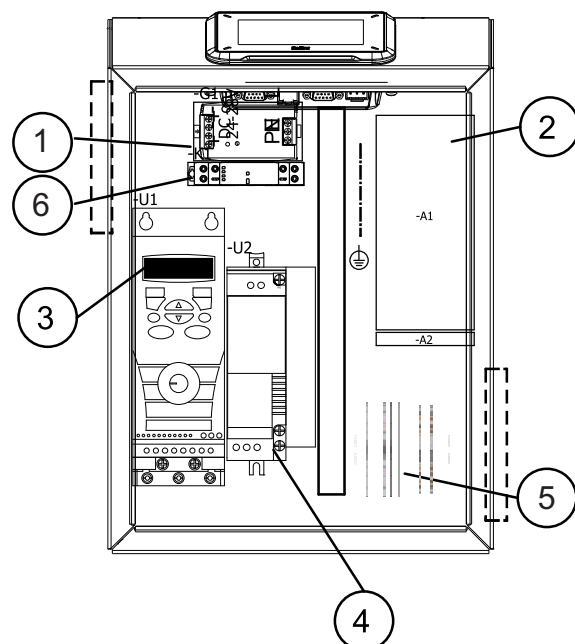
The flow is controlled by the VFD in the control cabinet, see chapter [6 Control Cabinet](#).

4.4 Control unit

The Control unit consist of following main parts:

1. Power supply, 24 V DC
2. PLC kit
3. Frequency converter, separator
4. Frequency converter, feed pump
5. Mini terminal
6. Contactor

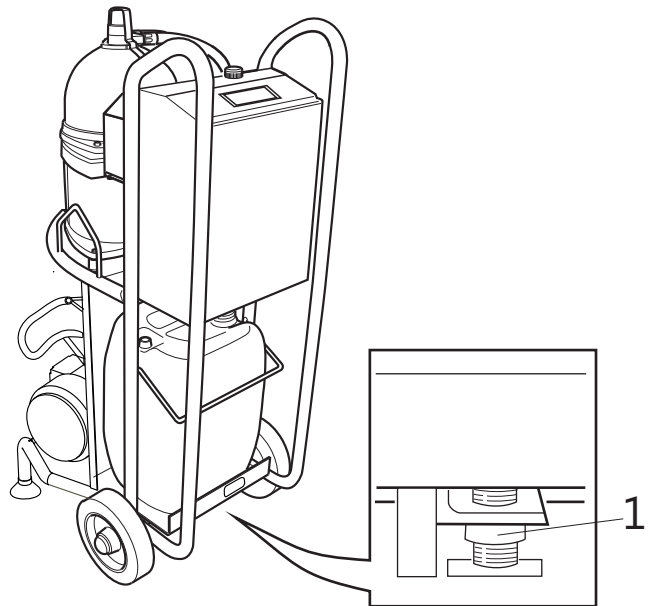
See chapter [6 Control Cabinet](#).



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4.5 Collecting tank

The tank stands on a support under the separator which is held in its upper position by a spring with adjustable tension. The spring can be adjusted by the handle (1) on the underside of the support. When the collecting tank is nearly full the weight will overcome the spring tension and a limit switch is actuated. The signal goes to the control unit which stops the pump. The lamp on the control unit lights up.



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5 Working principle of the separator

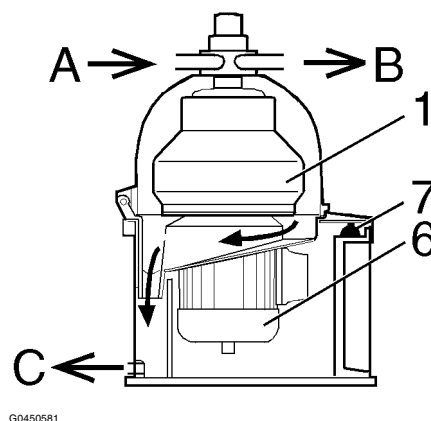
Dirty liquid continuously enters at (A) and flows into the bowl (1). The bowl rotates at high speed generating powerful centrifugal forces. As the liquid rotates with the bowl, the liquid (heavy phase) and solid particles moves towards the periphery of the bowl. The particles (2) are deposited on the bowl wall, while the cleaned liquid enters the channels (3) and leaves the bowl (B) at a constant pressure. The discs (4) in the bowl improves the cleaning efficiency during the separation process. The oil (light phase) is forced towards the centre of the bowl and then leaves through the underside of the bowl at (C) down into the collecting tank.

The speed of the electric motor (6) driving the bowl spindle (5) is regulated by a frequency converter, which by that eliminates any use of a transmission such as a gear or a belt. The converter also acts as a brake when the separator is stopped.

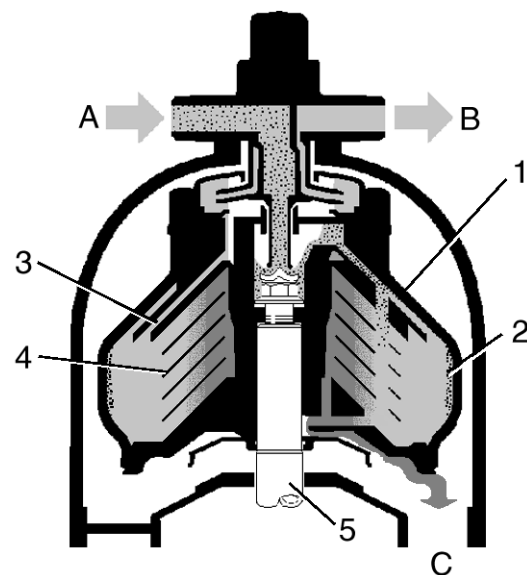
The bowl (1) and motor (6) are suspended on vibration dampers (7).

- A. Liquid inlet
- B. Clean liquid outlet
- C. Oil outlet to collecting tank

- 1. Bowl
- 2. Particles (sediment)
- 3. Channels from bowl to outlet B
- 4. Conical discs
- 5. Bowl spindle
- 6. Electric motor
- 7. Vibration dampers



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6 Control Cabinet

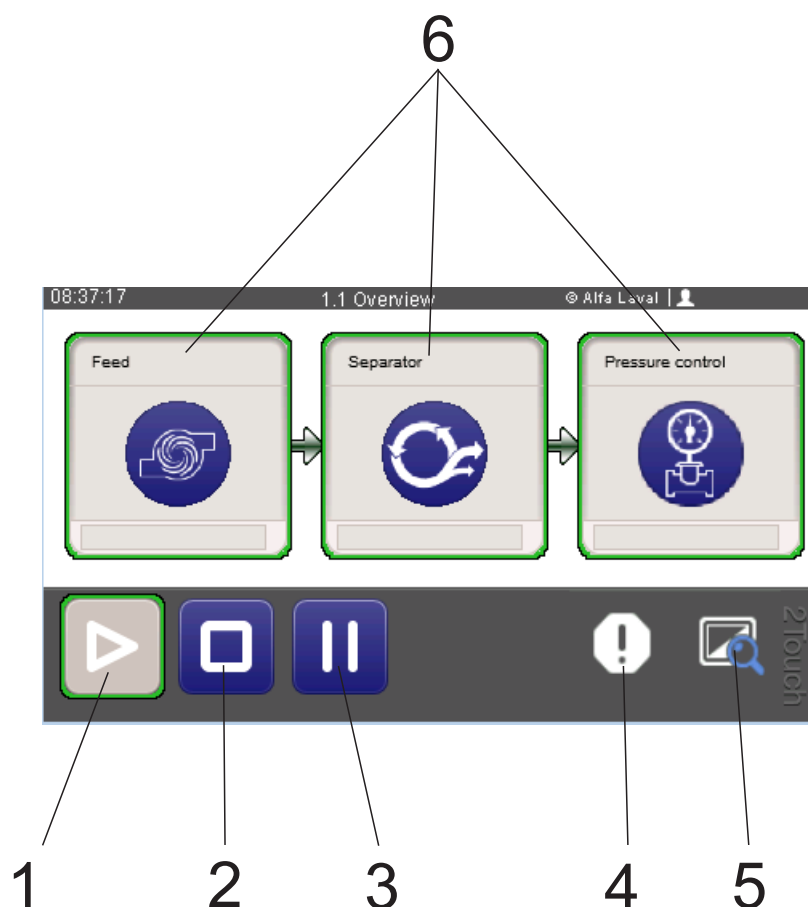
The operator panel is a 4" touch screen placed on top of the control cabinet. Do not use metal or any sharp objects to operate the panel. A stylus pen or similar however, can be used.

Inside the control cabinet there are two frequency converters for regulating the speed of the separator and the pump, a 24VDC power supply and a PLC.

There are no operator controls inside the cabinet, so it should not be opened. Qualified personnel only are allowed to open the cabinet.

On top of the cabinet there is also an alarm light. It is used to indicate the status of the unit. See [6.3 Alarm light pattern on page 28](#).

6.1 Operator panel



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- | | |
|-------------------|---------------------------------|
| 1. Start button | 4. Alarm button |
| 2. Stop button | 5. Dynamic Back/Overview button |
| 3. Standby button | 6. Sub-equipment tiles |

Control bar

The control bar is always visible at the bottom of the screen.



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Start, Stop and Standby buttons are blue when they are accessible, and grey when they are not. When an operating mode is active the corresponding button is circled in green.

The Alarm button takes the operator directly to the Alarm list (see “Alarm list” on page 30). If there is an active alarm the button will be red.

The Back/Overview button has different functions depending of which screen is displayed. If **Back** is displayed the button will switch to the previous screen.



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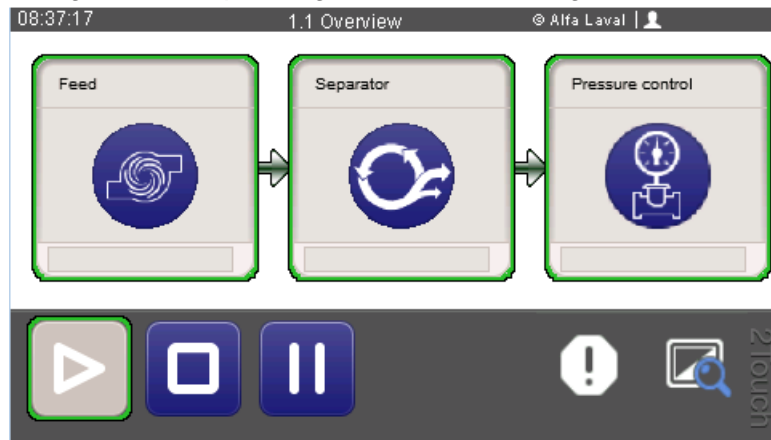


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If **Overview** is displayed it will switch to the overview screen.

Tiles

The startup screen contains three tiles, each representing a sub-equipment of the unit. When a sub-equipment is running the corresponding tile will be circled green.



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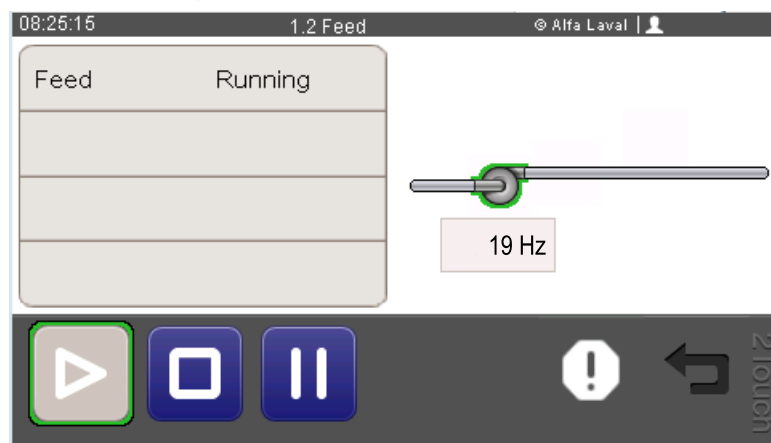
Tapping a tile will display an overview of all devices within that sub-equipment.

On the left hand side there is a status row for the sub-equipment and if applicable, setpoints for the devices and control functions for that subequipment.

On the right hand side is a graphical overview of the sub-equipment. Each device is circled green if running or open, and red if an alarm exists for that device. Actual values, such as pressure readings and speed, are displayed next to the device.

Feed

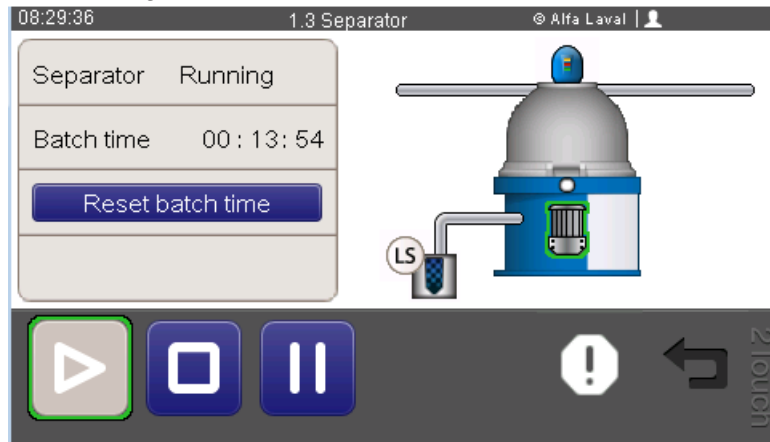
The **Feed** screen shows the feed pump.



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Separator

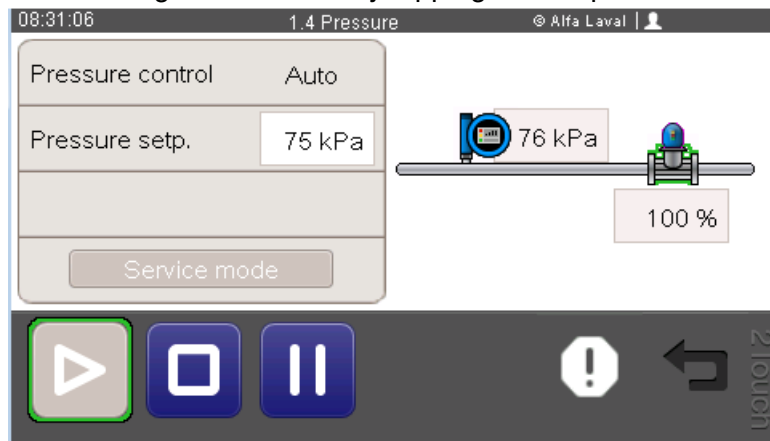
The **Separator** screen shows the separator motor, the bowl hood interlock and the tank limit switch. A trip counter for batch running time is available.



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Pressure control

The **Pressure control** screen shows the pressure sensor and the pressure regulation valve. Pressure set-point can be changed from here. By tapping the set-point value a touch dial will appear.

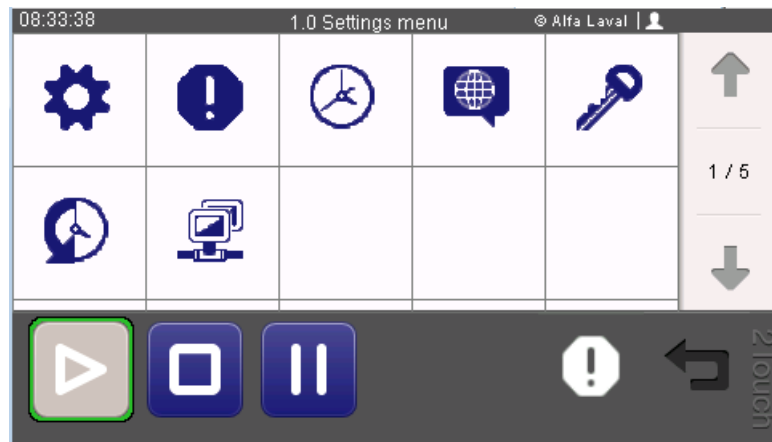


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When the unit is at standstill, the operator can switch to Service mode and enable manual control of the regulating valve. This is only intended as an operational test of the valve. It cannot be used when the unit is running.

Overview

By tapping the **Overview** button the Overview screen is displayed.



G1113851

From there the operator is given access to the following screens (starting on the top left hand side):

Parameters

Configuration of the system. Only possible to change values when logged in as Administrator.

NOTE

Administrator access level is only for Alfa Laval service engineers.

Alarm history

A list of all past alarms

System time

Set system time so correct time stamps are made in the alarm list.

Language

Set system language.

Login

Login and logout to change access level.

Operating timers

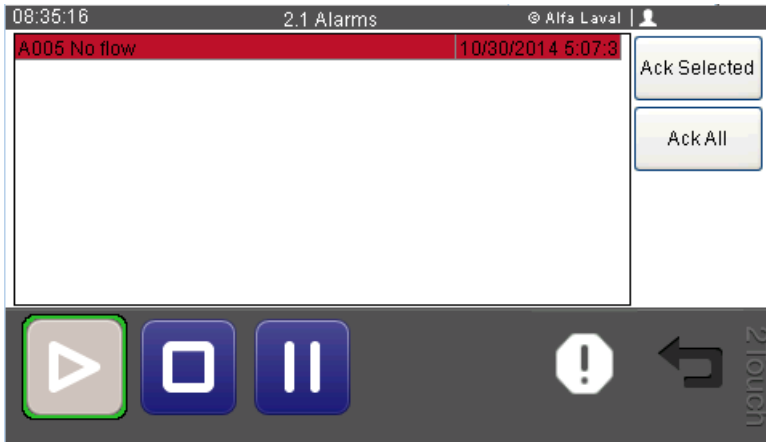
Separate running timers are available for System, Separator motor, Feed pump motor and Regulating valve.

System overview

Status of the control system; program versions, used RAM, internal temperature, etc.

Alarm list

The Alarm list shows all active and all unacknowledged alarms. It is always accessible from the Control bar.



G1113861

Alarms can be for operator information only but in most cases it also forces the unit to another operating mode. See “6.4 Alarm table” on page 33.

The operator acknowledges alarms with the two buttons on the right hand side.

Red indicates an unacknowledged alarm, yellow an acknowledged but still active alarm and green an unacknowledged but no longer active alarm.

6.2 Connection for correct voltage

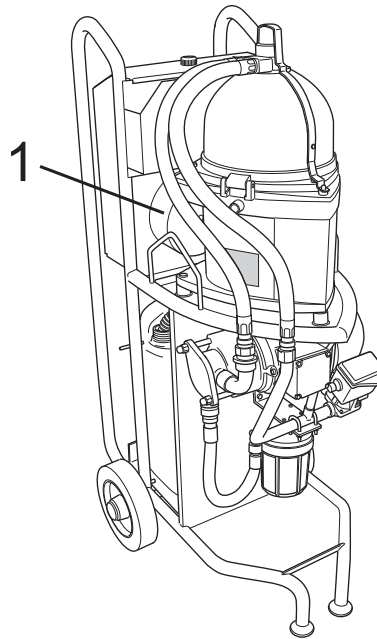
NOTE

If the power supply is equipped with an ELCB (Earth Leakage Circuit Breaker) make sure that it is of industrial type that allows higher (30mA at 230 V) leakage current.

If the cleaning unit should be connected to other voltage than 230 V, the unit should be equipped with a transformer (1). Other possible voltages are then 100, 110 and 120 V.

Switching between voltages requires changing of transformer connection inside the control cabinet. See circuit diagram. This should only be done by qualified personnel.

If a transformer is connected, first check that the power cable is correctly connected in the control unit before operating the cleaning unit. For further information, see chapter *Electrical system*.



