Digital E-BM-TEB/LEB drivers

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

① Fast plug-in connectors - factory plugged
② Bluetooth/USB connection
③ Leds for diagnostic
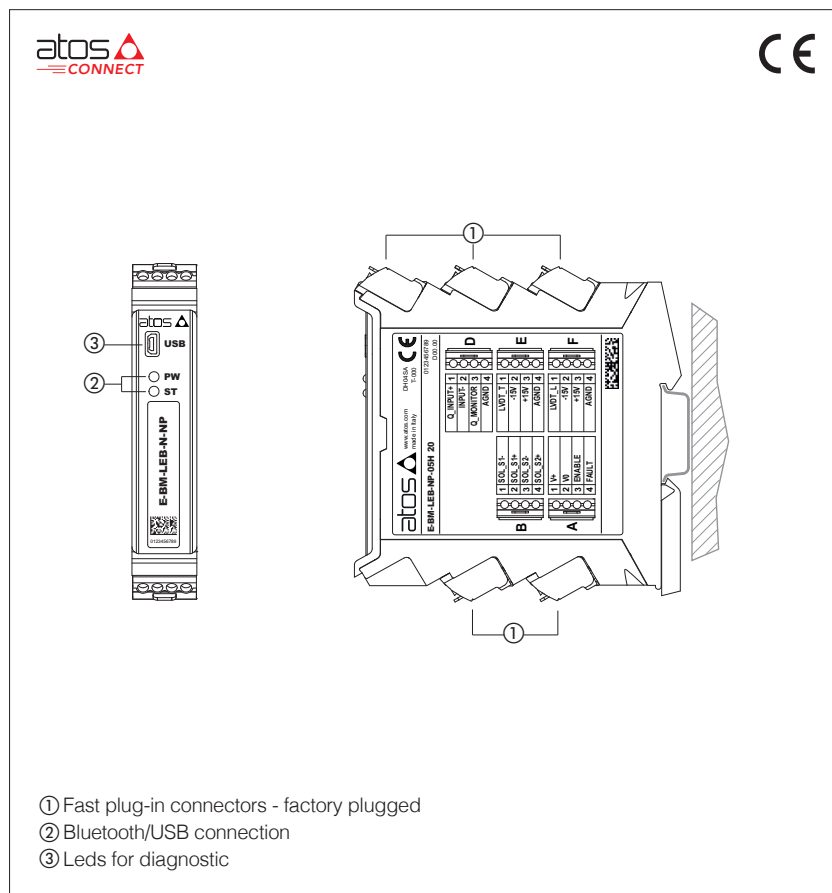
E-BM-TEB/LEB

Digital drivers 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.

Bluetooth/USB connection is always present for valve settings via mobile App and Atos PC software.

General Features:
- 5 fast plug-in connectors
- Mini USB connector for Bluetooth/USB connection - always present
- 2 leds for diagnostics (see 8.1)
- Electrical protection against reverse polarity of power supply
- Ambient temperature range: -20 ÷ +60 °C
- Plastic box with IP20 protection degree and standard DIN-rail mounting
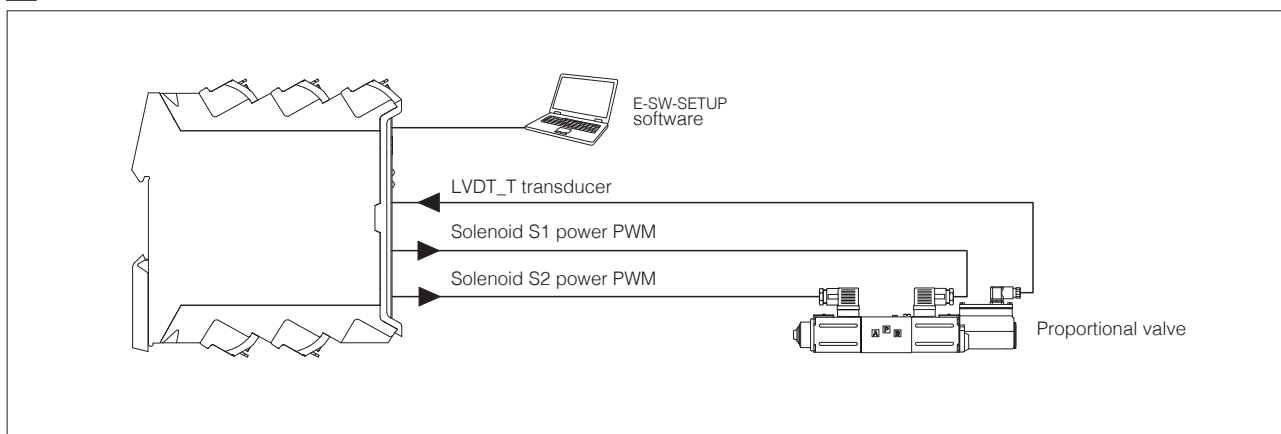- CE mark according to EMC directive

