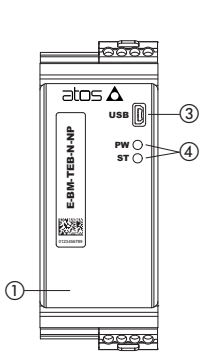
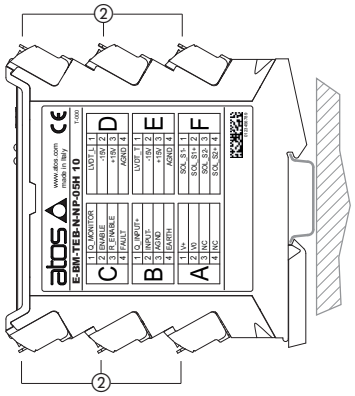
Digital E-BM-TEB/LEB drivers

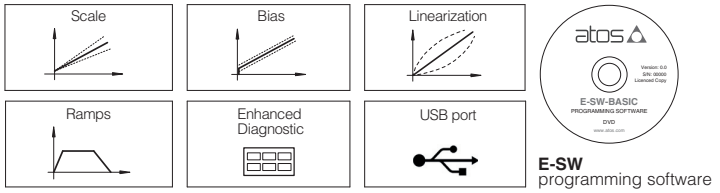
DIN-rail format, for proportional valves with one or two LVDT transducers

Phase-out components not recommended for new application - see table GS230-3 for new series



E-BM- **TEB** -N-NP





E-SW
programming software

Connectors ② included

E-BM-TEB/LEB

Digital drivers ① control in closed loop the position of the spool or poppet of direct and pilot operated proportional valves, according to the electronic reference input signal.

TEB execution controls direct operated directional/flow valves with one LVDT transducer.

LEB execution controls pilot operated directional valves with two LVDT transducers.

Atos PC software allows to customize the driver configuration to the specific application requirements.

Electrical Features:

- 6 fast plug-in connectors ②
- Mini USB port ③ always present
- 2 leds for diagnostics ④ (see 5.1)
- Electrical protection against reverse polarity of power supply
- Operating temperature range: -20 ÷ +60 °C
- Plastic box with IP20 protection degree and standard DIN-rail mounting
- CE mark according to EMC directive

Software Features:

- Intuitive graphic interface
- Setting of valve's functional parameters: bias, scale, ramps, dither
- Linearization function for hydraulic regulation
- Setting of PID gains
- Selection of analog IN / OUT range
- Complete diagnostic of driver status
- Internal oscilloscope function
- In field firmware update through USB port

1 MODEL CODE

E-BM	-	TEB	-	N	-	NP	-	01H	*	/	*	*	/	*

E-BM: Off-board electronic driver in DIN rail format

TEB = digital basic driver, for valves with one LVDT transducer
LEB = digital basic driver, for valves with two LVDT transducers

Alternated P/Q control:
N = none

Fieldbus interface, USB port always present:
NP = Not Present

01H = for single solenoid proportional valves
05H = for double solenoid proportional valves (only for **TEB**)

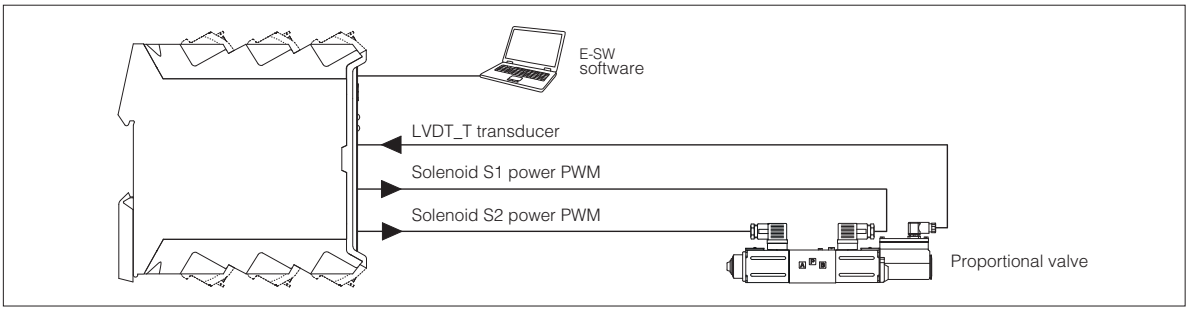
- = omit for direct valves and for pilot operated valves with two LVDT transducers
P = for pilot operated valves with one LVDT transducer (only for **TEB**)