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Location of transformer (1) if fitted

6.3 Alarm light pattern

| | |
|------------------------------|---|
| Off | <ul style="list-style-type: none">- In STOP when separator is in standstill- In PRODUCTION |
| Steady shine | <ul style="list-style-type: none">- During START- If an active alarm that has been acknowledged exists- During STOP as long as separator is not in standstill |
| Blinking (0.5s on, 0.5s off) | <ul style="list-style-type: none">- When feed pump speed is boosted (Startup speed)- If an unacknowledged alarm exists |
| Flashing (0.2s on, 2s off) | <ul style="list-style-type: none">- If system is in STANDBY and no alarm is active |

6.4 Alarm table

| Alarm | Alarm delay | Description | Action |
|---|-------------|---|--|
| A001 Low counter pressure | 15s | Too low counter pressure. | See 8.3 Pump stops on page 37 . |
| A002 Startup pressure | 35s | Too low startup pressure. | See 8.3 Pump stops on page 37 . |
| A003 Pressure sensor out of range | 5s | Signal out of range on PT. | Check sensor cable. Replace sensor. |
| A004 Max time in Standby | N/A | Maximum time in STANDBY (180 min) exceeded. | Restart the cleaning unit. |
| A005 No flow | 60s | No flow, regulator valve closed for too long. | See 8.7 No flow from pump on page 39 . |
| A006 High temp cabinet | 15s | High temperature in control cabinet | Check ventilation for control cabinet. |
| A100 Feed pump motor overload | 1s | Frequency converter fault for feed pump. | Check motor connection. Check pump motor. Check control cables to Frequency converter. |
| A200 Bowl hood interlock open | 1s | Bowl hood interlock out of correct position. | See 8.1 Cleaning system/separator does not start or stops shortly after start on page 37 |
| A201 Oil tank full | 5s | Collecting tank full. | Empty the tank and start the pump. |
| A202 Separator motor overload | 1s | Frequency converter fault for separator. | Check separator motor connection. Check separator motor. Check control cables to Frequency converter. |
| A300 (For Alfa Laval Emmie with heater only) Heater overheat | 5s | Alarm only | |

7 *Operating instructions*

7.1 Before first start

Check that the unit is wired for correct voltage, see [6.2 Connection for correct voltage on page 27](#).

7.2 Before normal start

1. If the strainer (pos. 7) has been cleaned/emptied, check that filter housing is filled with liquid.
2. If the cleaning unit has been out of operation for a longer period, the pump impeller should be greased before use to receive optimal suction ability.
3. Place the suction device (1A) with floaters in the tank as illustrated. If using the optional suction device with bellows (1B), place it in the tank as illustrated. Fill the inside of the bellows with liquid by pressing it below the surface. The device 1A is floating while 1B stands on the tank bottom.
4. Check that the hose for the feed inlet (2) is connected to the strainer. Admitted suction height for the separator is max. 1.7 metres.
5. Check that the return hose for the feed outlet (3) is placed securely in the tank and far away from the feed inlet, if possible.
6. Make sure that the three hood screws (4) and the knob (5) are firmly tightened and that the bowl hood interlock(6) is in closed (vertical) position.

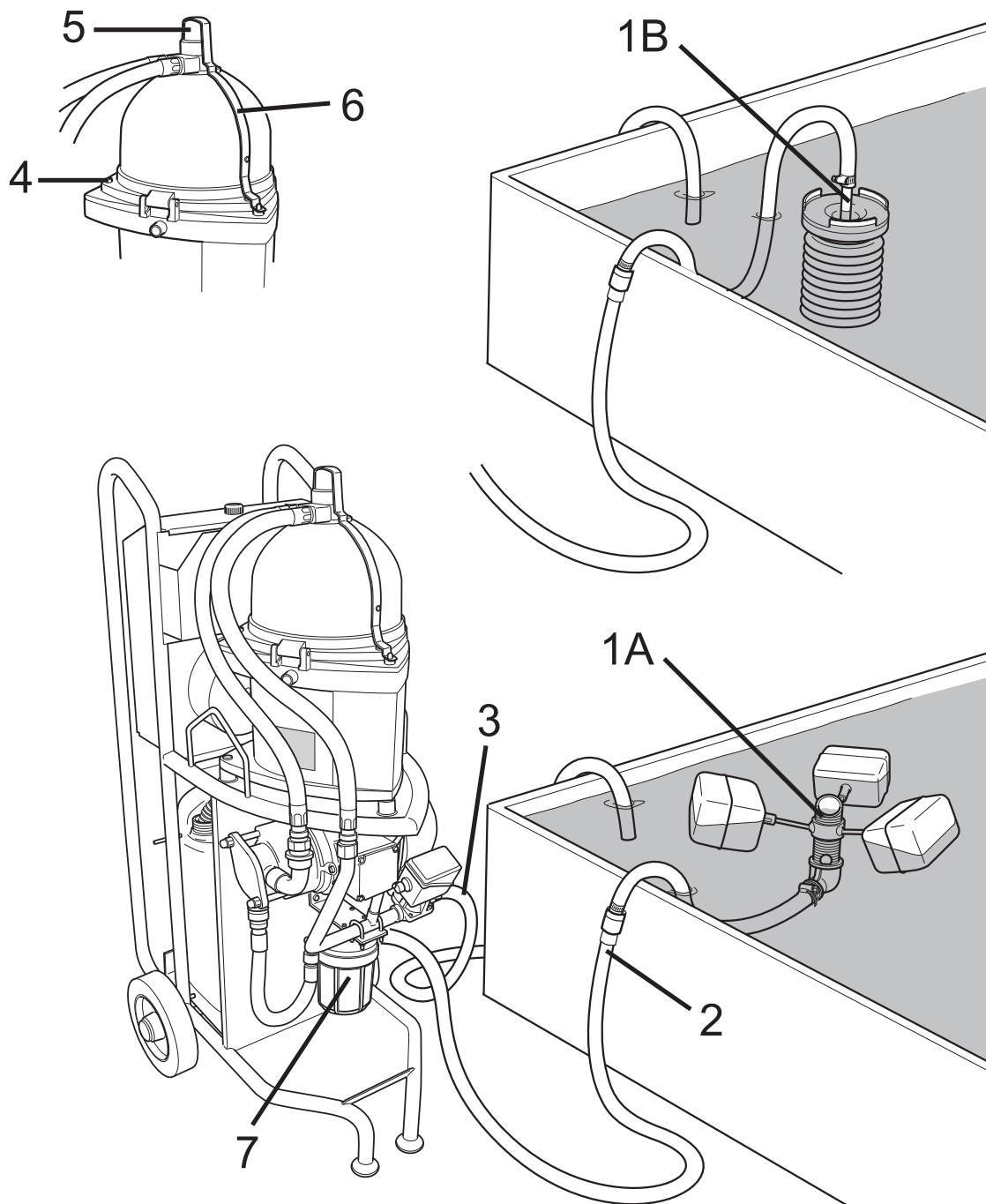
7.3 Start

1. Connect the unit to the power supply.

**NOTE**

Fill the filter housing with liquid before start. Running the pump dry will damage the impeller and may result in damage to the pump housing and/or motor.

7 Operating instructions



G1102311

- 1a. Suction device for deeper tanks (min. 100 mm)
- 1b. Suction device for shallow tanks (55 - 100 mm)
- 2. Feed inlet
- 3. Feed outlet

- 4. Hood screws (3 pcs)
- 5. Knob
- 6. Bowl hood interlock
- 7. Strainer

2. When there is no alarm active and unacknowledged the operator can tap the Start button and the cleaning unit will start. The separator starts. When it has reached full speed the feed pump starts. The control system waits for the pressure to rise. When the pressure has reached the set-point (see tile menu for pressure under [6.1 Operator panel on page 21](#)), the feed pump speed decreases to separation speed and the automatic pressure regulation starts. The cleaning unit is now running in Production mode.

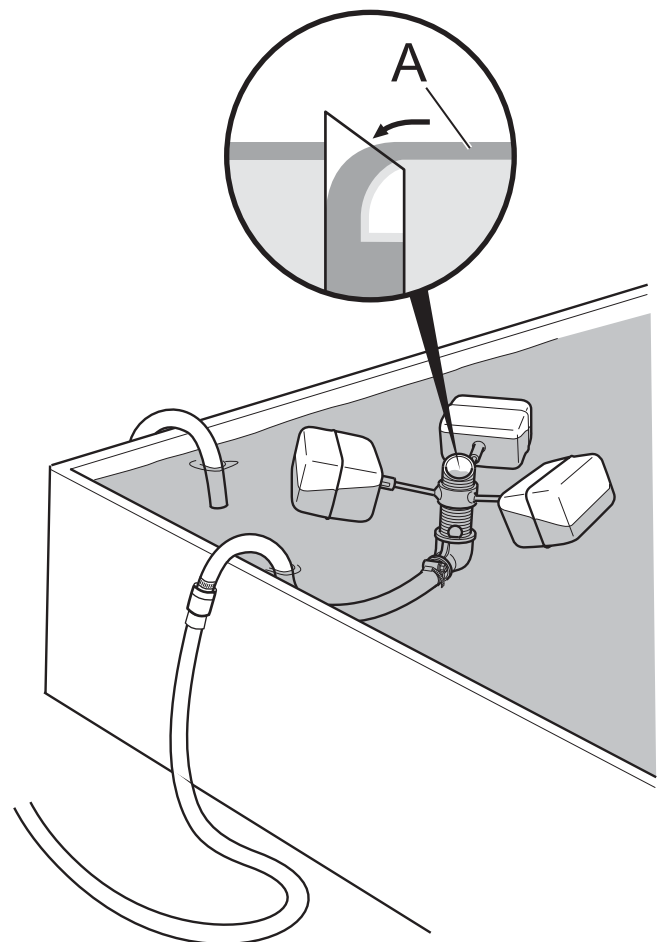


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Disintegration hazard

Some vibration can occur for short periods during the start phase when the separator passes through the critical speed. This is normal and passes over without danger. If the vibration becomes very severe or continues at full speed, stop the separator immediately. See chapter [8.6 Separator vibrates on page 39](#) for possible causes.

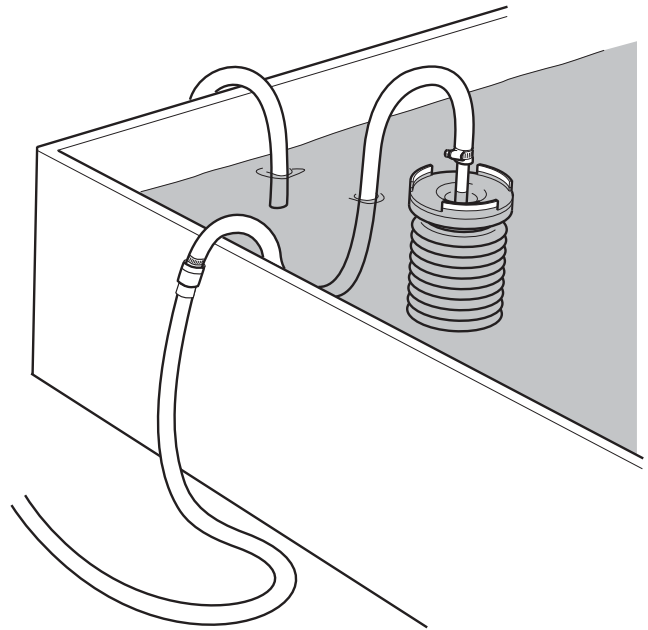
3. Check that the flow into the suction device is as illustrated. It is the surface layer A (normally oil) that should be sucked into the inlet. If the suction device is lying too high, air is sucked in. If the device is lying too low, liquid under the oil layer will be sucked instead of the oil itself.



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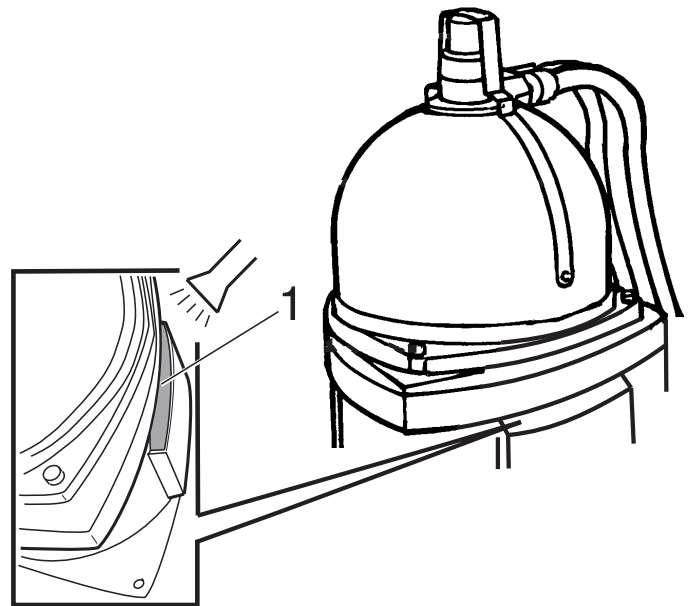
7 Operating instructions

If using the suction device with bellows (option), check that the top is located just under the surface in the tank so that the surface layer is sucked into the bellows. The setting is self-adjusted.



4. Increase the counter pressure slowly until a small stream of oil/ liquid is observed coming from the oil outlet (1). Preferably, use a torchlight to see this. Reduce the counter pressure to increase the oil concentration or increase the counter pressure to improve the oil removal efficiency of the separator.

5. After adjustment of the counter pressure, check that the pressure is within the recommended range (100 - 180 kPa).



7.4 Operation

1. Check the cleaning unit for correct operation (correct flow from outlet, counter pressure and vibration). This is especially important the first time the cleaning unit is run after installation or dismantling and assembly.

2. When the collecting tank is nearly full, the pump is stopped automatically and the lamp on the control unit lights up. The display shows alarm. Empty the tank and restart the pump to continue the cleaning.



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Recommended counter pressure is 100 – 180 kPa

7.5 Standby

If an alarm occurs in Production mode, the system goes into Standby mode. The feed pump is stopped and the pressure regulating valve is opened. The operator can also choose to go to Standby by tapping the Standby button. When there are no alarms active and unacknowledged, the operator can tap the Start button to resume separation by returning to Production mode.

NOTE

If an alarm has forced the system into standby, never do more than one pump restart. Check and remedy the cause. Several restarts can damage the pump, which can also result in damage to the pump housing and/or motor.

7.6 Stop

1. The cleaning unit is stopped by tapping the Stop button, or if an alarm forces the system to stop. Feed pump and separator are turned off. Pressure regulating valve is opened.



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NOTE

After each stop of the cleaning unit, the separator bowl must be cleaned well. If not, an unevenly spaced sludge cake will at next start result in heavy vibration and can cause damage.

NOTE

When the separator has nearly stopped rotating (within two minutes), the liquid content of the bowl will be drained by gravity into the collecting tank.

NOTE

If the position of the tank level is higher than the inlet/outlet of the separator, there is a risk that liquid may be siphoned from the tank and drained via the separator into the collecting tank.

NOTE

If the cleaning unit is not used for a longer period drain the pump from liquid. The rubber material of the impeller ages and should be treated as perishables.

8 Trouble shooting

8.1 Cleaning system/separator does not start or stops shortly after start

| Possible cause | Action |
|---|--|
| No power supplied | Check the mains switch, fuses and supply line |
| Bowl hood interlock is not in correct position | Position the interlock correctly |
| Defective magnetic switch indicating the position of the bowl hood interlock | Check that the switch opens and closes when interlock is moved up and down |
| Incorrect assembly after cleaning. The bowl and motor shaft cannot rotate freely | Dismantle and check |
| Voltage protection for frequency control trips because of too low/high voltage or voltage spikes greater than $\pm 5\%$. | Check the voltage. If unstable voltage, connect a transformer. |
| Separator stops | See 8.4 Separator stops on page 38 . |
| Pump stops | See 8.3 Pump stops on page 37 |

8.2 Pump does not start

| Possible cause | Action |
|--|--|
| Microswitch for filled collecting tank activated | Empty the tank or adjust the spring tension for the tank support |

8.3 Pump stops

| Possible cause | Action |
|---|--|
| Collecting tank filled | Empty the tank and start the pump |
| Overload caused by clogged strainer | Clean the strainer. The motor protector in control unit is automatically reset |
| Counter pressure at separator outlet is lower than 50 kPa | <ul style="list-style-type: none"> • Check that suction inlet is not above surface in tank • Check for obstructed inlet line • Check function of regulating valve • Adjust the counter pressure. See chapter 6 Control Cabinet • Check the direction of rotation for separator and pump |
| Overload caused by obstructed inlet or outlet side | Check that the feed through the whole system is sufficient |

| Possible cause | Action |
|--|--|
| Voltage protection on frequency card trips because of too low/high voltage or voltage spikes | Check the voltage. If unstable voltage, connect a transformer. |
| Defective motor/frequency converter | Remedy - replace |

8.4 Separator stops

| Possible cause | Action |
|--|--|
| Bowl hood interlock out of correct position | Reposition the interlock |
| Overload due to clogged disc stack | Clean the separator disc stack |
| Overload due to incorrect assembly | Check the bowl assembly |
| Tripped frequency converter due to too low or too high supplied voltage ($>\pm 5\%$ of nominal voltage) | Check the voltage. Check the voltage. If unstable voltage, connect a transformer. |
| Also see possible causes and actions in 8.1 Cleaning system/separator does not start or stops shortly after start on page 37 . | |
| Defective frequency converter | Replace frequency control in control cabinet. |

8.5 Noise

| Possible cause | Action |
|---|---------------------|
| Vibration dampers in separator are worn | Fit new dampers |
| Incorrect assembly of separator bowl | Dismantle and check |
| Bearings damaged | Fit new bearings |

8.6 Separator vibrates



Disintegration hazard

If excessive vibrations occur, **STOP** the separator

| Possible cause | Action |
|--|--|
| Bowl out of balance due to: <ul style="list-style-type: none"> • Insufficient or incorrect cleaning (sludge in disc stack) • Unevenly spaced sludge cake (bowl not cleaned prior to start) • Incorrect assembly | Dismantle and clean the separator bowl. Be sure that the separator is assembled correctly. |
| Vibration dampers in separator are worn | Fit new dampers |
| Damaged bearings | Replace the bearings |

8.7 No flow from pump

| Possible cause | Action |
|--|--|
| Incorrect setting of flow control (too low speed of pump) | Start with max. flow. See 6 Control Cabinet . |
| The screw fitted in pump is not closed (internal leakage too high) | Turn the adjustment screw clockwise. |
| Air leakage on suction side between tank and pump | Check that the inlet is below surface in tank. Check that couplings are correctly fitted. |

8.8 Flow too low

| Possible cause | Action |
|--|--|
| Impeller in pump worn or broken | Replace impeller, See 9.6 Replacing the impeller and mechanical seal for pump on page 55 |
| Counter pressure at outlet too high | Reduce the counter pressure with the regulating valve (100 - 180 kPa is recommended) |
| Leakage caused by incorrect assembly | <ul style="list-style-type: none"> The three screws fastening the bowl hood or the paring disc knob (the upper part of the separator) are not completely tightened. Dismantle and check the separator bowl parts. Especially check that no O-rings are missing, are defective or incorrectly fitted. Ensure that the separator is assembled correctly. |
| Separator or pump rotates in wrong direction | Check power supply cables. |

8.9 No flow either through clean oil outlet or through drain to collecting tank

| Possible cause | Action |
|---|---|
| Separator or pump stopped | Check function, see 8.4 on page 38 and 8.3 on page 37 |
| Inlet and outlet hoses for pump wrongly connected | Interchange the hose connections |
| Strainer before separator clogged | Clean strainer |
| Separator disc stack clogged | Clean separator bowl and disc stack |
| Air leakage on suction side between liquid tank and pump | Check that the inlet of the suction device is below surface in tank. Check that couplings are correctly fitted. |
| Impeller attachment to nave is loose | Replace impeller, see 9.6 on page 55 |
| The sleeve fastened to the motorshaft for the pump is loose | Tighten the lock screws, see illustration, pos. 14 & 15 on page 55 |

8.10 Some liquid escaping through drain outlet to collecting tank

| Possible cause | Action |
|--|---|
| Counter pressure at outlet too high | <ul style="list-style-type: none"> Reduce the counter pressure with the regulating valve (100 - 180 kPa is recommended) Reduce the flow by adjusting the screw fitted in pump |
| Leaking O-rings in separator | Replace O-rings |
| Clogged disc stack | Clean the bowl and disc stack |
| The three screws fastening the bowl hood or the paring disc knob (the upper part of the separator) are not completely tightened, causing leakage | Tighten the screws and/or the knob |

8.11 Oil flow through drain outlet to collecting tank only

| Possible cause | Action |
|--|---|
| If operating in purifier mode: broken liquid seal in separator bowl | <ul style="list-style-type: none"> Stop the pump and add water through the inlet at top of the separator. |
| Obstruction in cleaned oil feed line | <ul style="list-style-type: none"> Check that regulating valve is open Check that outlet end to tank is open (no closed check valve in hose connection) |

8.12 Oil leakage through drain outlet to collecting tank when separator is not running

| Possible cause | Action |
|--|---|
| Oil is siphoned from fluid tank due to siphon effect | Disconnect both hoses connected to the oil tank |

8.13 Collecting tank overflowing but pump does not stop

| Possible cause | Action |
|--|---|
| Adjustment of the spring tension for the tank support is incorrect | Adjust the setting. See description in 4.5 Collecting tank on page 17 . |
| Faulty limit switch | Remedy |

8.14 Insufficient separation result

| Possible cause | Action |
|---|--|
| The suction device in liquid tank lays too high | Adjust the height. See description in chapter 7.3 Start on page 31 |
| Separator disc stack clogged | Clean separator bowl and disc stack |
| The counter pressure is too low | Increase the counter pressure until oil is observed to be discharged from the oil outlet, see chapter 7.3 Start on page 31 |

9 Maintenance



Entrapment hazard

Switch off the power supply, remove the electric cables from the sockets and make sure that rotating parts have come to a **complete standstill** before starting any dismantling work.