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

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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:
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 **10** :
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

Series number

Set code
(see section **9**)

2 BLOCK DIAGRAM EXAMPLE

E-SW-SETUP software

LVDT_T transducer

Solenoid S1 power PWM

Solenoid S2 power PWM

Proportional valve

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	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	DPZA-L FX232, FX237	LIQZA-L FX350, FX370
Driver model	E-BM-TEB				E-BM-LEB	

4 GENERAL NOTES

Atos digital proportionals valves 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 tech table **FS900** and in the user manuals included in the Z-SW-* programming software.

5 VALVE SETTINGS AND PROGRAMMING TOOLS - see tech. table GS500

5.1 Atos CONNECT mobile App

Free downloadable App for smartphones and tablets which allows quick access to valve main functional parameters and basic diagnostic information via Bluetooth, thus avoiding physical cable connection and significantly reducing commissioning time.
Atos CONNECT supports Atos digital valve drivers equipped with E-A-BTH adapter or with built-in Bluetooth. It does not support valves with p/Q control or axis controls.

Bluetooth or USB connection

E-A-BTH adapter

E-C-BTH cable

mobile App

E-C-SB-USB/BM cable

E-A-SB-USB/OPT isolator

PC software

5.2 E-SW-SETUP PC software

Free downloadable software for PC allows to set all valve functional parameters and to access complete diagnostic information of digital drivers via Bluetooth/USB service port.
Atos E-SW-SETUP PC software supports all Atos digital valve drivers and it is available at www.atos.com in MyAtos area.
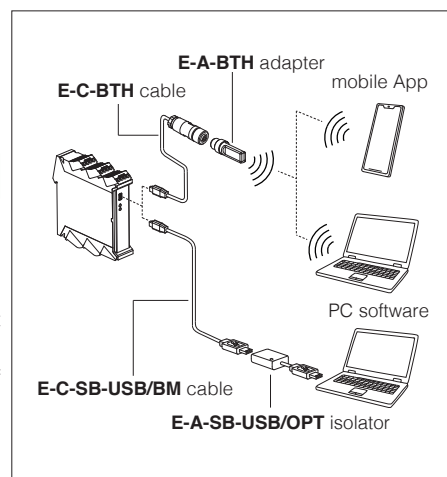
⚠ **WARNING: drivers USB port is not isolated!** For E-C-SB-USB/BM cable, the use of E-A-SB-USB/OPT isolator adapter is highly recommended for PC protection

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

6 FIELDBUS - see tech. table GS510

Fieldbus allows valve direct communication with machine control unit for digital reference, valve diagnostics and settings. These execution allow to operate the valves through fieldbus or analog signals available on the main connector.

7 MAIN CHARACTERISTICS

Power supply	(see 7.1)	Nominal : +24 V_{DC} Rectified and filtered : V_{RMS} = 20 ÷ 32 V_{MAX} (ripple max 10 % V_{PP})
Max power consumption		50 W
Current supplied to solenoids		I_{MAX} = 3.0 A for standard driver I_{MAX} = 2.5 A for ex-proof driver (**/A option**)
Analog input signal	(see 7.2)	Voltage: range ±10 V_{DC} (24 V_{MAX} tolerant) Input impedance: Ri > 50 kΩ Current: range ±20 mA Input impedance: Ri = 500 Ω
Monitor output	(see 7.3)	Output range: voltage ±10 V_{DC} @ max 5 mA current ±20 mA @ max 500 Ω load resistance
Enable input	(see 7.4)	Range: 0 ÷ 5 V_{DC} (OFF state), 9 ÷ 24 V_{DC} (ON state), 5 ÷ 9 V_{DC} (not accepted); Input impedance: Ri > 10 kΩ
Fault output	(see 7.5)	Output range: 0 ÷ 24 V_{DC} (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. 300 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 2015/863/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 has to be considered between the driver energizing with the 24 V_{DC} power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero.
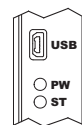
8 CONNECTIONS AND LEDS