Options, see section 5 **:**
A = max current limitation for Ex-proof valves
C = current feedback 4 ÷ 20 mA for LVDT transducers only in combination with option **A**
I = current reference input and monitor 4 ÷ 20 mA (omit for voltage reference and monitor input ±10 VDC)

Series number

Set code (see section 6)

2 BLOCK DIAGRAM EXAMPLE



3 VALVES RANGE

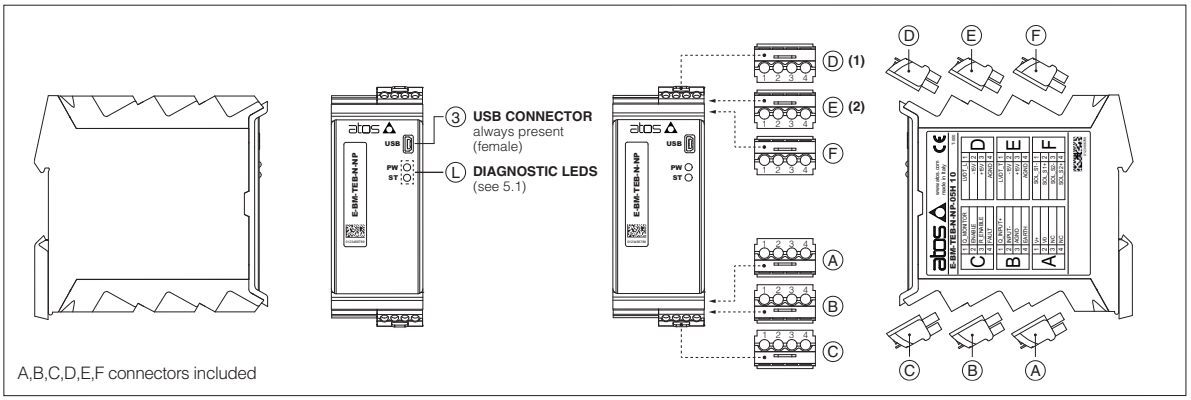
Valves	Directional			Flow	Directional	Cartridge
Industrial Tech table	**DHZO-T, DKZOR-T** F165, F168	**DLHZO-T, DLKZOR-T** F180	**DPZO-T** F172	**QVHZO-T, QVKZOR-T** F412	**DPZO-L** F175, F178	**LIQZO-L, LIQZP-L** F330, F340
Ex-proof Tech table	**DHZA-T, DKZA-T** FX120	**DLHZA-T, DLKZA-T** FX140	**DPZA-T** FX220	**QVHZA-T, QVKZA-T** FX420	-	**LIQZA-L** FX350, FX370
Driver model	**E-BM-TEB**				**E-BM-LEB**	

4 MAIN CHARACTERISTICS

Power supply	(see 7.1)	Nominal : +24 VDC Rectified and filtered : VRMS = 20 ÷ 32 VMAX (ripple max 10 % VPP)
Max power consumption		50 W
Current supplied to solenoids		IMAX = 3.0 A for standard driver IMAX = 2.5 A for ex-proof driver (**/A option**)
Analog input signal	(see 7.2)	Voltage: range ±10 VDC (24 VMAX tollerant) Input impedance: Ri > 50 kΩ Current: range ±20 mA Input impedance: Ri = 500 Ω
Monitor output	(see 7.3)	Output range: voltage ±10 VDC @ max 5 mA current ±20 mA @ max 500 Ω load resistance
Enable input	(see 7.4)	Range: 0 ÷ 5 VDC (OFF state), 9 ÷ 24 VDC (ON state), 5 ÷ 9 VDC (not accepted); Input impedance: Ri > 10 kΩ
Repeat enable output Fault output	(see 7.5) (see 7.6)	Output range: 0 ÷ 24 VDC (ON state > [power supply - 2 V] ; OFF state < 1 V) @ max 50 mA; external negative voltage not allowed (e.g. due to inductive loads)
Alarms		Solenoid not connected/short circuit, cable break with current reference signal, over/under temperature, valve spool transducer malfunctions, alarms history storage function
Format		Plastic box ; IP20 protection degree ; L 35 - H 7,5 mm DIN-rail mounting as per EN60715
Operating temperature		-20 ÷ +60 °C (storage -25 ÷ +85 °C)
Mass		Approx. 400 g
Additional characteristics		2 leds for diagnostic; protection against reverse polarity of power supply
Compliance		CE according to EMC directive 2014/30/EU (Immunity: EN 61000-6-2; Emission: EN 61000-6-3) RoHS Directive 2011/65/EU as last update by 2015/65/EU REACH Regulation (EC) n°1907/2006
Communication interface		USB Atos ASCII coding
Communication physical layer		USB 2.0 + USB OTG not insulated
Recommended wiring cable		LiYCY shielded cables: 0,5 mm² max 50 m for logic - 1,5 mm² max 50 m for power supply Note: for transducers wiring cable please consult the transducers datasheet
Max conductor size	(see 11)	2,5 mm²