Never use cleaning agents with a pH below 6 or above 9 as they can damage the metal surfaces.

9.1 Cleaning

9.1.1 Strainer

The strainer has to be cleaned regularly. During the initial period, open and inspect once every week to determine the necessary cleaning interval.



When fitting the filter housing it must first be filled with liquid to prevent the pump operating in dry condition. Otherwise the life of pump will be shortened.

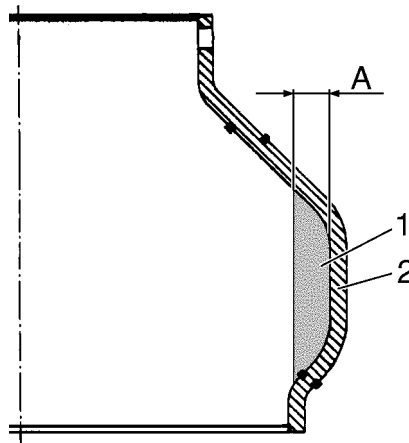
9.1.2 Separator

The separated solids collected inside the separator bowl must be removed manually. The length of the cleaning interval depends on the liquid flow rate and on the amount of solids. During the initial period, open and inspect the bowl once a day to determine the necessary cleaning interval. The bowl must be cleaned before the solids layer has become thicker than 10 mm. Otherwise there will be risk that the clean liquid outlet in the bowl will be covered by solids.

Control of sludge content

Dismantle the separator and measure the thickness (A) of the sludge collected on the bowl wall. The thickness should never exceed 10 mm.

If the interval between bowl cleaning is too long, this can result in a sludge cake that is hard and difficult to remove. Too long interval can also result in that sludge enters the disc stack and hinders separation. Oil overflow and vibration can also occur.



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When cleaning very contaminated oil, bowl cleaning every 20 - 30 minutes could be necessary.

- A. Max. thickness = 10 mm (corresponds to 0.6 litre)
1. Sludge
 2. Bowl wall

See [9.5.2 Cleaning of bowl on page 46](#) for information on procedure.

9.2 Once per month

9.2.1 Pump

Check that the vanes of the impeller are not broken. If a vane is broken replace with a new impeller. Always check that rubber parts from the impeller does not block the hoses or separator inlet (including the inlet pipe). If blocked the new impeller will break very quickly.

The impeller is a wearing part and the performance of the pump will change with the wear. Abrasive liquids will shorten the service life of the impeller and the pump (cover and pump housing).

Frequent dry running or change of rotation will shorten the service life. When operated at high temperatures (more than 55 °C) the service life is shortened. The expected service life differs depending on installation parameters and is normally 200 - 1200 operating hours but can be longer.

9.3 Once per year

9.3.1 Separator

Replace the O-rings with new ones included in the O-ring service kit. Their positions are shown in the *Spare Parts Catalogue*.

See [9.5.3 Replacement of O-rings on page 50](#) for procedure.

Check the condition of discs in the bowl, replace if necessary.

Fit new vibration dampers.

To get access to the dampers, only remove the three screws and washers shown in illustration 10 on page 52. Inspect the stop flanges of the dampers for possible damage and replace the stop flanges with new ones if necessary. Use Loctite 243 at assembly, see illustration 33 in chapter 9.4.5 Replacement of motor bearings.

9.4 Every second year

9.4.1 Separator

Check/replace the disc stack to maintain the separation efficiency.









See 9.5.3 Replacement of O-rings on page 50 for procedure.

9.5 Dismantling - assembly instructions for separator

9.5.1 Introduction

The illustrations on the following pages describe step by step how to dismantle, clean, replace and assemble the various parts of the separator.

The illustrations have symbols only to indicate the actions required. The key to the symbols is given below.

| | | | | | | | |
|---|-------------|---|---------------------------------|---|---|---|--------|
|  | Remove |  | Screw or turn clockwise |  | Press or move in the direction of arrow |  | Clean |
|  | Fit, insert |  | Screw or turn counter-clockwise |  | Check, make sure |  | Safety |

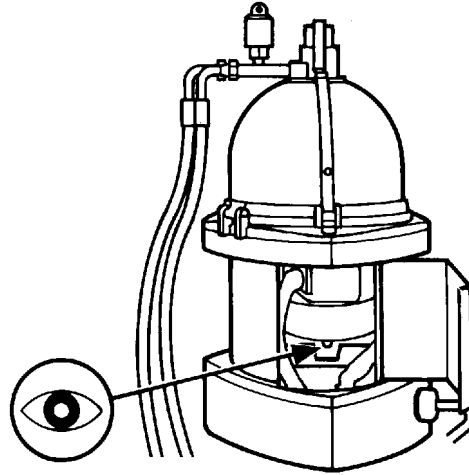
9.5.2 Cleaning of bowl

Comments to illustrations following.

Illustration 4:

Before dismantling the separator, wait until the rotating parts have come to a complete standstill, which will take up to two minutes.

To be sure, open the front cover and check that the rotation of the electric motor shaft has stopped.



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Entrapment hazard

Switch off the power supply, remove the electric cable from the socket and make sure that rotating parts have come to a **complete standstill** before starting any dismantling work.



If the separator is opened too soon, the following could happen:

- The pin on the inside of the connecting housing breaks.
- The pin inside the top of the paring disc breaks.
- Excessive wear of top of level ring.

Illustration 8:

Some coolant will normally leak from the connecting housing when the frame hood is opened. If coolant continues to leak, the cause could be a non-sealing check valve (if any) while the separator is connected to a tank with a level higher than the separator (siphon effect).

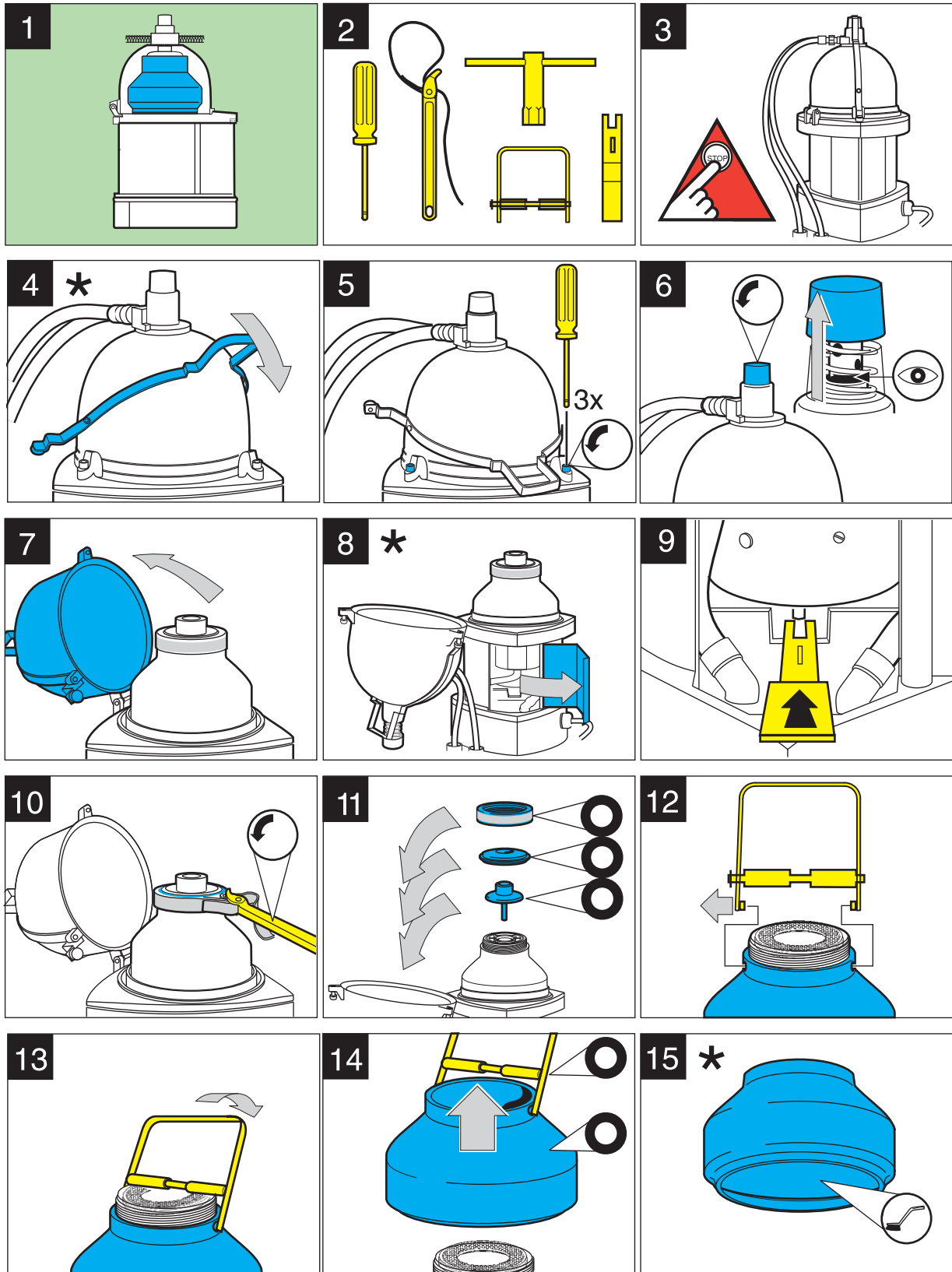
Illustration 15:



Never use sharp or metallic tools when cleaning the bowl wall. This can damage the coating and later on cause pitting corrosion. Always use soft rags.

Cleaning of the disc stack is not normally necessary unless sludge has accumulated and entered the stack (cleaning interval too long).

Dismantling



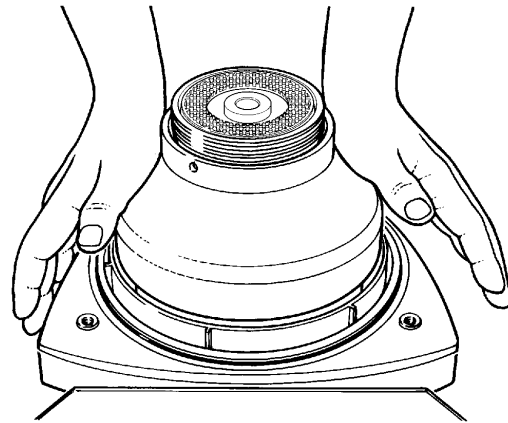
G04491ct

*See comments on opposite page

Comments to illustrations on opposite page.

Illustration 16:

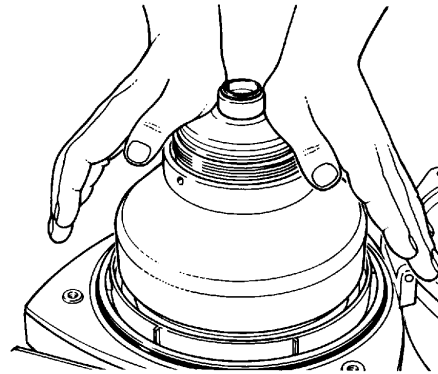
When fitting the bowl shell, press firmly downwards with both hands to overcome the resistance from the O-ring fitted on the bowl bottom. A “clicking” sound will be heard.



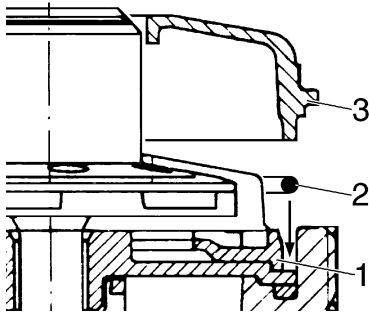
G0912141

Illustration 17:

If the level ring (1) and O-ring (2) have been removed, first fit the level ring and then the O-ring outside the level ring. Finally press down the cover (3) firmly with both hands.



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G0907211

Illustration 18:

Check that the distance illustrated is max. 0.5 mm. If not, the reason could be:

1. The O-ring outside the level ring is not in the downwards position or the O-ring is located under the level ring.
2. Two washers are fitted under the centre screw fixing the bowl to spindle.

Illustration 20:

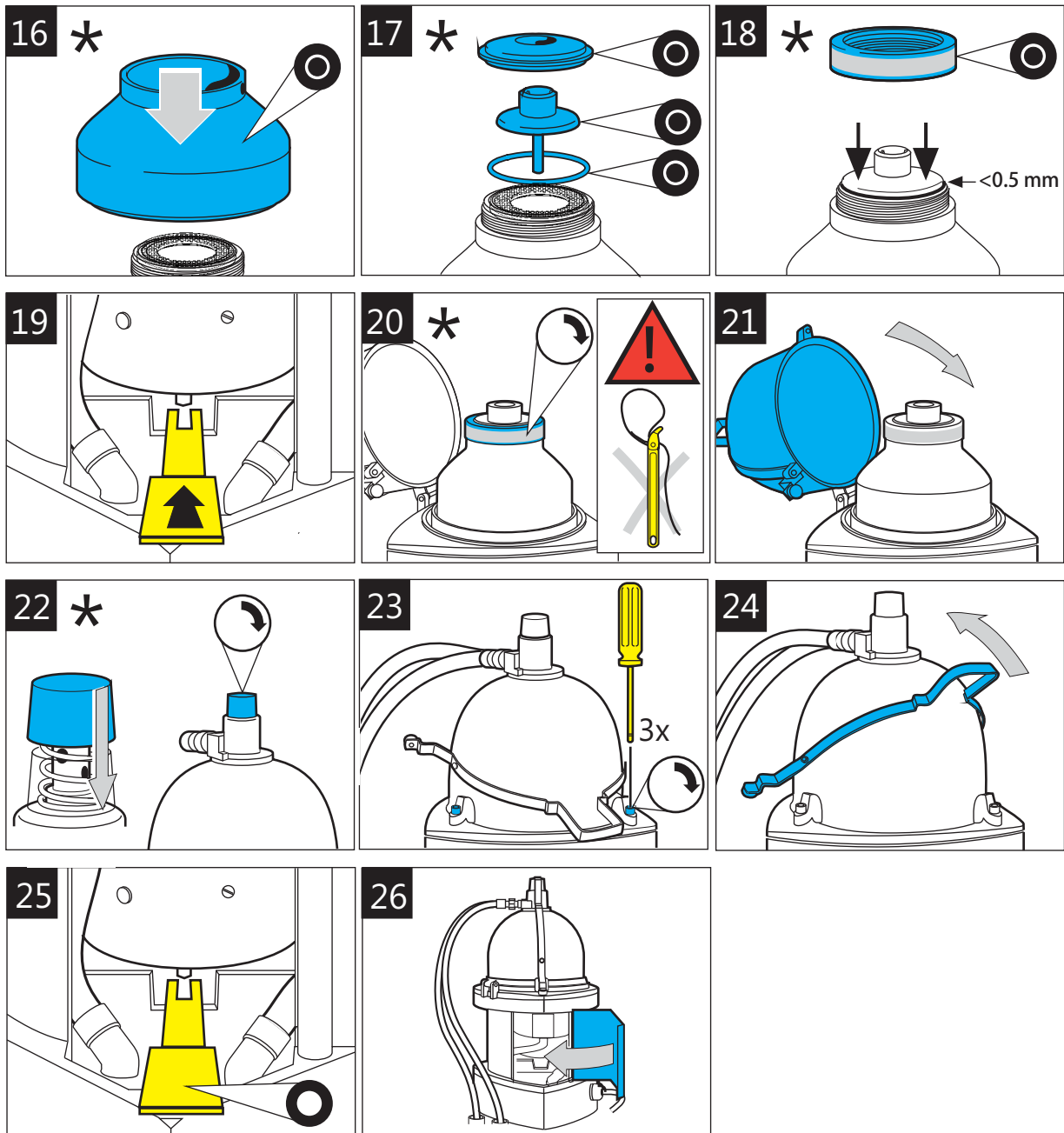
Only tighten by hand. Never overtighten when assembling parts.

Illustration 22:

NOTE

Always screw home the knob fitted on the connecting housing **before** tightening the screws shown in illustration 23. Otherwise there is a risk that the pin inside the connecting housing could break.

Assembly



G0449281

*See comments above and on opposite page.

9.5.3 Replacement of O-rings

Comments to illustrations on opposite page.

Illustration 5:

Take care of the washer.

Illustration 13:

Check that the washer is fitted. Otherwise there is a risk that the bowl will not make firm contact with the spindle.

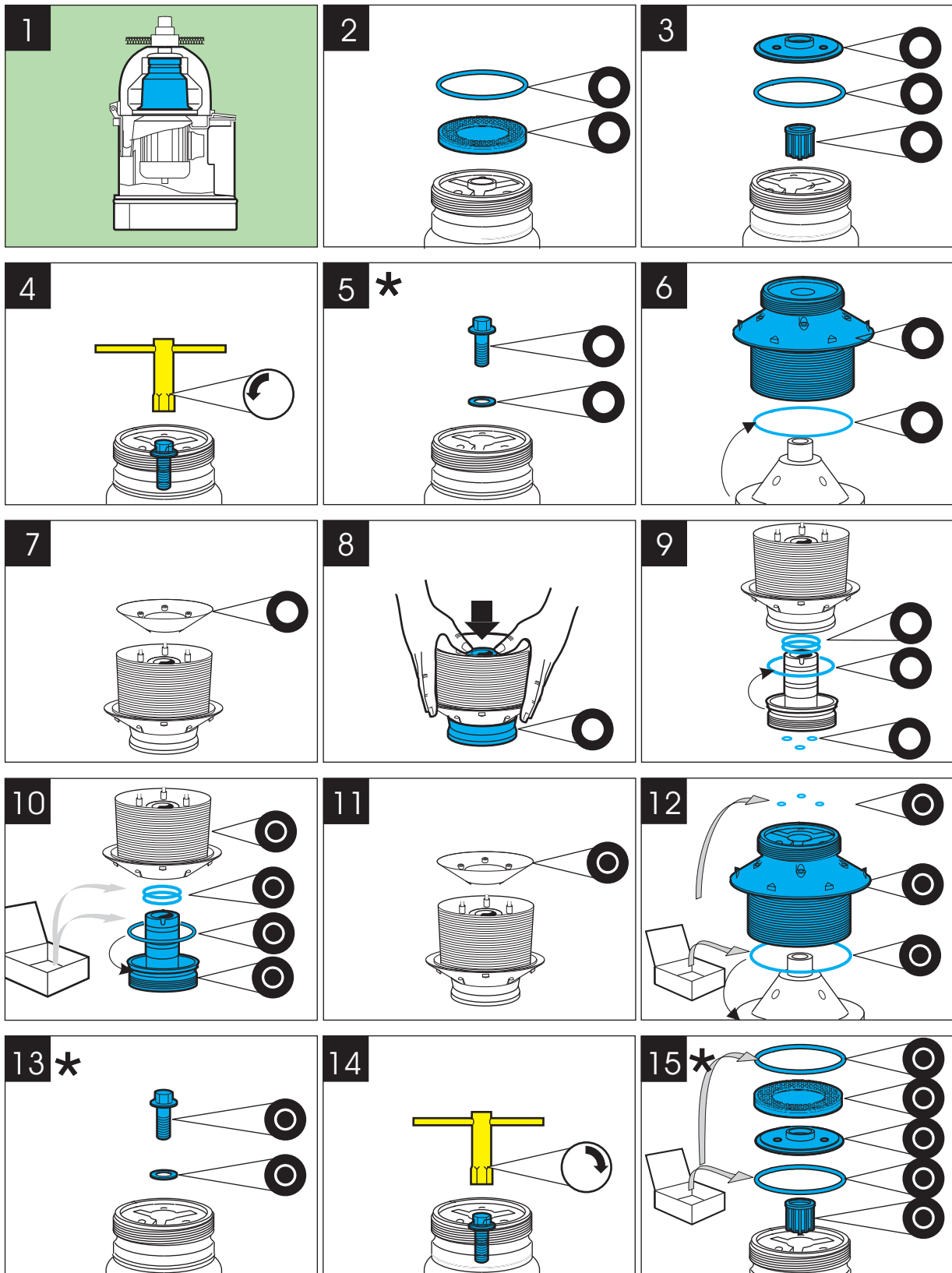
If two or more washers are fitted accidentally this will prevent the top parts of the bowl from being positioned correctly.

Illustration 15:



Fit the upper O-ring outside the level ring, see comments to illustration 17.

First dismantle the separator bowl as described in [9.5.2 Cleaning of bowl on page 46](#).

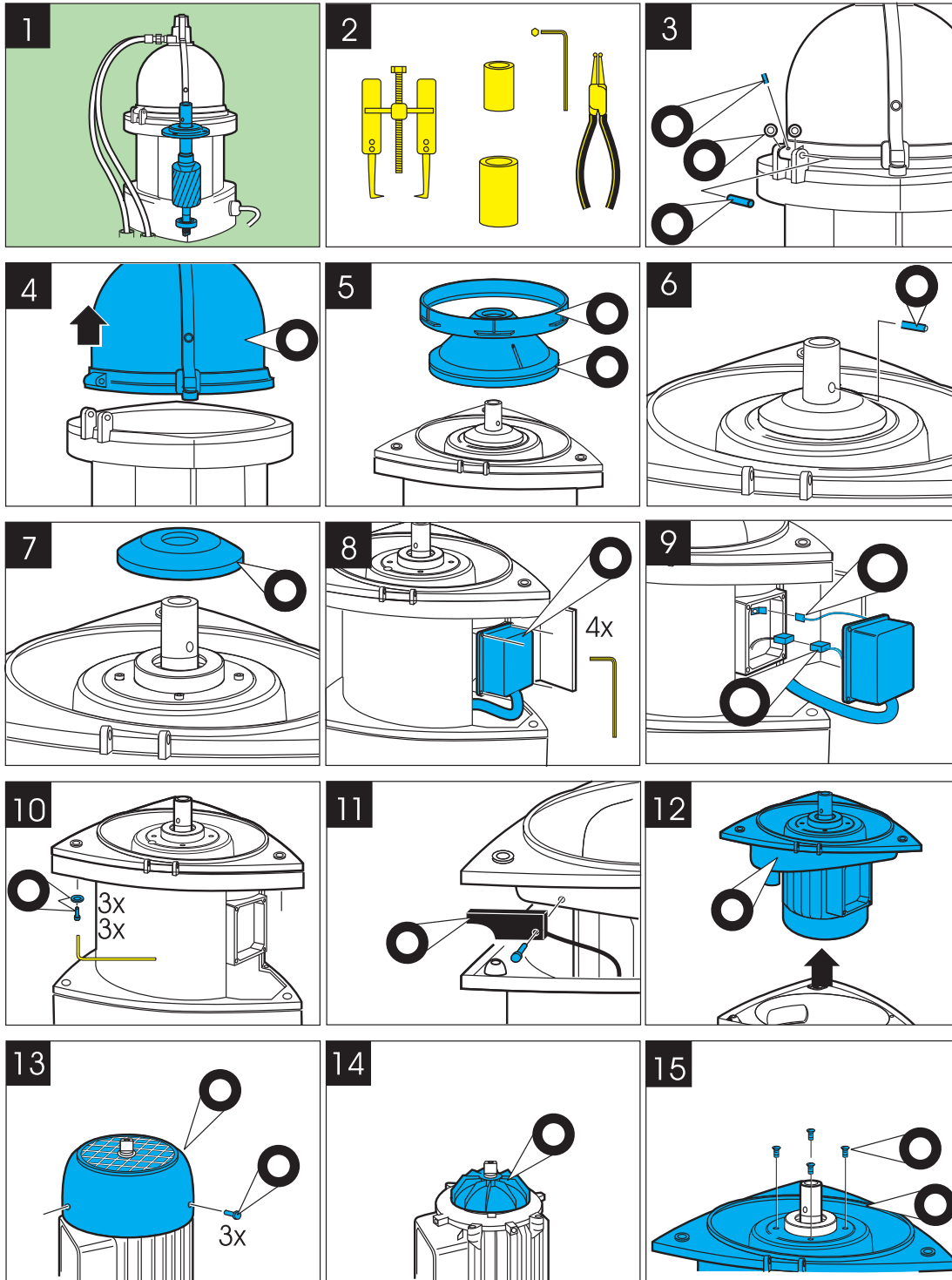


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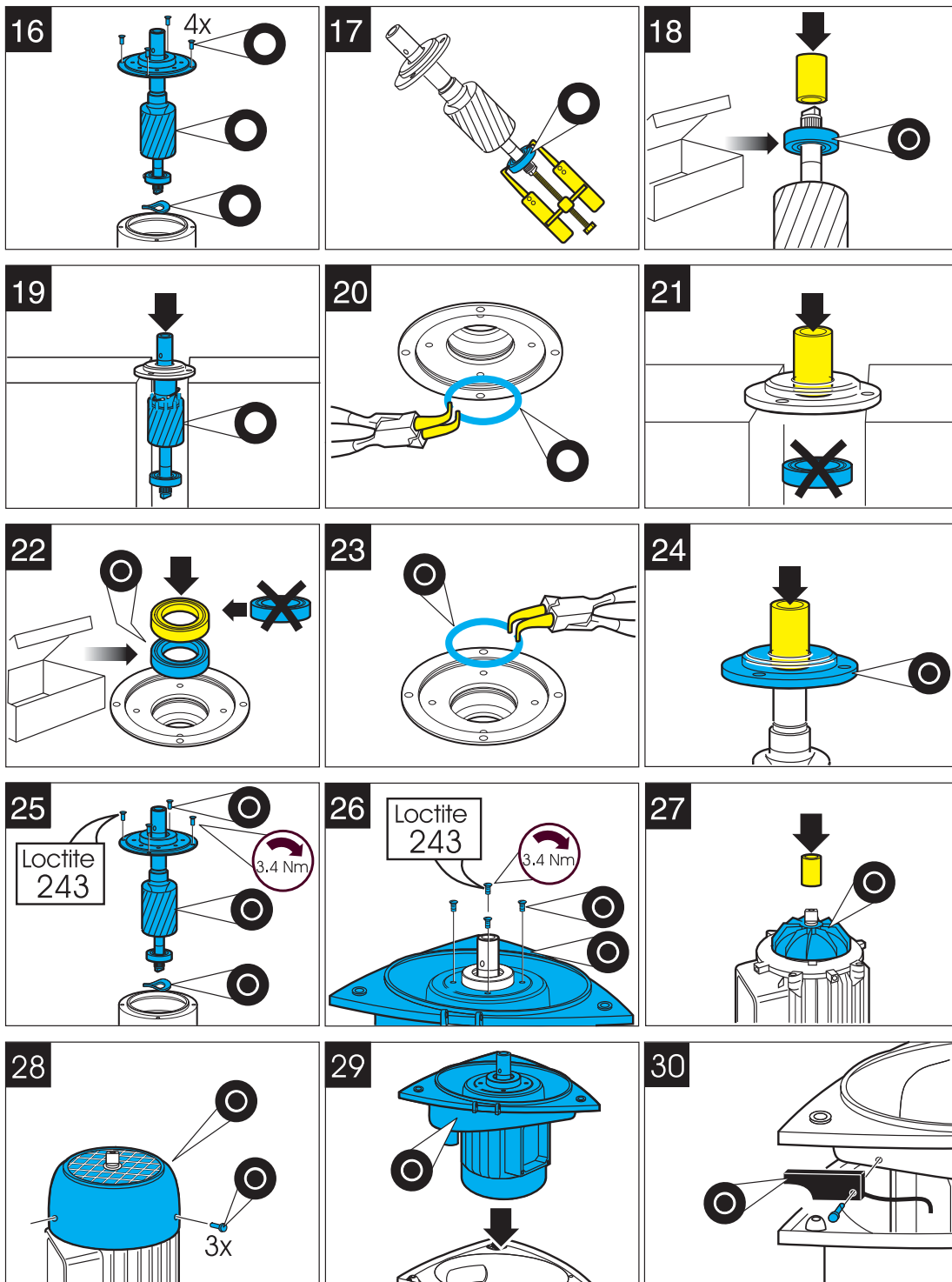
*See comments on opposite page.

9.5.4 Replacement of motor bearings

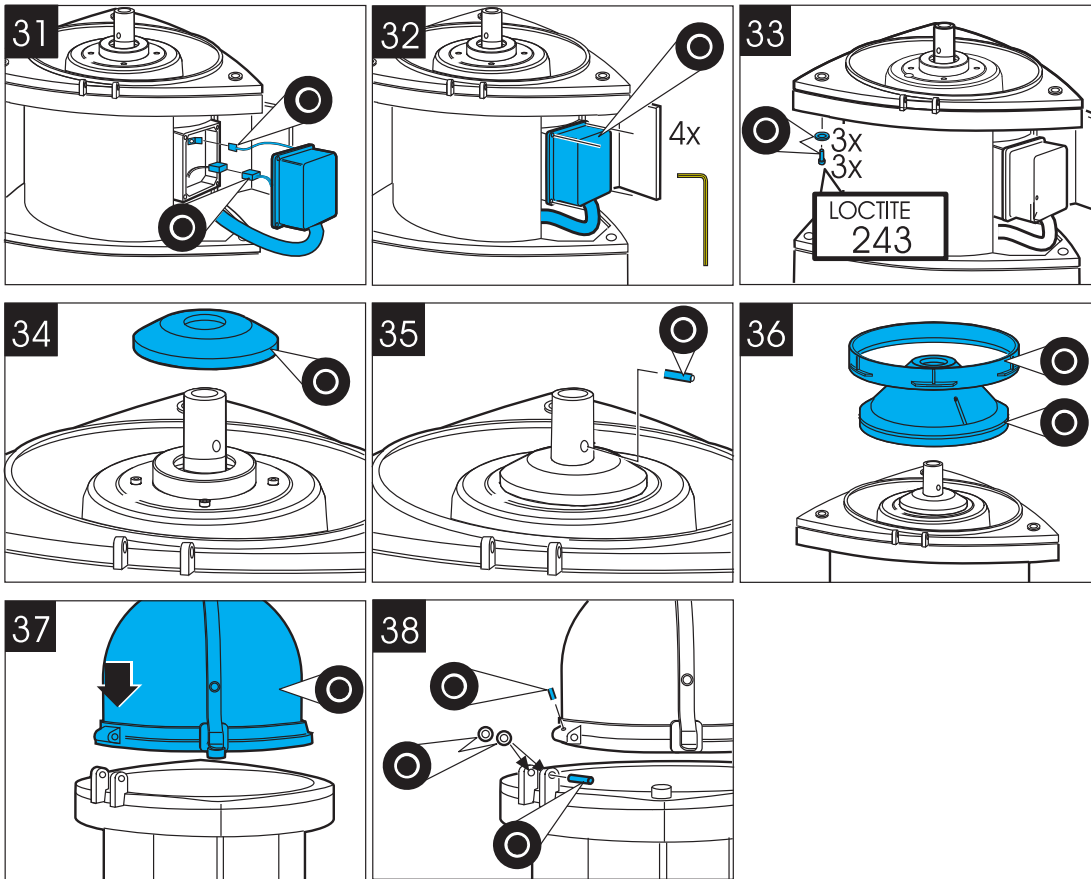
First dismantle the separator bowl as described in [9.5.2 Cleaning of bowl on page 46](#).



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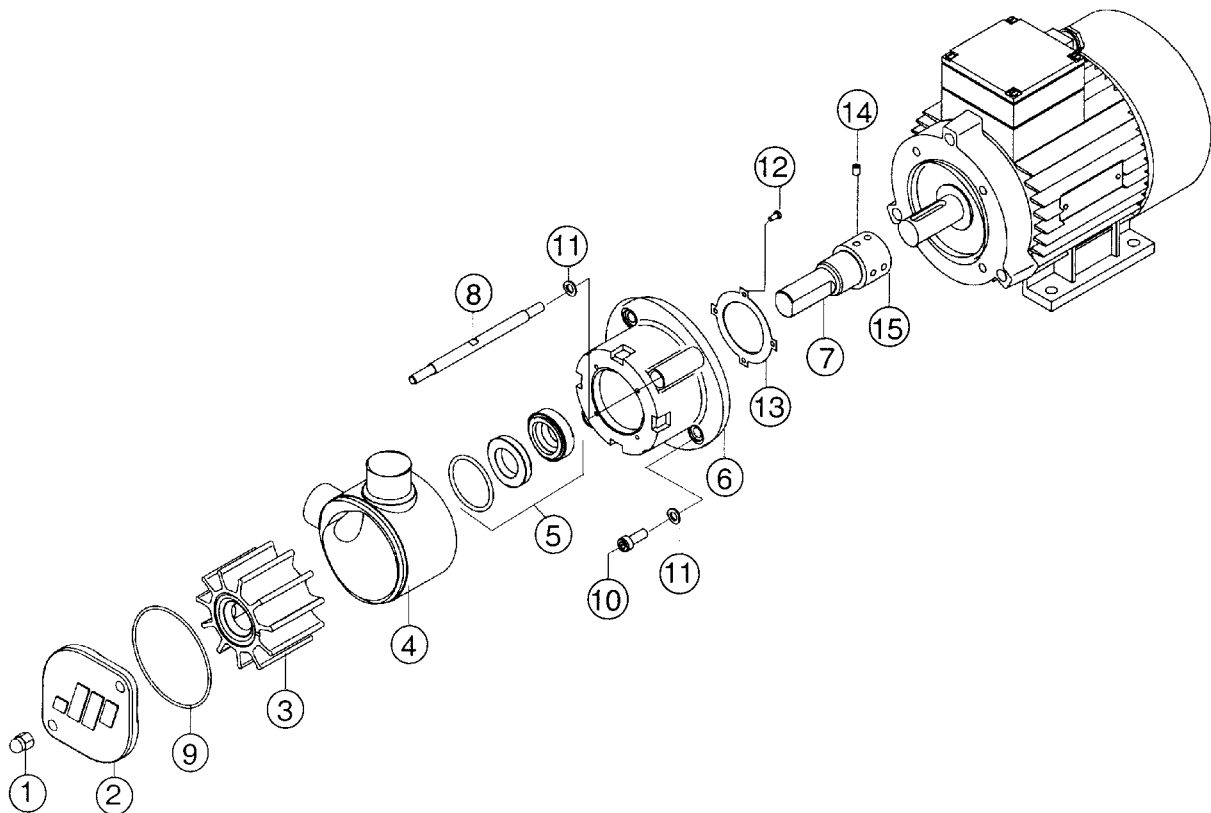


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9.6 Replacing the impeller and mechanical seal for pump



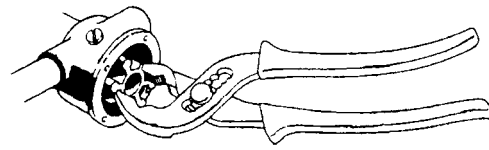
G09869a1

- | | | |
|--|-----------------|----------------|
| 1. Screw cap | 6. Motor flange | 11. Washer |
| 2. Cover | 7. Shaft | 12. Screw |
| 3. Impeller | 8. Screw stud | 13. Washer |
| 4. Pump body | 9. O-ring | 14. Lock screw |
| 5. Mechanical seal (Carbon/Ceramic/Nitrile) | 10. Screw | 15. Sleeve |

Dismantling of impeller and mechanical seal

1. Check that hoses between the cleaning unit and the tank to clean are removed.
2. Disconnect the hoses from the pump in- and outlet.
3. Place a vessel under the pump to collect leaking liquid at dismantling.
4. Remove the front cover (2) and the O-ring (9).

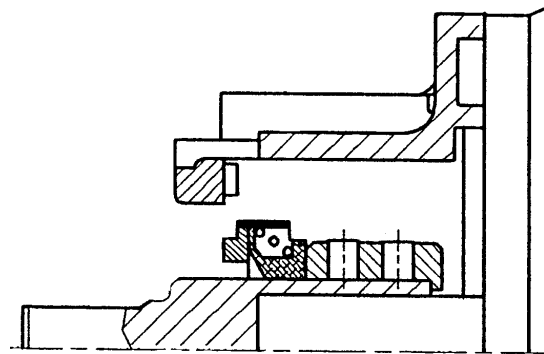
5. Remove the impeller (3) from the pump body (4) by using suitable pliers or two levers. Take care not to damage the pump body.
6. If replacing the mechanical seal, separate the pump body from the flange (6). Check for wear inside the pump body.
7. Press out the seal seat from the pump body. Remove the seal assembly from the shaft.
8. Inspect and clean all parts which will be re-used.



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Assembly of impeller and mechanical seal

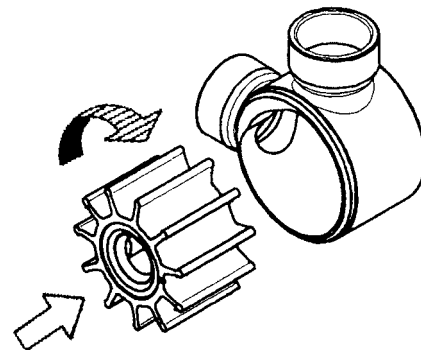
1. Slide the rotating seal part onto the shaft with a twisting movement and press the stationary seal part into the pump body. Lubrication with soap solution will ease the assembly.
2. Assemble the pump body to the flange, taking care not to damage the seal.



G09869c1

3. Lubricate the impeller with grease or vaseline.
4. Push the impeller into the pump body with a twisting movement in the operating direction, centralizing the impeller hub.
5. Assemble the front cover O-ring and the front cover.

Tightening torque: 8 Nm.



G09869d1

NOTE

If the screw caps are tightened harder the front cover will bend which can cause leakages and the impeller to jam.