Note: a maximum time of 400 ms have be considered between the driver energizing with the 24 VDC power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero.

5 CONNECTIONS AND LEDS

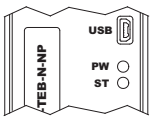


(1) D connector is available only for TEB-N versions 01HP / 05HP and LEB-N
(2) E connector is available only for TEB-N versions 01H / 05H and LEB-N

5.1 Diagnostic LEDs (L)

Two leds show driver operative conditions for immediate basic diagnostics. Please refer to the driver user manual for detailed information.

LEDS	DESCRIPTION	
PW	OFF = Power supply OFF	ON = Power supply ON
ST	OFF = Fault present	ON = No fault



5.2 Connectors - 4 pin

CONNECTOR	PIN	SIGNALS	TECHNICAL SPECIFICATIONS	NOTES
A	A1	**V+**	Power supply 24 VDC (see 7.1)	Input - power supply
	A2	**V0**	Power supply 0 VDC (see 7.1)	Gnd - power supply
	A3	**NC**	Do not connect	
	A4	**NC**	Do not connect	
B	B1	**Q_INPUT+**	Flow reference input signal: ±10 VDC / ±20 mA maximum range Default are ±10 VDC for standard and 4 ÷ 20 mA for /I option (see 7.2)	Input - analog signal **Software selectable**
	B2	**INPUT-**	Negative reference input signal for Q_INPUT+	Input - analog signal
	B3	**AGND**	Common gnd for monitor output	Common gnd
	B4	**EARTH**	Connect to system ground	
C	C1	**Q_MONITOR**	Flow monitor output signal: ±10 VDC / ±20 mA maximum range, referred to AGND Default are ±10 VDC for standard and 4 ÷ 20 mA for /I option (see 7.3)	Output - analog signal **Software selectable**
	C2	**ENABLE**	Enable (24 VDC) or disable (0 VDC) the controller, referred to V0 (see 7.4)	Input - on/off signal
	C3	**R_ENABLE**	Repeat enable, output repeater signal of enable input, referred to V0 (see 7.5)	Output - on/off signal
	C4	**FAULT**	Fault (0 VDC) or normal working (24 VDC), referred to V0 (see 7.6)	Output - on/off signal
D (1)	D1	**LVDT_L**	Main stage valve position transducer signal (see 7.7)	Input - analog signal
	D2	**-15V**	Main stage valve position transducer power supply -15V	Output power supply
	D3	**+15V**	Main stage valve position transducer power supply +15V	Output power supply
	D4	**AGND**	Common gnd for transducer power	Common gnd
E (2)	E1	**LVDT_T**	Direct valve or pilot valve position transducer signal (see 7.7)	Input - analog signal
	E2	**-15V**	Direct valve or pilot valve stage position transducer power supply -15V	Output power supply
	E3	**+15V**	Direct valve or pilot valve tage position transducer power supply +15V	Output power supply
	E4	**AGND**	Common gnd for transducer power	Common gnd
F	F1	**SOL_S1-**	Negative current to solenoid S1	Output - power PWM
	F2	**SOL_S1+**	Positive current to solenoid S1	Output - power PWM
	F3	**SOL_S2-**	Negative current to solenoid S2	Output - power PWM
	F4	**SOL_S2+**	Positive current to solenoid S2	Output - power PWM

(1) D connector is available only for TEB-N versions 01HP / 05HP and LEB-N
(2) E connector is available only for TEB-N versions 01H / 05H and LEB-N

6 SET CODE

The basic calibration of electronic driver is factory preset, according to the proportional valve to be coupled. These pre-calibrations are identified by the set code at the end of driver's model code (see section 1). For correct set code selection, please include in the driver order also the complete code of the coupled proportional valve. For further information about set code, please contact Atos technical office.