10 Technical data

10.1 Technical data, system

| | |
|--|---|
| Denomination: | Alfa Laval Alfie 500 Use is restricted to removal of solids and oil from water-based liquid with the following specifications. |
| Application: | Process media: Water-based liquid |
| Technical design | pH value: 6 – 9 Separation temperature: +15 – +70 °C |
| Max. throughput: | 500 litres/hour (50/60 Hz) |
| Max. ambient temperature: | +45 °C |
| Counter pressure at outlet of unit: | |
| - Recommended | 100 - 180 kPa |
| - Max. | 185 kPa |
| Suction height: | Max. 1.7 metres |
| Volume in collecting tank: | 20 litres |
| Power supply: | 230 V (±5%), 1 phase, 50/60 Hz 100/110/120 V (±5%), 1 phase, 50/60 Hz (option, with fitted transformer) |
| Amperage: | 10 A (230 V), 16 A (100 – 120 V) |
| Sound: | Sound power: Max. 8.9 Bel(A), ISO 3744 Sound pressure level: Max. 75 dB(A), ISO 3744 |
| Enclosure class: | IP 54 |
| Weight, total: | 60 kg (135 lbs) |
| Dimensions (LxHxW): | 620 x 1140 x 510 mm (24" x 45" x 20") |

10.2 Declaration

Alfa Laval ref. 594945 Rev. 3

This declaration is issued under the sole responsibility of the manufacturer.

Manufacturer:
 Manufacturer address:
 Separator type:
 Product specification:
 Configuration number:
 Serial number:

EU Declaration of Conformity

The machinery complies with the following Directives:

| Designation | Description |
|---|---|
| 2006/42/EC | Machinery Directive |
| 2004/108/EC (to 2016-04-19) 2014/30/EU (from 2016-04-20) | Electromagnetic Compatibility Directive |

To meet the requirements the following standards have been applied:

| Designation | Description |
|----------------|---|
| EN 60204-1 | Safety of machinery - Electrical equipment of machines. Part 1: General requirements |
| EN 61000-6-2 | Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments |
| EN 61000-6-4 | Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments |
| EN ISO 12100 | Safety of machinery - General principles for design - Risk assessment and risk reduction |
| EN ISO 13849-1 | Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design |
| EN ISO 3744 | Acoustics - Determination of sound power levels of noise sources using sound pressure |

The technical construction file for the machinery is compiled and retained by the authorized person Hans Thomasson within the Product Centre for High Speed Separator systems, Alfa Laval Tumba AB, SE-14780 Tumba Sweden.

Signed for and on behalf of:
 Place:
 Date of issue:

 Signature:
 Name:
 Function:

11 Lifting instruction

11.1 Cleaning unit

Attach two lifting straps (1) to the lifting hooks.

The distance between the lifting hooks and crane hook should be min. 1 metre (A).

NOTE

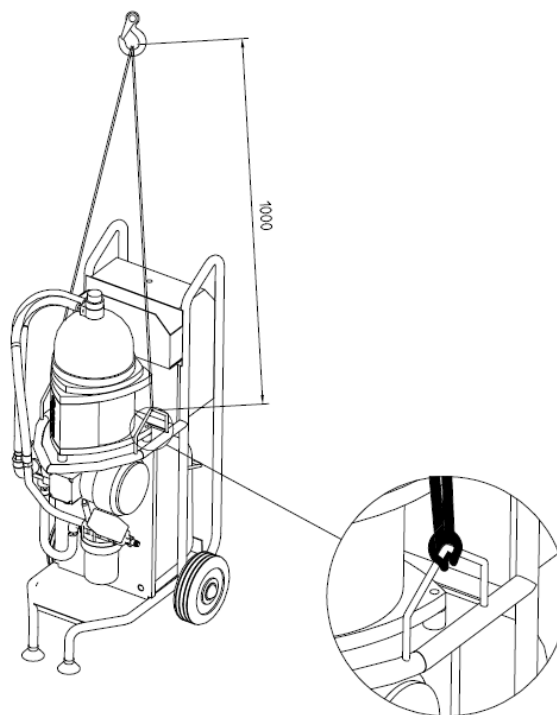
Weight of unit is approx. 60 kg.

WARNING

Entrapment hazard

Only attach the lifting straps to the two lifting hooks when lifting the cleaning unit.

A falling unit can cause accidents resulting in serious injury to persons and damage to equipment.



G1102411

Lifting procedure for cleaning unit

12 Diagrams

12.1 Electrical system

Alfa Laval ref. 9014733 Rev. 7



Alfa Laval Tumba AB

Company / customer
 Project description Alfie/Emmie
 Main supply 230V AC (100/110/120VAC with optional transformer)
 Control voltage 24V DC

Manufacturer (company) Alfa Laval Tumba AB

Drawing number 9014733

Created on 2014-04-01 SETUTBL
 Edit date 2015-10-07 SETUAKL

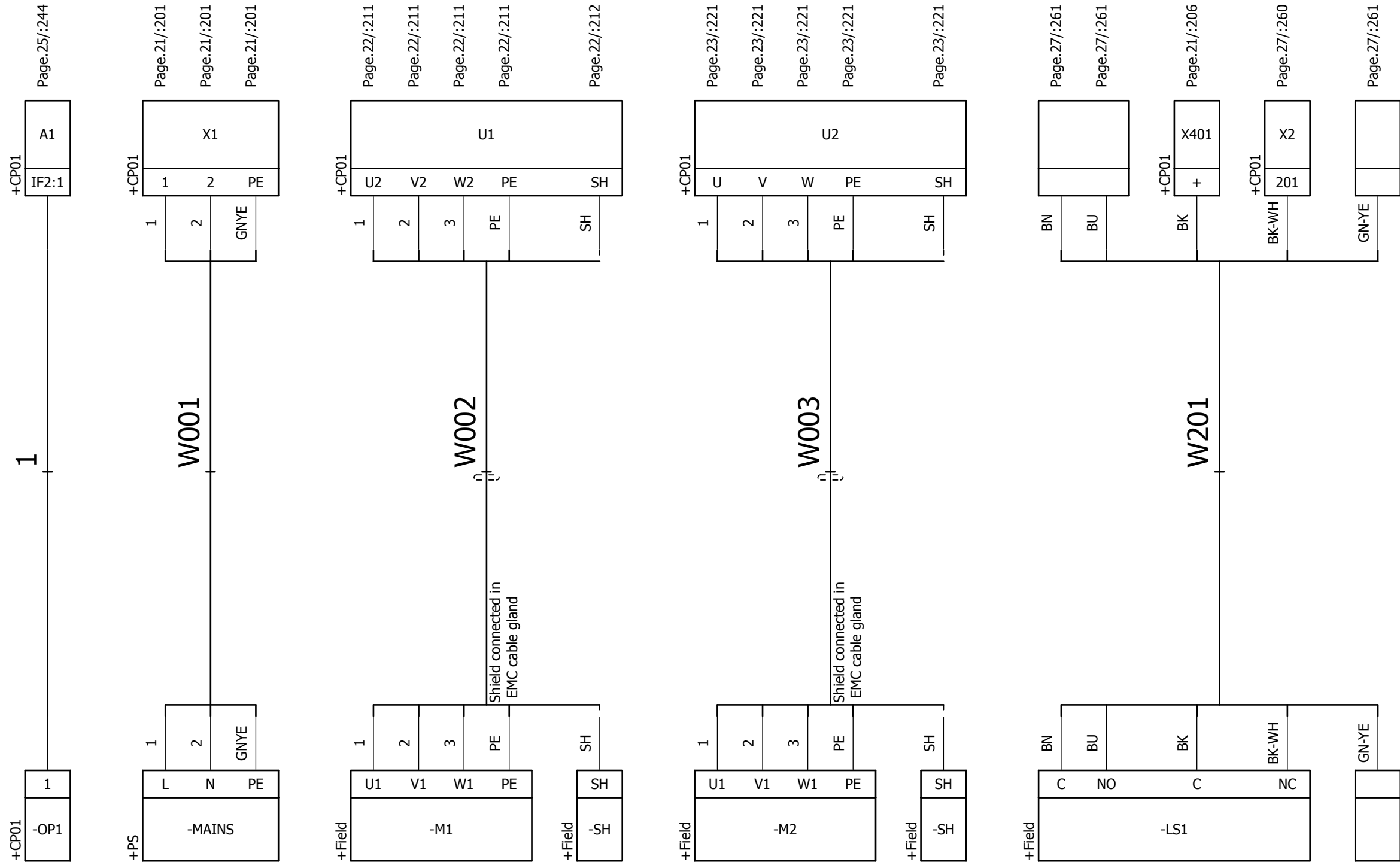
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| | | | | | | | | | |
|----------------------------|-----------------------------|------------------------|------------------------|-----------------------------------|----------|--|------------------------------|----------------------------|------------------|
| Created date 2014-04-01 | Created by SETUTBL | Revised by SETUTBL | Project Alfie/Emmie | Title Title page / cover sheet | Location | | Page Revision | Revised date 2014-09-05 | Page 1 |
| Department CAT | Approved date 2015-10-23 | Approved by SETUNLN | | | | | Latest Revision 07 | Document No. 9014733 | Next page 2 |

Internal targets

External targets



Ethernet to OP

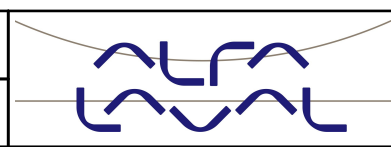
Power Supply:
1x230V 50/60Hz
(Max fuse 10A)
Option:
1x100/110/120V
50/60Hz (Max fuse 10A)

Separator

Pump

Tank full

Shield SH shall be connected to cable glands, except for power supply cables, they shall be connected to PE bar.

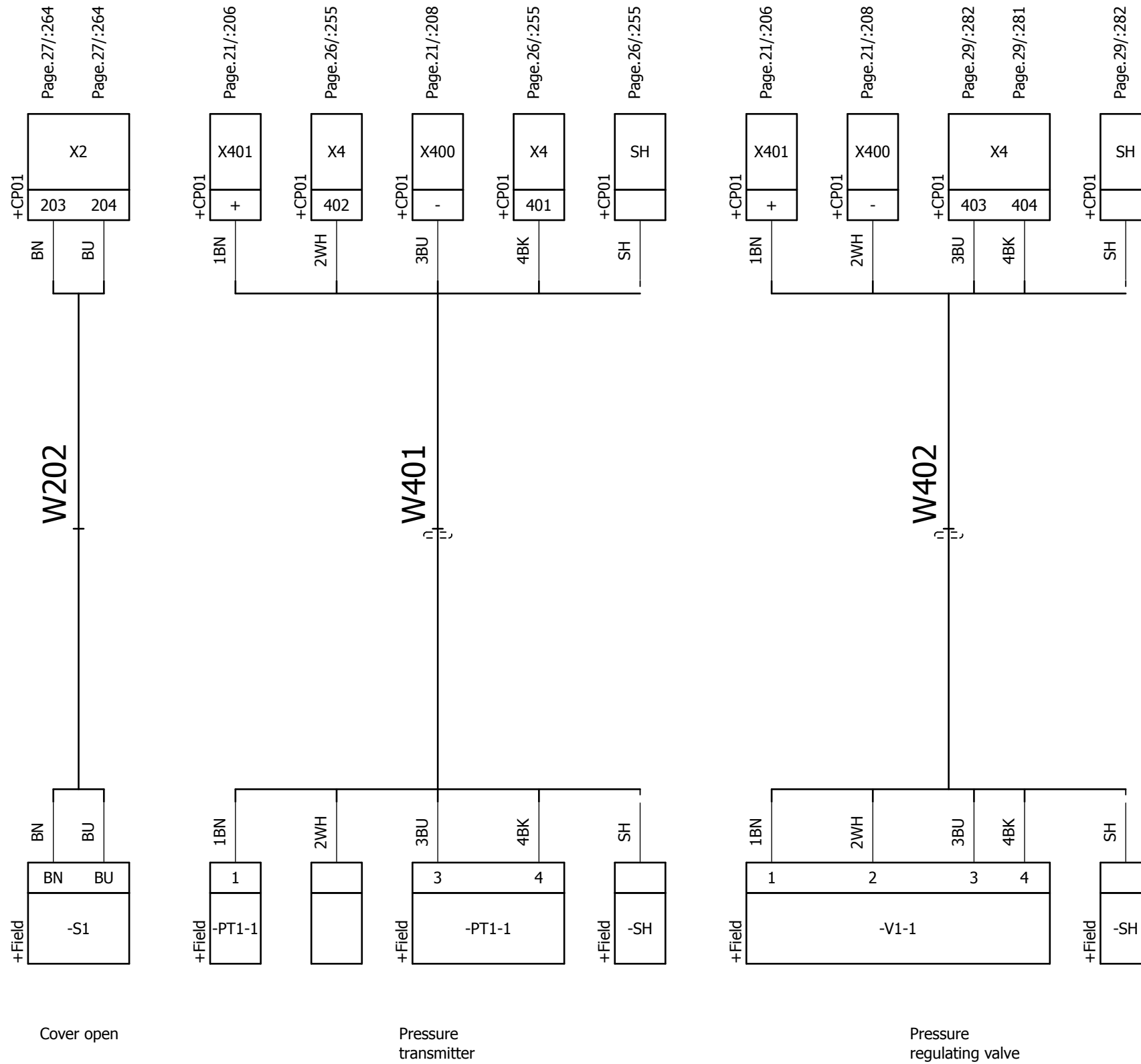
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| Created date 2014-04-01 | Created by SETUTBL | Revised by SETUTBL | Project Alfie/Emmie | Title Cable-connection diagram 1 W001 W002 W003 W201 | Location |  | Page Revision 06 | Revised date 2015-03-26 | Page 2 |
| Department CAT | Approved date 2015-10-23 | Approved by SETUNLN | | | | | Latest Revision 07 | Document No. 9014733 | Next page 3 |

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Internal targets

External targets



Shield SH shall be connected to cable glands, except for power supply cables, they shall be connected to PE bar.

| | | | | | | | | | |
|----------------------------|-----------------------------|------------------------|------------------------|---|----------|---|-----------------------|----------------------------|----------------|
| Created date 2014-04-01 | Created by SETUAKL | Revised by SETUAKL | Project Alfie/Emmie | Title Cable-connection diagram W202 W401 W402 | Location |  | Page Revision 07 | Revised date 2015-10-07 | Page 3 |
| Department CAT | Approved date 2015-10-23 | Approved by SETUNLN | | | | | Latest Revision 07 | Document No. 9014733 | Next page 4 |

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Cable overview

| Cable no | Source (from) | Target (to) | Cable type | Conductors / Area | Conductors used | Function text | Note |
|----------|--------------------|----------------------|------------|-------------------|-----------------|---|------|
| 1 | =9014733+CP01-A1 | =9014733+CP01-OP1 | 581803 45 | | 1 | Ethernet to OP | |
| W001 | =9014733+CP01-X1 | =CUSTOMER+PS-MAINS | 576705 01 | 3G1,5 | 3 | Power Supply: 1x230V 50/60Hz (Max fuse 10A) Option: 1x100/110/120V 50/60Hz (Max fuse 10A) | |
| W002 | =9014733+CP01-U1 | =9014733+Field-M1 | 9009089 81 | 4G1,5 | 4 | Separator | |
| W003 | =9014733+CP01-U2 | =9014733+Field-M2 | 9005079 80 | 4G1,5 | 4 | Pump | |
| W201 | =9014733+CP01-X2 | =9014733+Field-LS1 | 571937 01 | 5x0,75 | 5 | Tank full | |
| W202 | =9014733+CP01-X2 | =9014733+Field-S1 | 554151 03 | 1x2x0,75 | 2 | Cover open | |
| W401 | =9014733+CP01-X401 | =9014733+Field-PT1-1 | 9017476 03 | 4x0,34 | 4 | Pressure transmitter | |
| W402 | =9014733+CP01-X401 | =9014733+Field-V1-1 | 901747604 | 4x0,34 | 4 | Pressure regulating valve | |
| | | | | | | | |
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Other equivalent and approved cables may be used.
All signal cables should be a Signal Shielded Cable with the shield properly connected to earth as shown in the electrical drawings.

For power cables, armour must be connected to the earth bar.
Providing the armour is connected to the earth as shown in the electrical drawings gives sufficient EMC protection.

- Note:
- 1) Cable not included in Alfa Laval delivery
 - 2) Cable type and size according to VFD/motor specification
 - 3) Optional
 - 4) If external transformer, main supply is connected to transformer panel

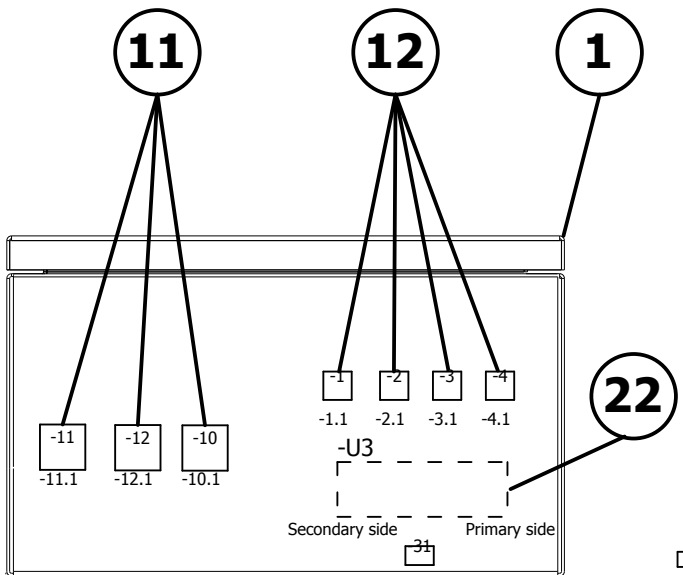
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| Created date 2014-04-01 | Created by SETUTBL | Revised by SETUTBL | Project Alfie/Emmie | Title Cable overview : 1 - W402 | Location |  | Page Revision 06 | Revised date 2015-03-26 | Page 4 |
| Department CAT | Approved date 2015-10-23 | Approved by SETUNLN | | | Mounting | | Latest Revision 07 | Document No. =9014733+CP01-X401 | Next page Circuit/10 |

Wiring Table

| | | | |
|-----------------------------|--|--------------------|----------------|
| Wire Type | N07V-K (or equivalent flame retardent) | | |
| Wire Colour | EN 60204-1:2006 / IEC 60204-1:2005 | | |
| Wire Code | IEC 60757 | | |
| Power Circuits | 0-16A | 2,5mm ² | Black |
| | 16-25A | 4mm ² | Black |
| | 25-32A | 6mm ² | Black |
| | 32-48A | 10mm ² | Black |
| | 48-64A | 16mm ² | Black |
| | 64-85A | 25mm ² | Black |
| | 85-104A | 35mm ² | Black |
| | 104-130A | 50mm ² | Black |
| Earth (PE) | | 1,5mm ² | Yellow / Green |
| Auxiliary Circuits 24VAC | | 0,5mm ² | Red |
| Auxiliary Circuits 24VDC | | 0,5mm ² | Blue |
| External auxillary Circuits | | 1mm ² | Orange |

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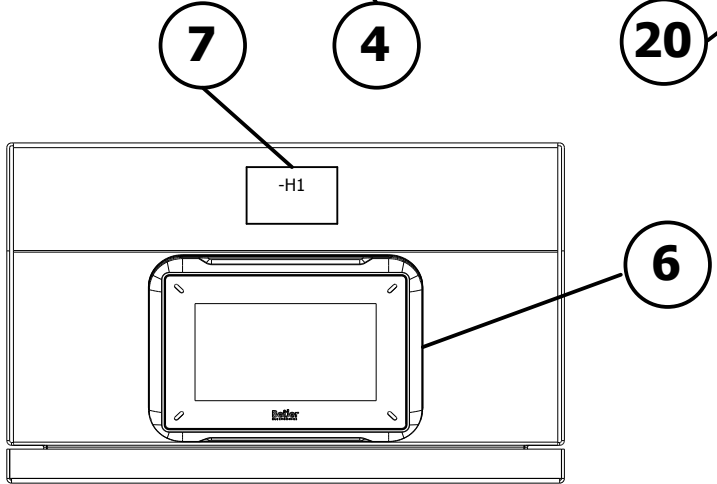
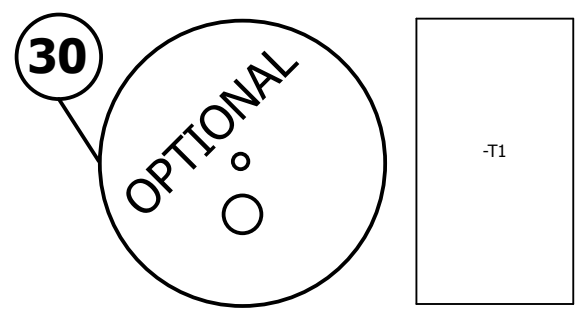
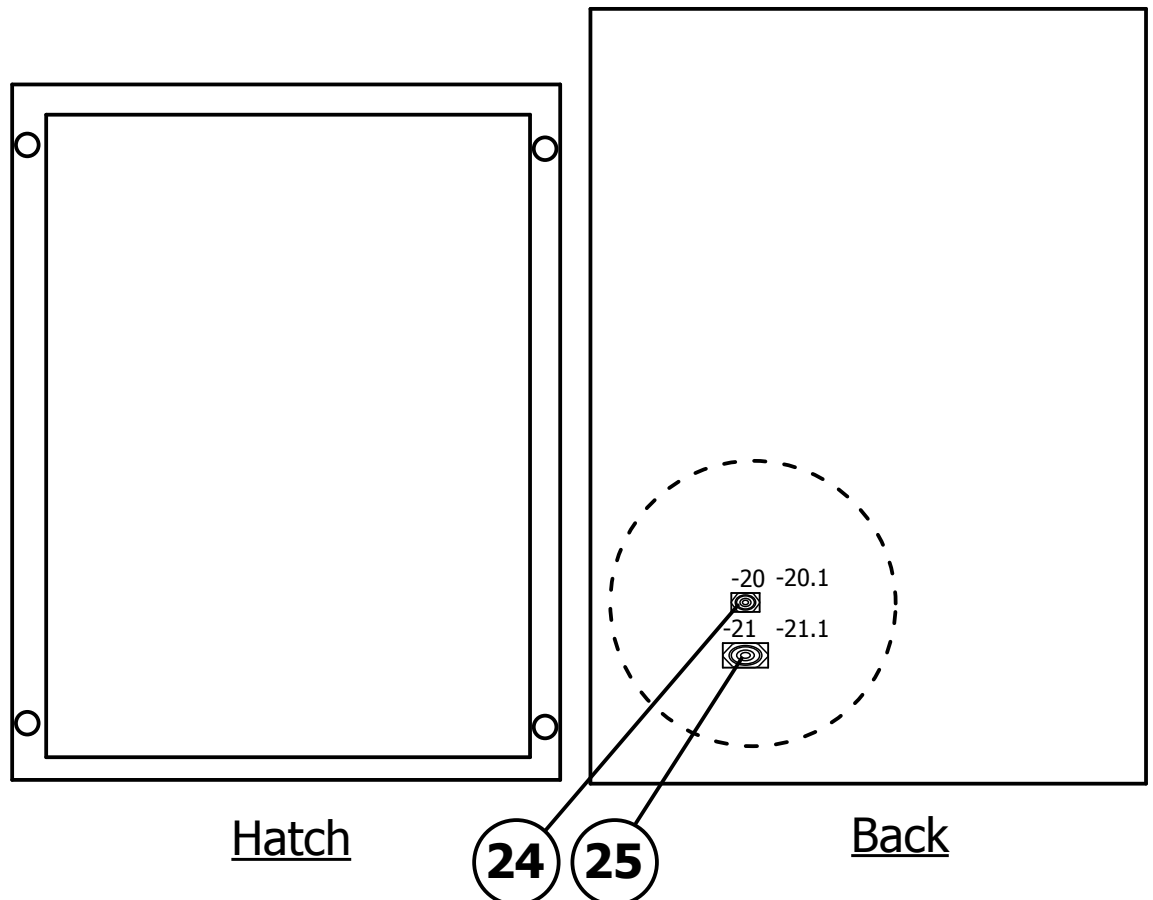
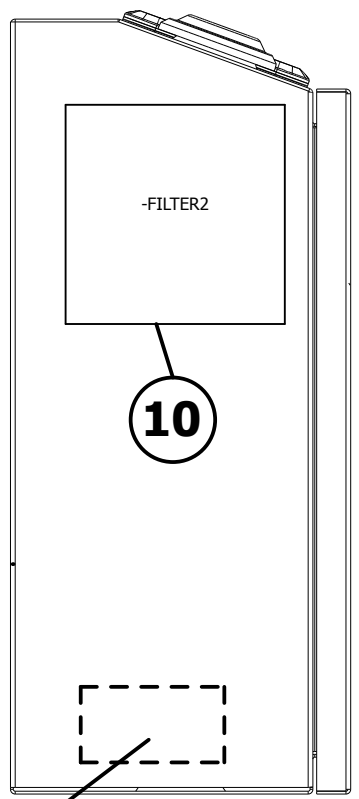
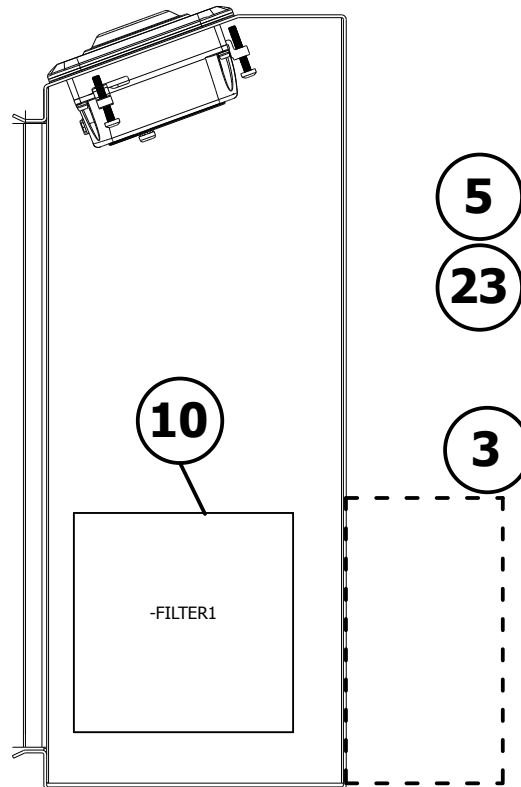
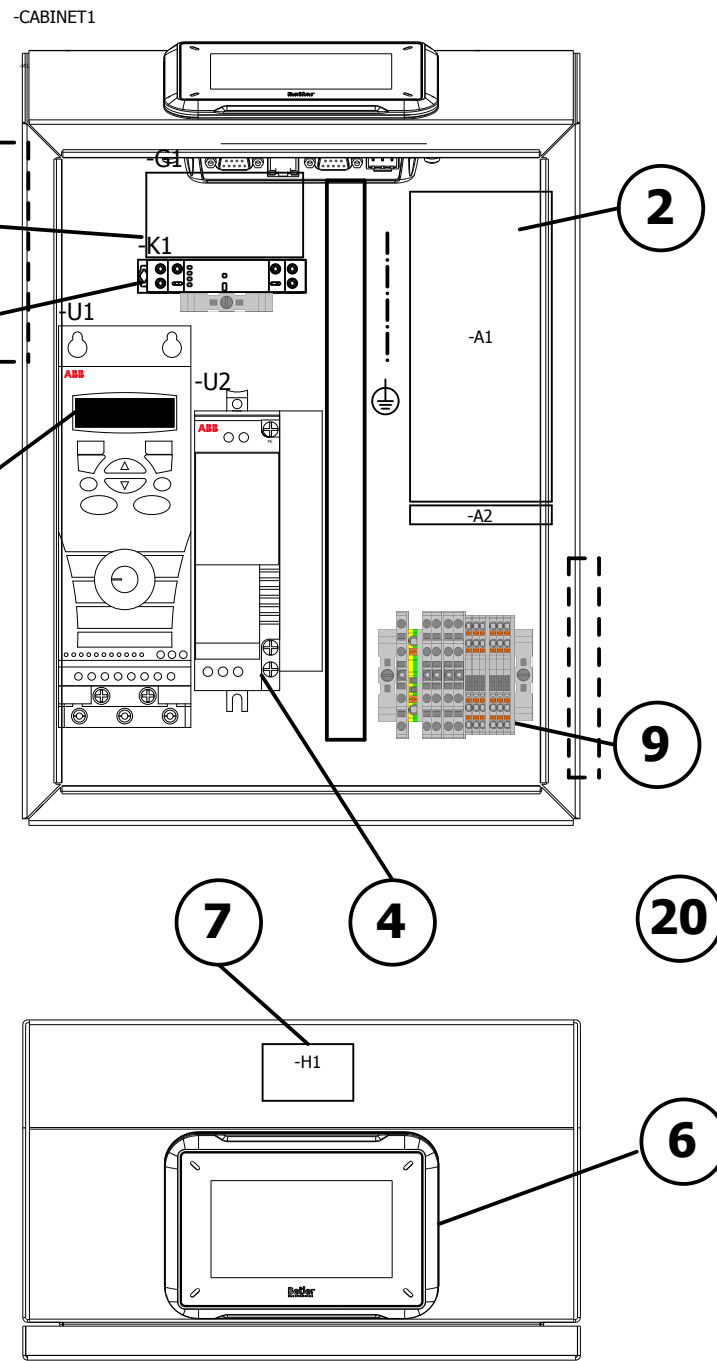


Technical data

IP54
 SSAISI304 Stainless steel 1.5mm thickness
 EMC-doorsealing
 Cable tray: ABB T20 part No. E2998812 or equivalent

Instructions

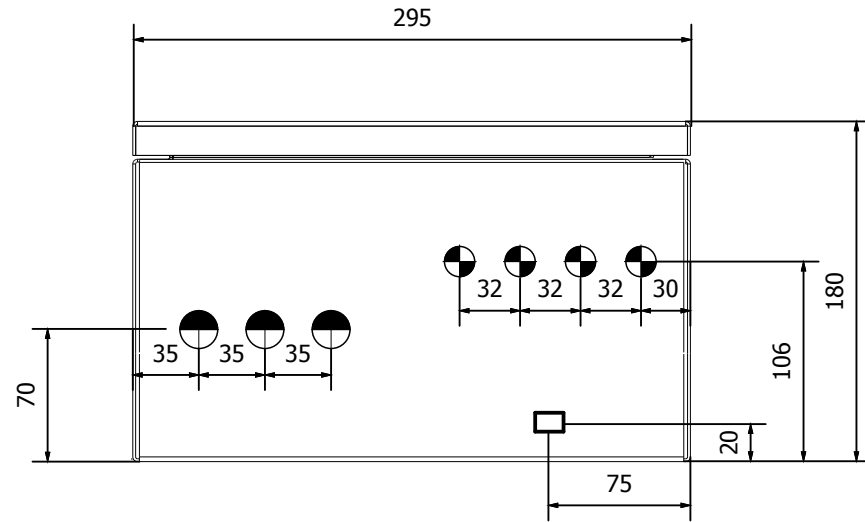
Rectifier -G1 must be mounted like shown to maintain maximum derating.
 Use silicone when mounting transformer to maintain IP54.
 Line filter -U3 must be mounted with primary side to the right hand side and secondary side to the left hand side



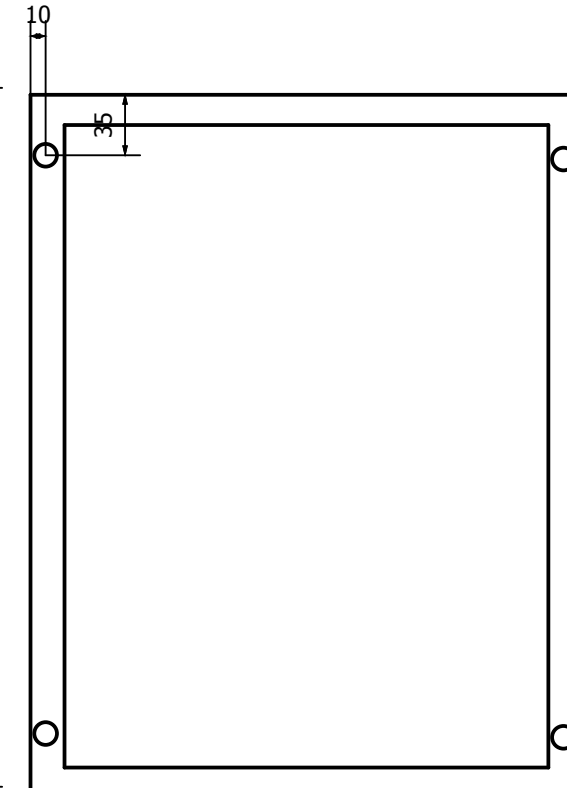
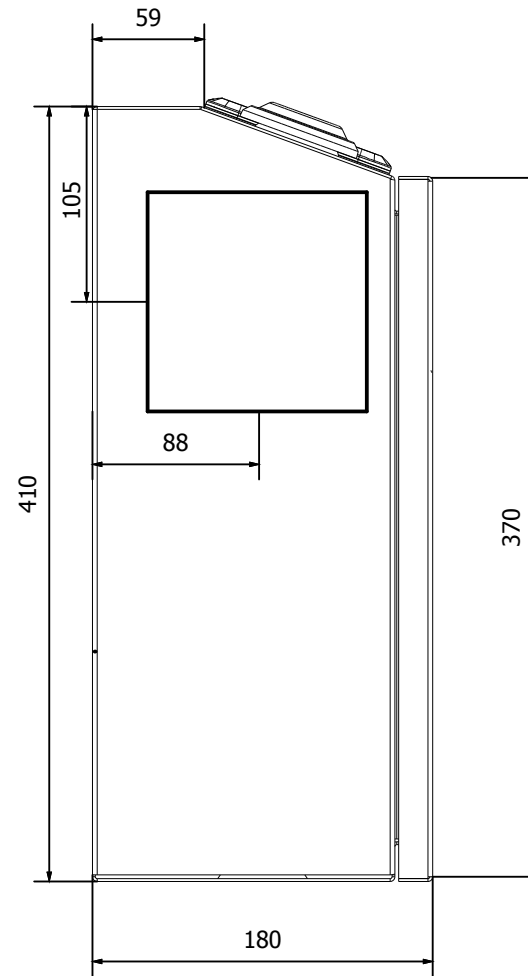
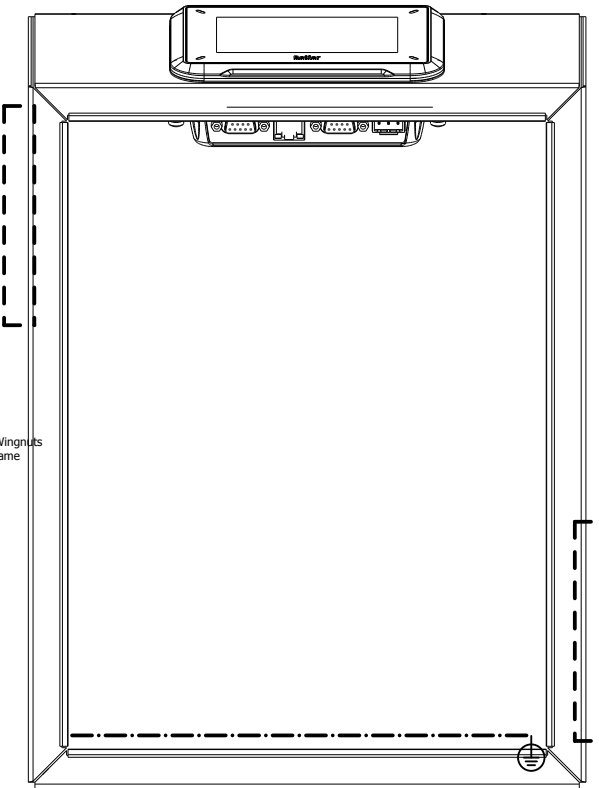
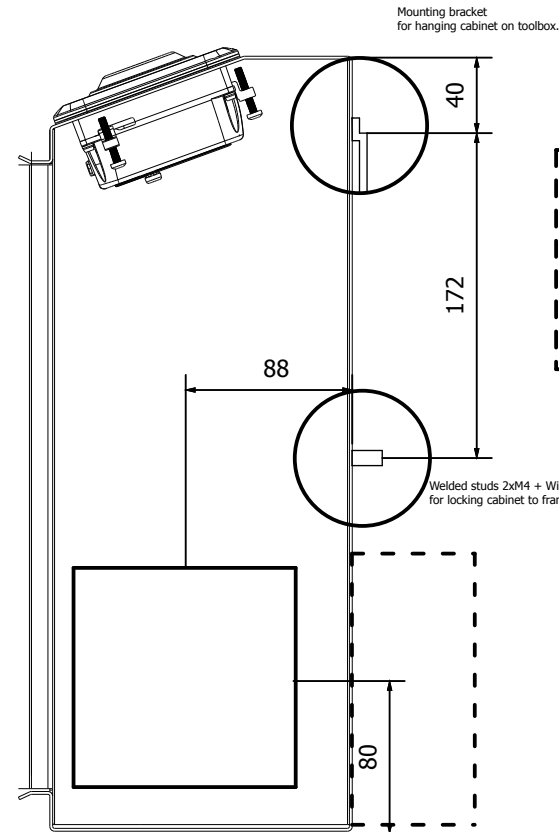
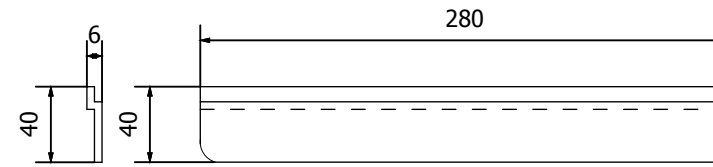
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| Created date 2014-04-01 | Created by SETUTBL | Revised by SETUAKL | Project Alfie/Emmie | Title Control cabinet assembly | Location =9014733 |  | Page Revision 07 | Revised date 2015-10-23 | Page 11 |
| Department CAT | Approved date 2015-10-23 | Approved by SETUNLN | | | Mounting +CP01 | | Latest Revision 07 | Document No. 9014733 | Next page 12 |

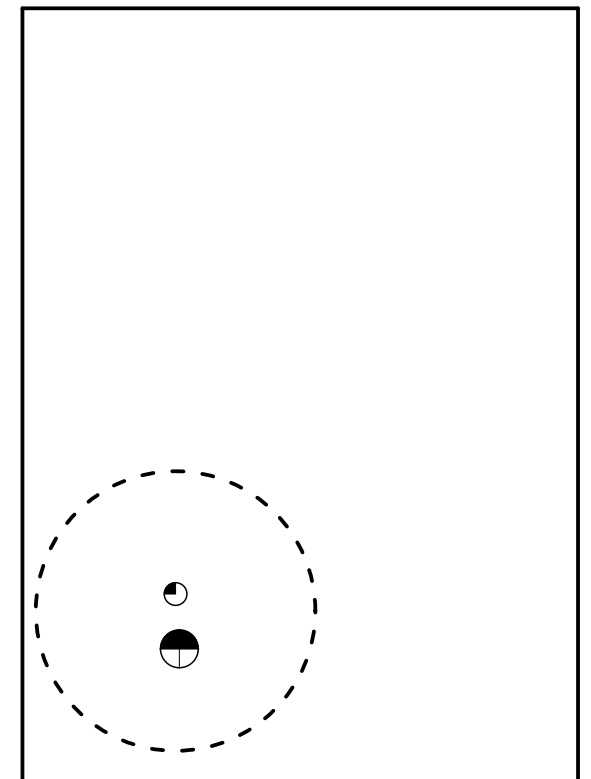
| | | |
|-----|-----|-----|
| Ø12 | Ø16 | Ø20 |
| 1 | 4 | 4 |
| | | |