7 POWER SUPPLY AND SIGNALS SPECIFICATIONS

Atos digital drivers are CE marked according to the applicable directives (e.g. Immunity and Emission EMC Directive).
Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in the user manuals included in the E-SW-* programming software.
Generic electrical output signals of the valve (e.g. fault or monitor signals) must not be directly used to activate safety functions, like to switch-ON/OFF the machine's safety components, as prescribed by the European standards (Safety requirements of fluid technology systems and components-hydraulics, ISO 4413).

7.1 Power supply (V+ and V0)

The power supply (pin A1 and A2) must be appropriately stabilized or rectified and filtered: apply at least a 10000 µF/40 V capacitance to single phase rectifiers or a 4700 µF/40 V capacitance to three phase rectifiers.

⚠ A safety fuse is required in series to each power supply: 2,5 A time lag fuse.

7.2 Flow reference input signal (Q_INPUT+)

The driver is designed to receive an analog reference input signal (pin B1) for the valve's spool position.
Reference input signal is factory preset according to selected valve code, defaults are ±10 VDC for standard and 4 ÷ 20 mA for /I option.
Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 VDC or ± 20 mA.

7.3 Flow monitor output signal (Q_MONITOR)

The driver generates an analog output signal (pin C1) proportional to the actual spool position; the monitor output signal can be software set to show other signals available in the driver (e.g. analog reference, valve spool position).
Monitor output signal is factory preset according to selected valve code, defaults are ±10 VDC for standard and 4 ÷ 20 mA for /I option.
Output signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 VDC or ± 20 mA.

7.4 Enable input signal (ENABLE)

To enable the driver, supply 24 VDC on pin C2: Enable input signal allows to enable/disable the current supply to the solenoid, without removing the electrical power supply to the driver; it is used to active the communication and the other driver functions when the valve must be disabled for safety reasons. This condition **does not comply** with norms IEC 61508 and ISO 13849.

7.5 Repeat enable output signal (R_ENABLE)

Repeat enable (pin C3) is used as output repeater signal of enable input signal (see 7.4).

7.6 Fault output signal (FAULT)

Fault output signal (pin C4) indicates fault conditions of the driver (solenoid short circuits/not connected, reference or transducer signal cable broken, maximum error exceeded, etc.). Fault presence corresponds to 0 VDC, normal working corresponds to 24 VDC.
Fault status is not affected by the status of the Enable input signal.

7.7 Main stage and direct or pilot position transducer input signals (LVDT_L and LVDT_T)

Main stage (LVDT_L pin D1) and direct or pilot (LVDT_T pin E1) position transducer integrated to the valve have to be directly connected to the driver using ±15 VDC supply output available at pin D2, D3 and pin E2, E3.
Note: transducer input signals working range is ±10 VDC for standard or 4 ÷ 20 mA for /C option and **cannot** be reconfigured via software (input signals setting depends to the driver set code).

7.8 Possible combined options: /AC, /AI, /ACI

8 VALVE SETTINGS AND PROGRAMMING TOOLS

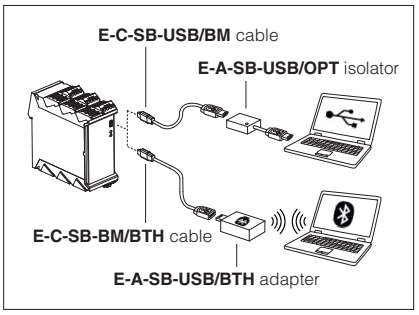
Valve's functional parameters and configurations, can be easily set and optimized using Atos E-SW programming software connected via USB port to the digital driver.
For fieldbus versions, the software permits valve's parameterization through USB port also if the driver is connected to the central machine unit via fieldbus.