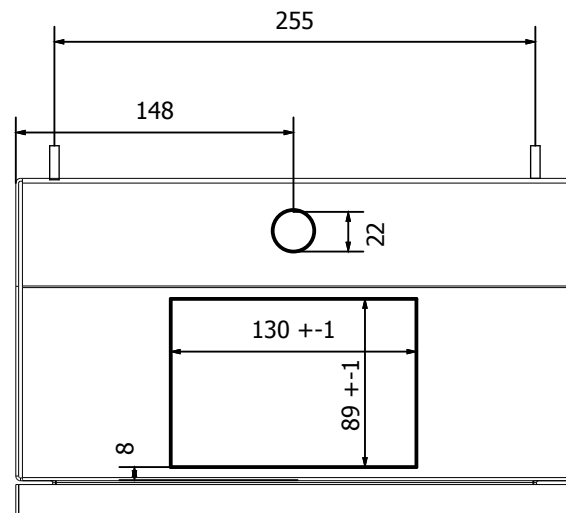
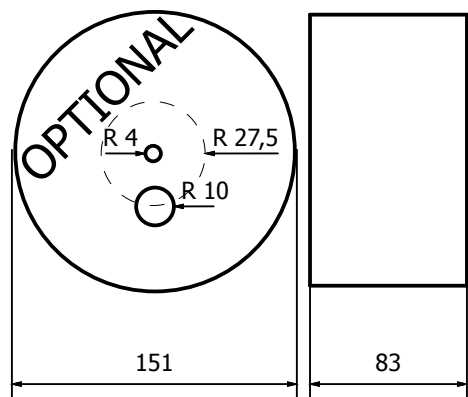
Mounting rail



Hatch



Back

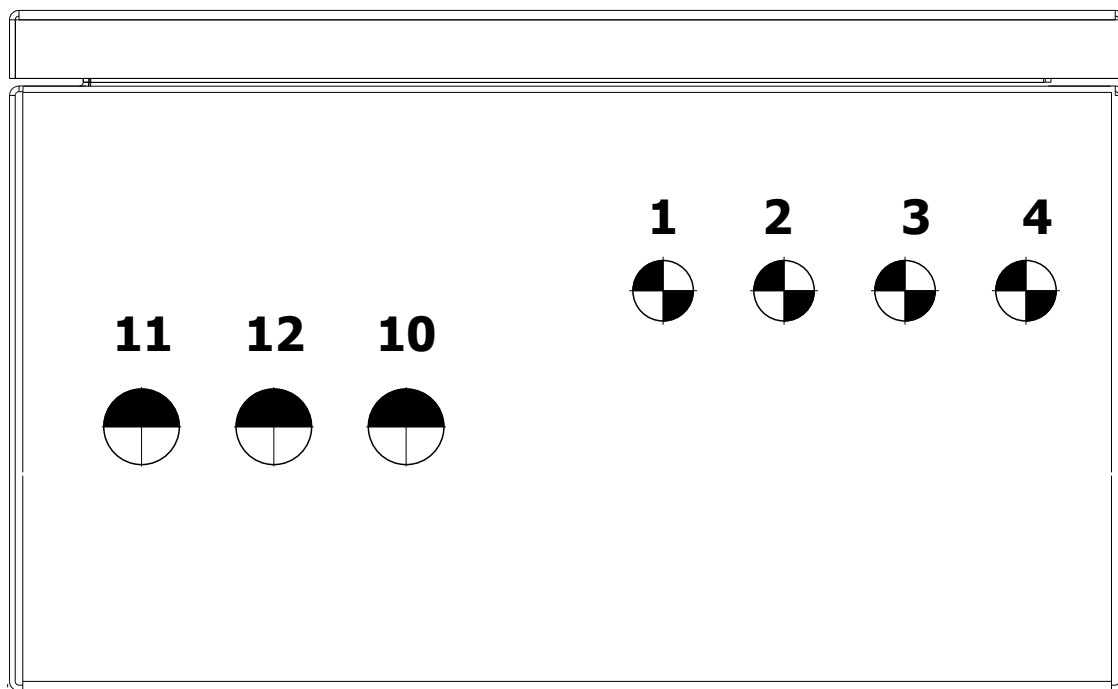


All measurements in mm

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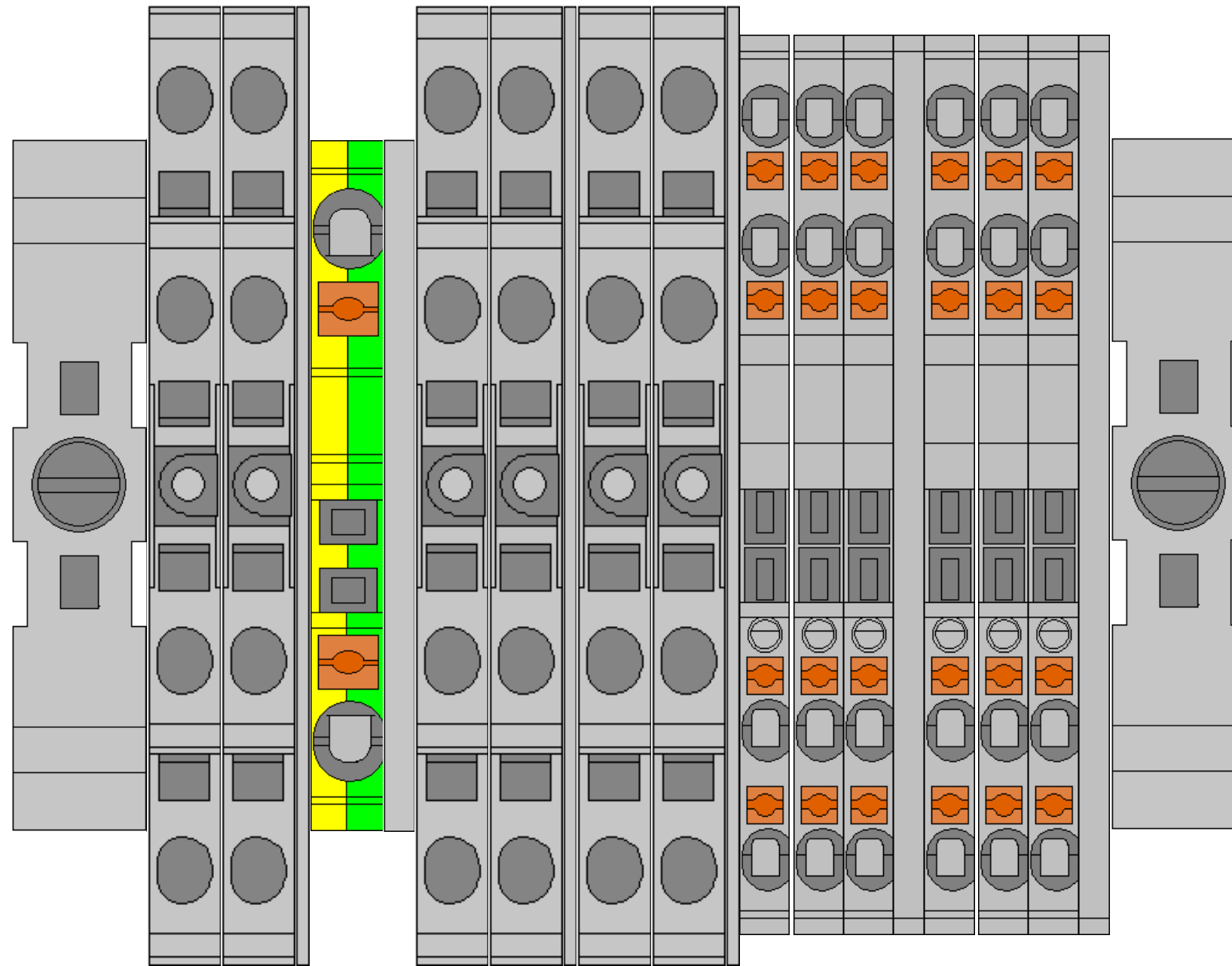


| Cable glands | | |
|--------------|------|-------|
| No | Size | Cable |
| 1 | 16 | W201 |
| 2 | 16 | W202 |
| 3 | 16 | W401 |
| 4 | 16 | W402 |
| | | |
| 10 | 20 | W001 |
| 11 | 20 | W002 |
| 12 | 20 | W003 |

| | |
|-----|-----|
| Ø16 | Ø20 |
| 4 | 6 |
| | |

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X1

X2


X4

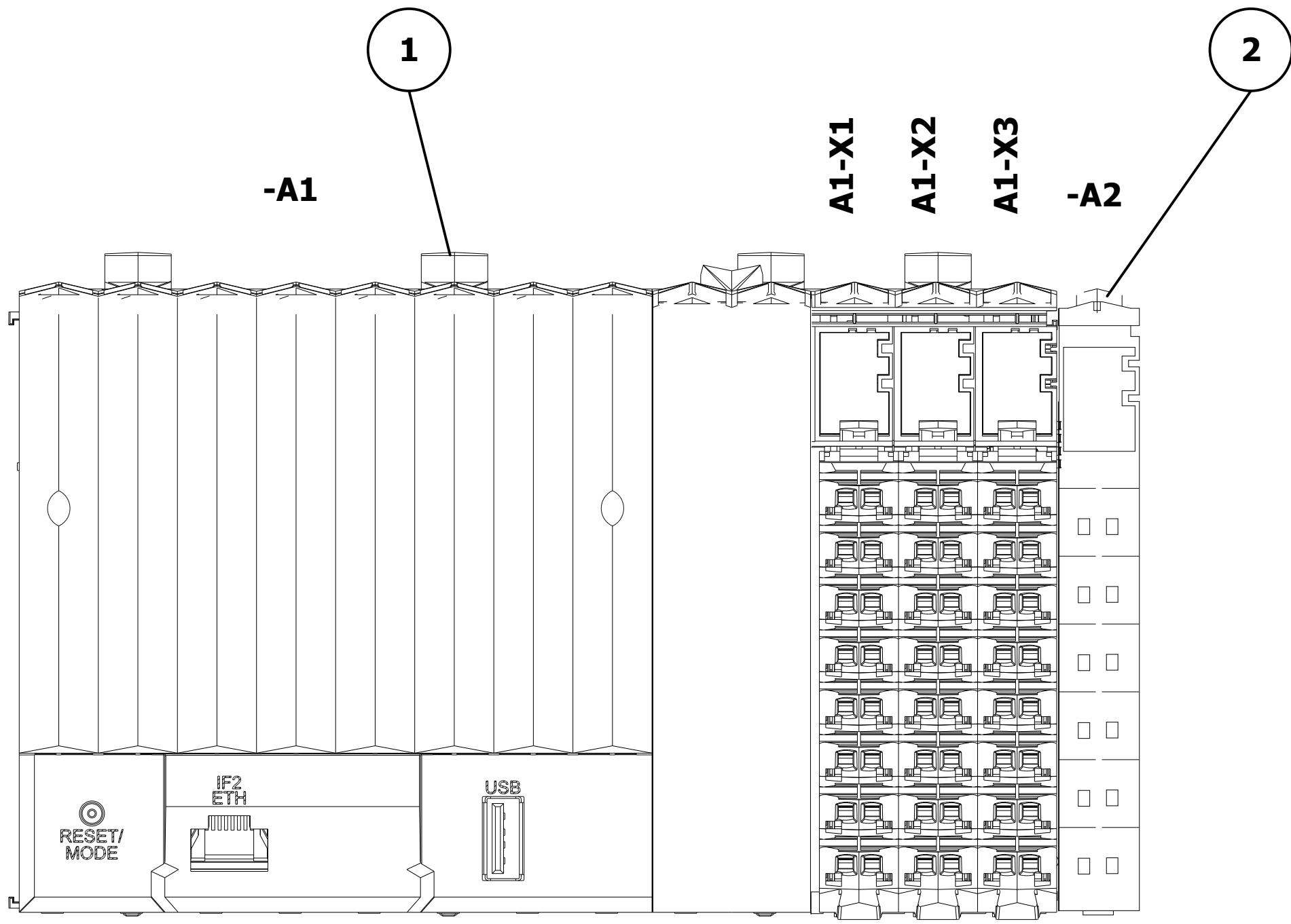
X400

X401

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| Department CAT | Approved date 2015-10-23 | Approved by SETUNLN | | | Mounting +CP01 | | Latest Revision 07 | Document No. 9014733 | Next page 15 |

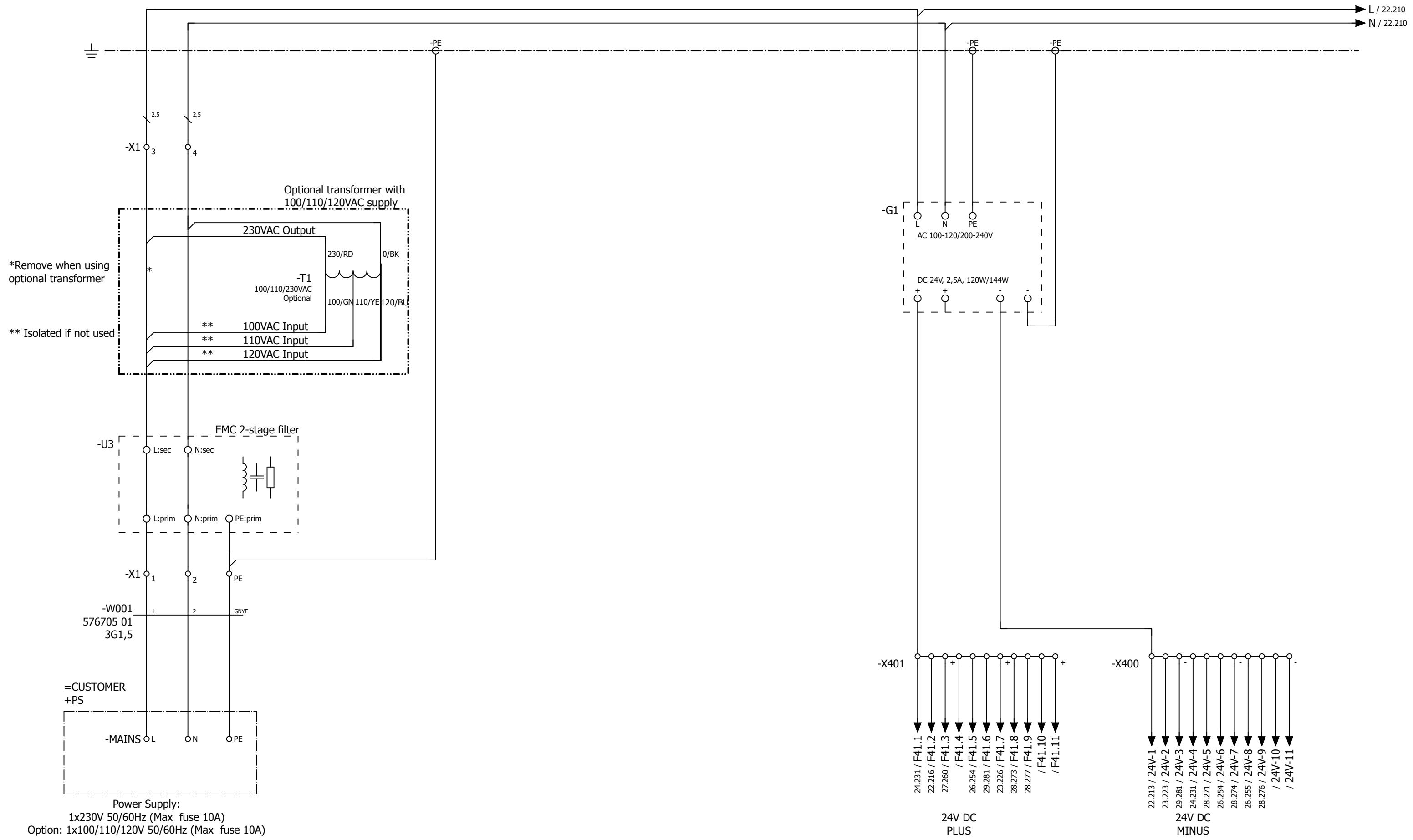


Note : A1-X1 to A1-X3 are integrated on CPU.

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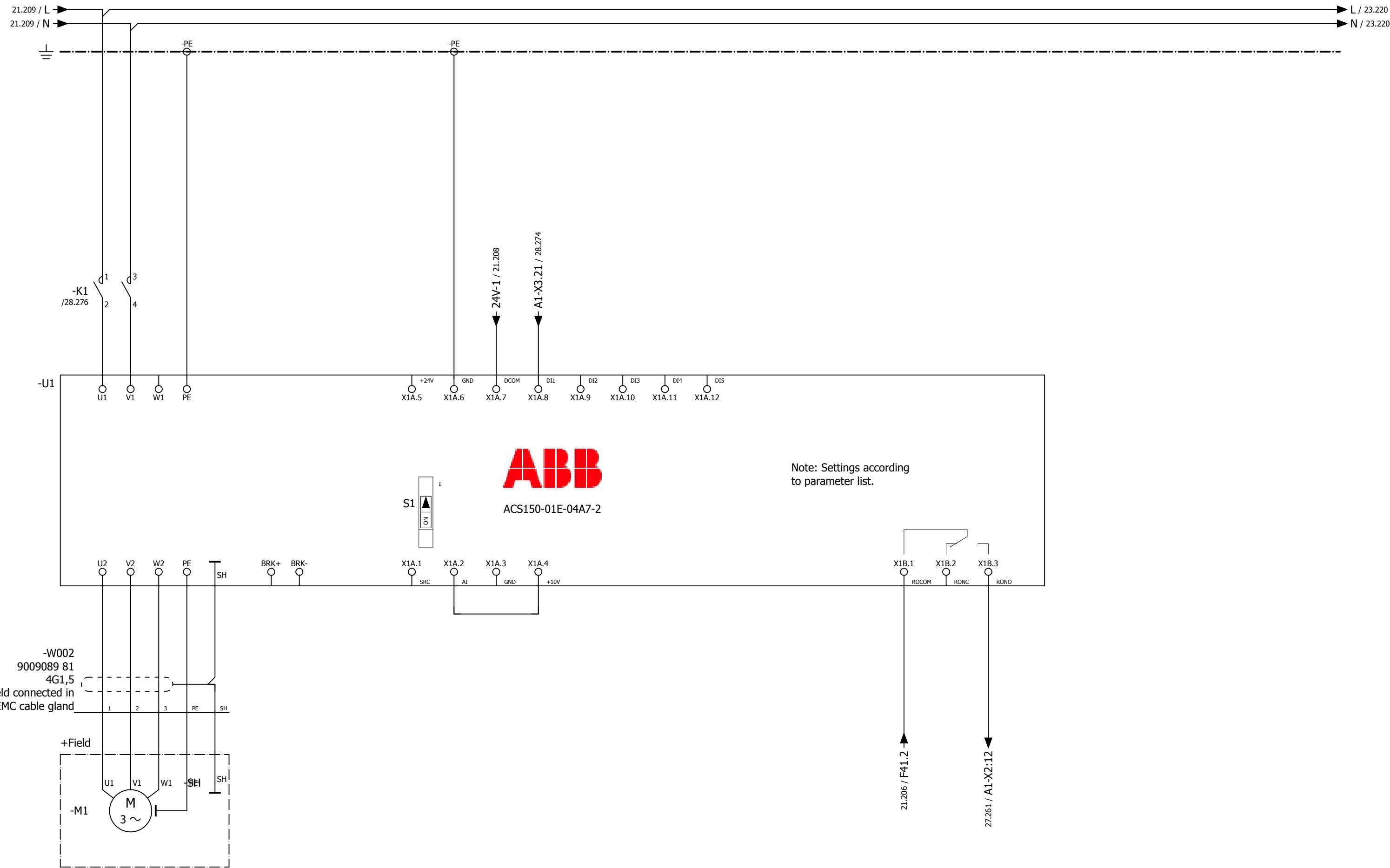
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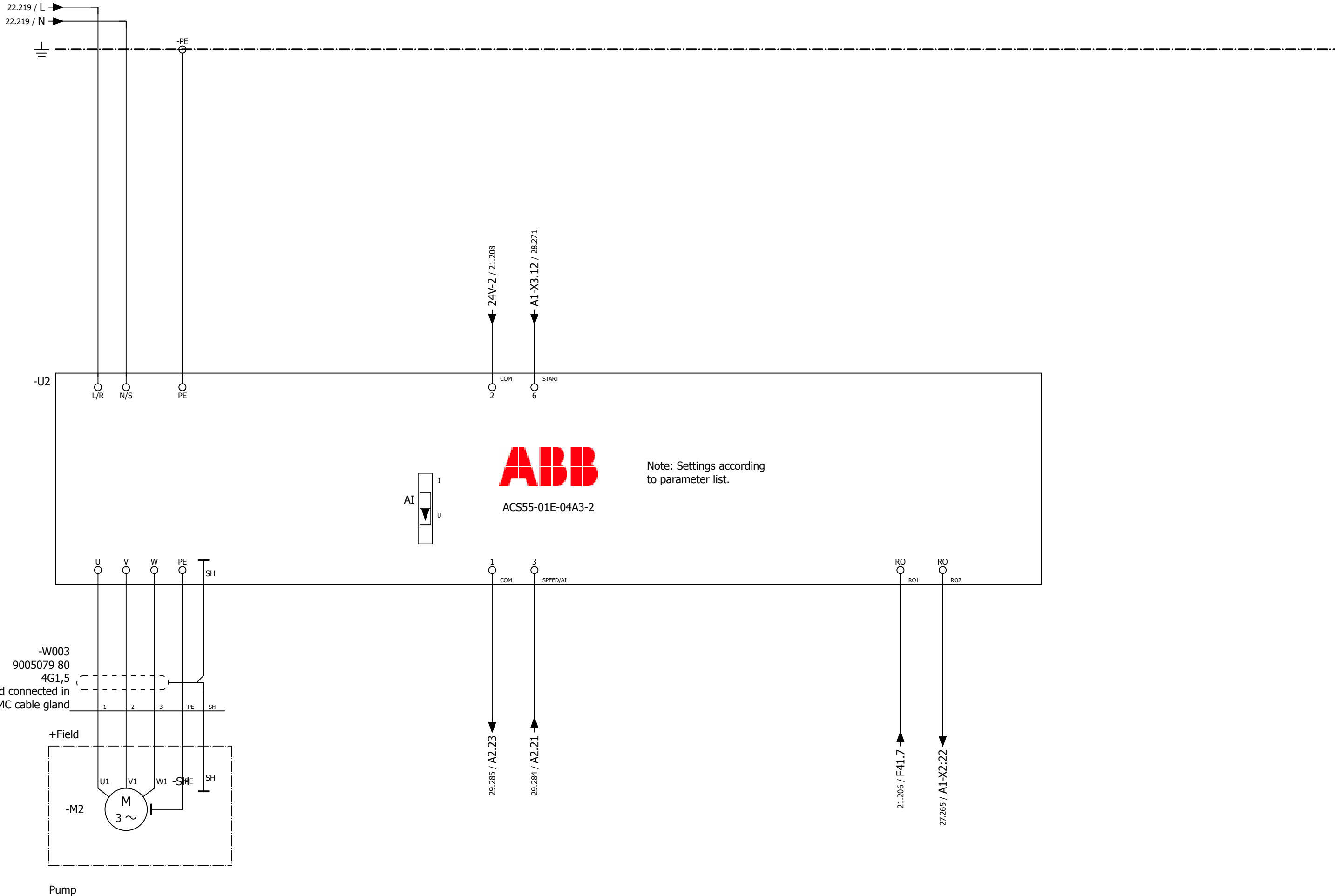
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| Department CAT | Approved date 2015-10-23 | Approved by SETUNLN | | | Mounting +CP01 | | Latest Revision 07 | Document No. 9014733 | Next page 24 |




* Jumpered in ferrule

HMI Cabinet Ethernet to OP

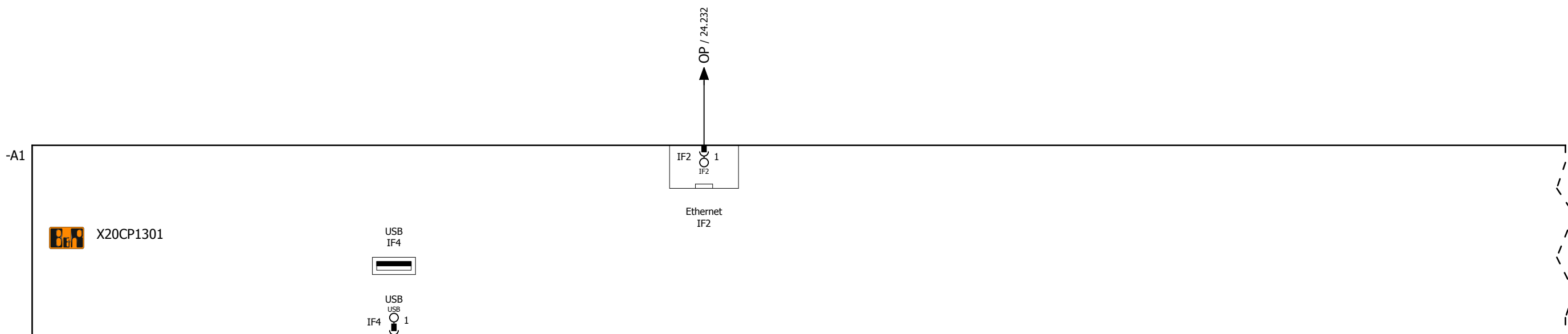
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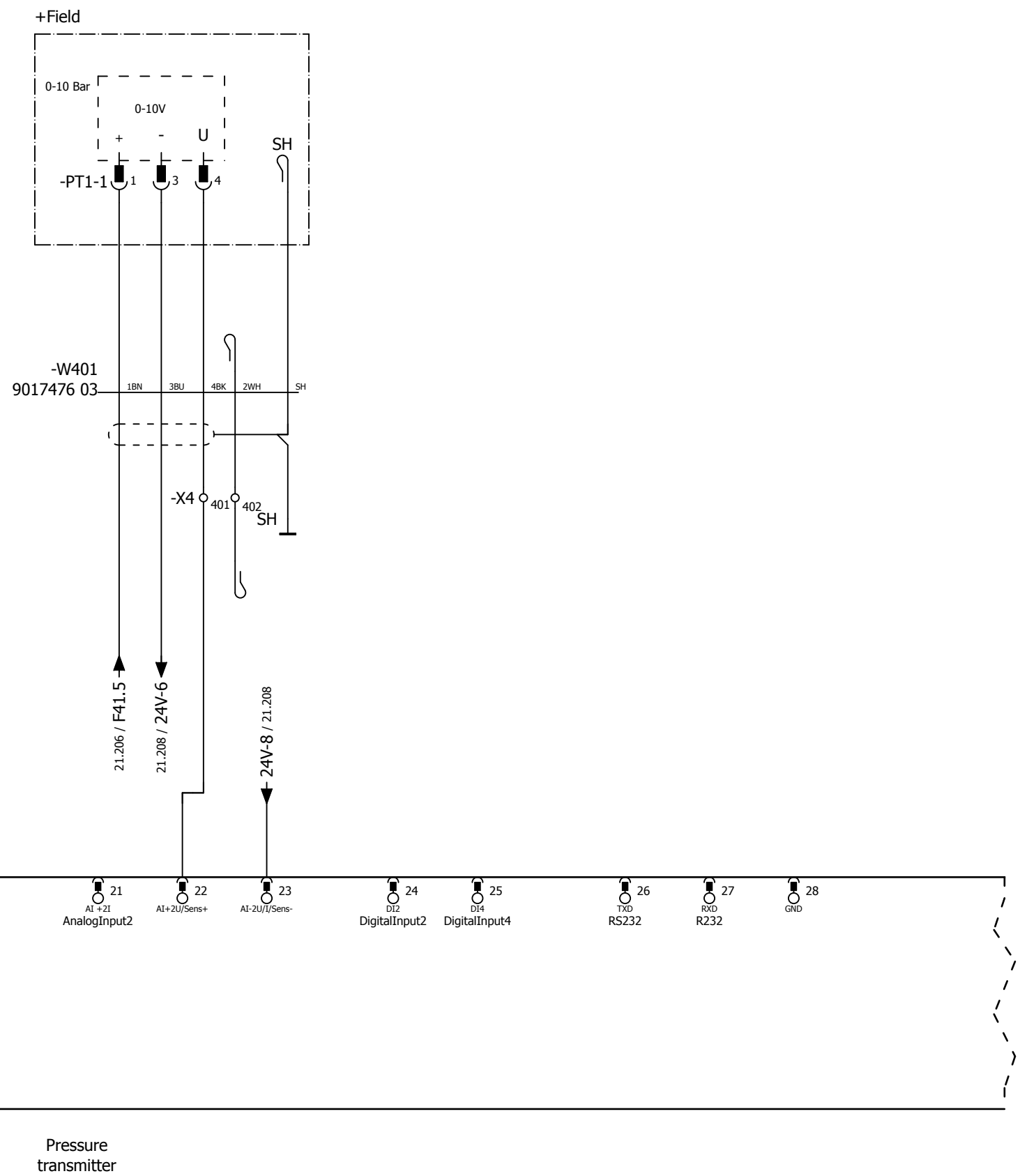
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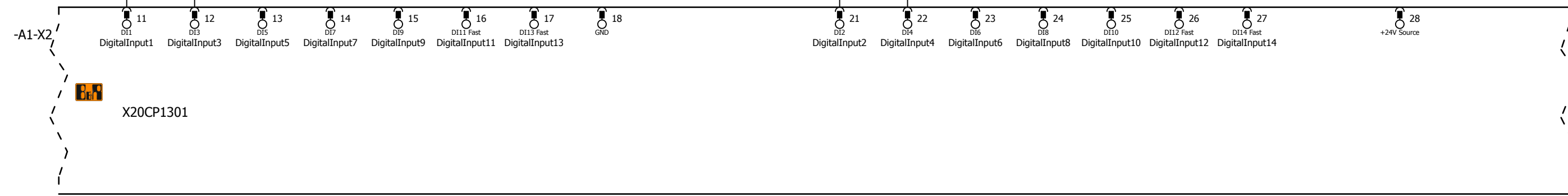
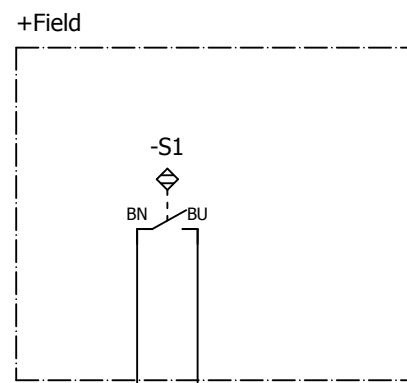
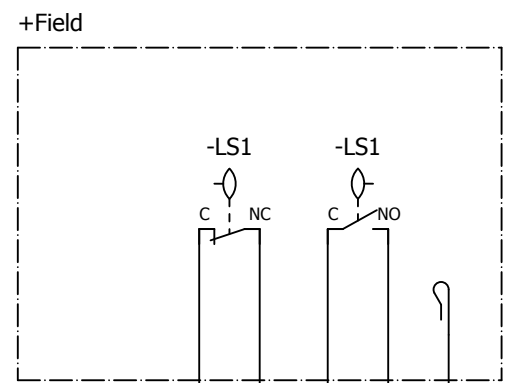
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Tank full


Separator Fault

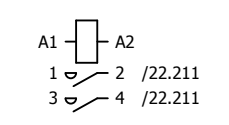
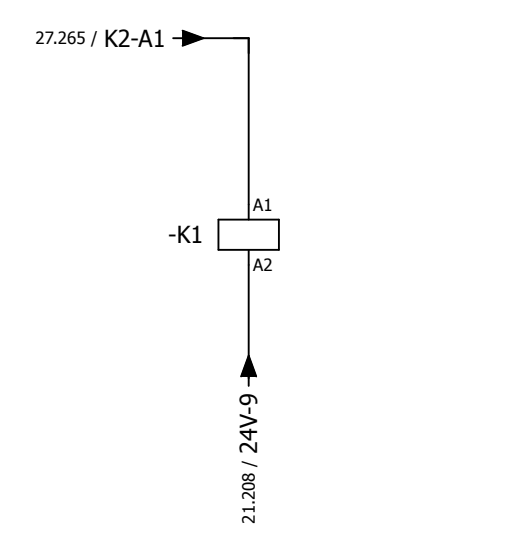
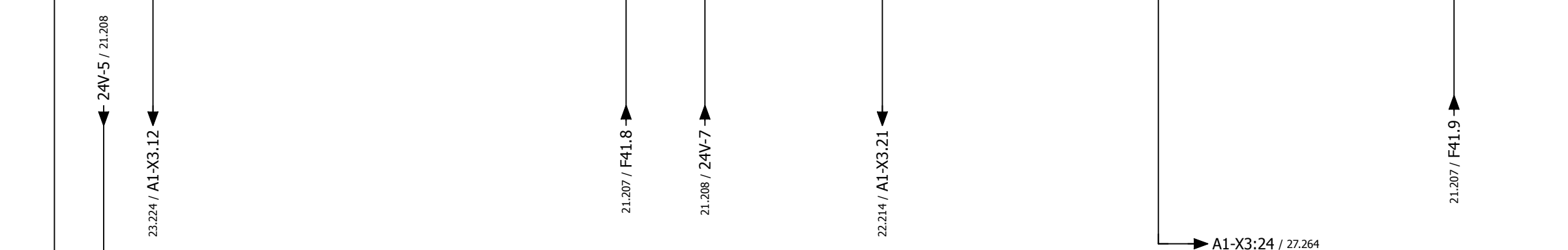
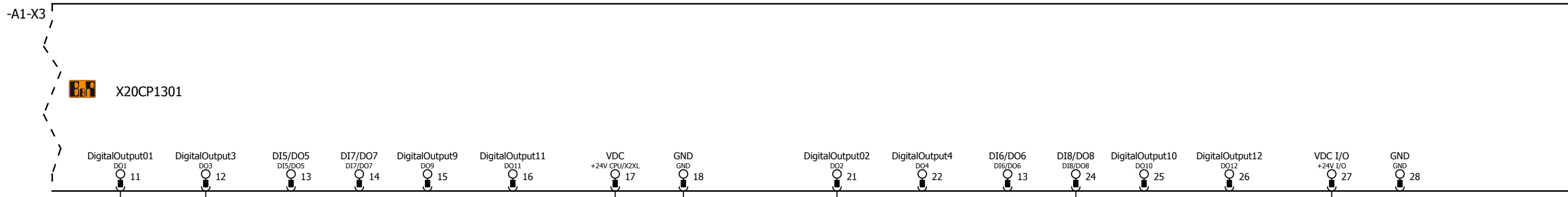
Cover open

Pump Fault

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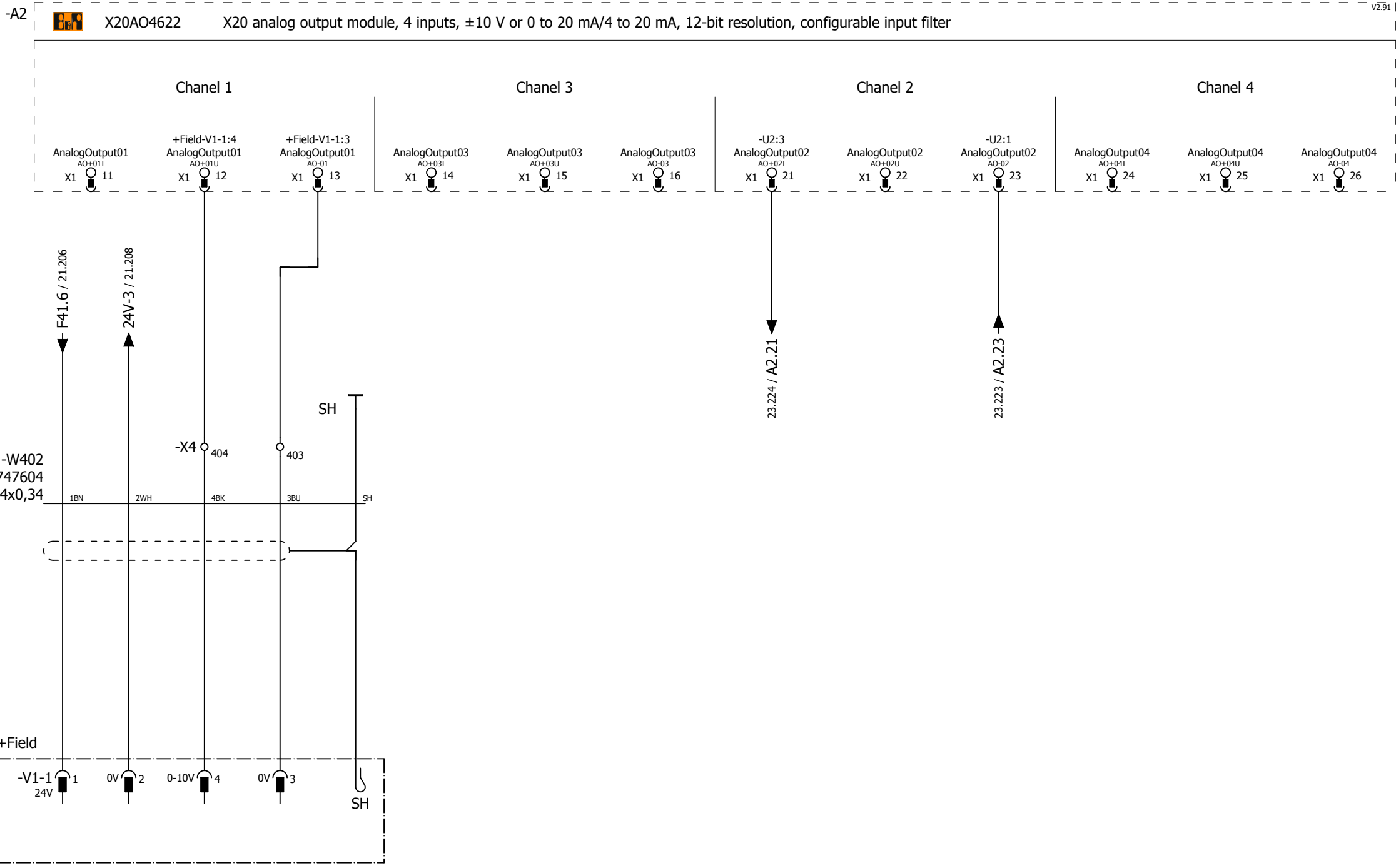


Indication Common Alarm Pump start Separator start External Alarm ON=NO ALARM Enable VFD separator

Note!
24VDC Max 0.5A


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| Department CAT | Approved date 2015-10-23 | Approved by SETUNLN | | | Mounting +CP01 | | Latest Revision 07 | Document No. 9014733 | Next page |