The software is available in different versions according to the driver's options (see table **GS500**):

E-SW-BASIC	support:	NP (USB)	PS (Serial)	IR (Infrared)
E-SW-FIELDBUS	support:	BC (CANopen)	BP (PROFIBUS DP)	EH (EtherCAT)
		EW (POWERLINK)	EI (EtherNet/IP)	EP (PROFINET)
E-SW-*/PQ	support:	valves with SP, SF, SL alternated control (e.g. E-SW-BASIC/PQ)		

⚠ **WARNING: drivers USB port is not isolated!** For E-C-SB-USB/BM cable, the use of isolator adapter is highly recommended for PC protection

USB or Bluetooth connection



⚠ **WARNING:** see tech table **GS500** for the list of countries where the Bluetooth adapter has been approved

Free programming software, web download:

E-SW-BASIC web download = software can be downloaded upon web registration at www.atos.com ; service and DVD not included
Upon web registration user receive via email the Activation Code (software free license) and login data to access Atos Download Area

DVD programming software, to be ordered separately:

E-SW-*/PQ DVD first supply = software has to be activated via web registration at www.atos.com ; 1 year service included
Upon web registration user receive via email the Activation Code (software license) and login data to access Atos Download Area

E-SW-*-N/PQ DVD next supplies = only for supplies after the first; service not included, web registration not allowed
Software has to be activated with Activation Code received upon first supply web registration

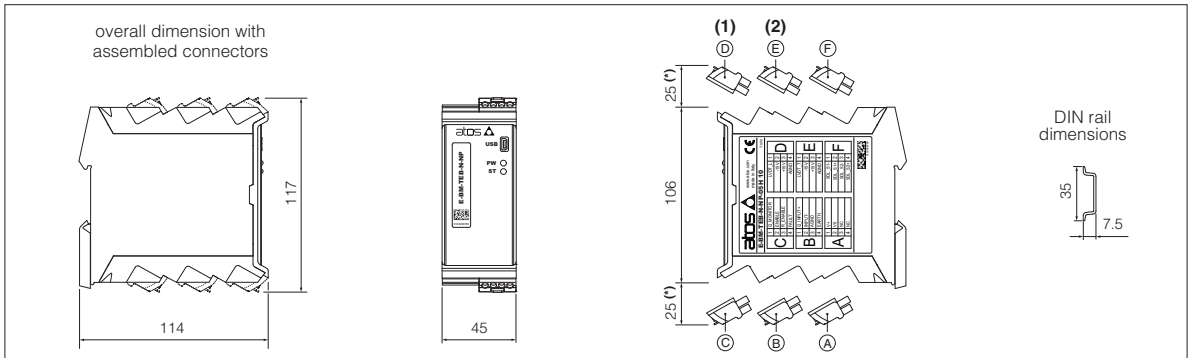
Atos Download Area: direct access to latest releases of E-SW software, manuals, USB drivers and fieldbus configuration files at www.atos.com

USB Adapters, Cables and Terminators, can be ordered separately

9 MAIN SOFTWARE PARAMETER SETTINGS

For detailed descriptions of settings, wirings and installation procedures, please refer to the user manual included in the E-SW programming software:
E-MAN-BM-LEB - user manual for **E-BM-TEB** and **E-BM-LEB** digital drivers

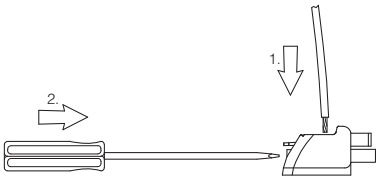
10 OVERALL DIMENSIONS [mm]



(1) D connector is available only for TEB-N versions 01HP / 05HP and LEB-N
(2) E connector is available only for TEB-N versions 01H / 05H and LEB-N

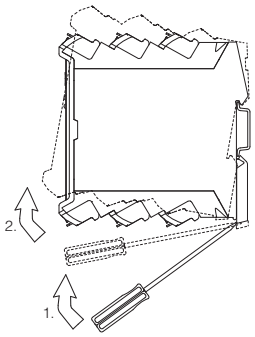
11 INSTALLATION

To wire cables in the connectors:
1. insert cable into the termination
2. turn screw with a screwdriver



Note: max conductor size: 2,5 mm²
tightening torque: 0,4 ÷ 0,6 Nm

To unlock the driver from the DIN rail:
1. pull down the locking slide with a screwdriver
2. rotate up the driver



To extract the connectors:
1. push lever
2. pull connector

To insert the connectors:
1. push the connector in its slot

Note: all connectors are supplied with a mechanical coding. This feature ensures a unique insertion of each connector in the own slot.
(e.g. connector A can not be inserted into connector slot of B,C,D,E,F)