A,B,D,E,F connectors included
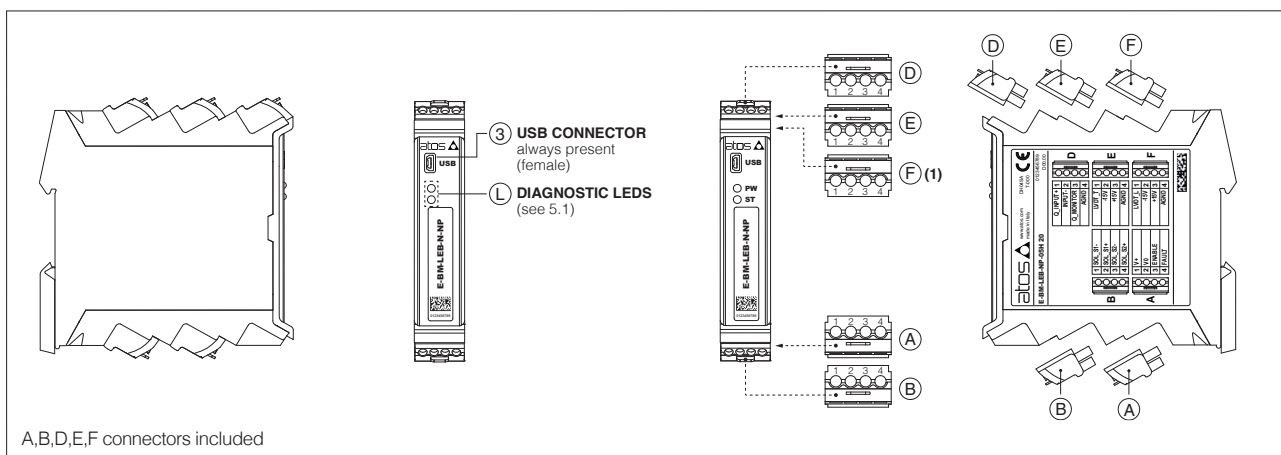
(1) F connector is available only for LEB

8.1 Diagnostic LEDs Ⓛ

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	

CONNECTOR	PIN	SIGNALS	TECHNICAL SPECIFICATIONS	NOTES
A	A1	**V+**	Power supply 24 V_{DC}	Input - power supply
	A2	**V0**	Power supply 0 V_{DC}	Gnd - power supply
	A3	**ENABLE**	Enable (24 V_{DC}) or disable (0 V_{DC}) the controller, referred to V0	Input - on/off signal
	A4	**FAULT**	Fault (0 V_{DC}) or normal working (24 V_{DC}), referred to V0	Output - on/off signal
B	B1	**SOL_S1-**	Negative current to solenoid S1	Output - power PWM
	B2	**SOL_S1+**	Positive current to solenoid S1	Output - power PWM
	B3	**SOL_S2-**	Negative current to solenoid S2	Output - power PWM
	B4	**SOL_S2+**	Positive current to solenoid S2	Output - power PWM
D	D1	**Q_INPUT+**	Flow reference input signal: ± 10 V_{DC} / ± 20 mA maximum range Default are ± 10 V_{DC} for standard and 4 ÷ 20 mA for /I option	Input - analog signal **Software selectable**
	D2	**INPUT-**	Negative reference input signal for Q_INPUT+	Input - analog signal
	D3	**Q_MONITOR**	Flow monitor output signal: ± 10 V_{DC} / ± 20 mA maximum range, referred to AGND Default are ± 10 V_{DC} for standard and 4 ÷ 20 mA for /I option	Output - analog signal **Software selectable**
	D4	**AGND**	Common gnd for monitor output	Common gnd
E	E1	**LVDT_T**	Direct valve or pilot valve position transducer signal	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 (1)	F1	**LVDT_L**	Main stage valve position transducer signal	Input - analog signal
	F2	**-15V**	Main stage valve position transducer power supply -15V	Output power supply
	F3	**+15V**	Main stage valve position transducer power supply +15V	Output power supply
	F4	**AGND**	Common gnd for transducer power	Common gnd

(1) F connector is available only for LEB

8.3 Communication connector ③

③	**USB connector - Mini USB type B** always present	
PIN	**SIGNAL**	**TECHNICAL SPECIFICATION** (1)
1	**+5V_USB**	Power supply
2	**D-**	Data line -
3	**D+**	Data line +
4	**ID**	Identification
5	**GND_USB**	Signal zero data line

9 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.

10 POWER SUPPLY AND SIGNALS SPECIFICATIONS

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).

10.1 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.

10.2 Flow reference input signal (Q_INPUT+)

The driver is designed to receive an analog reference input signal (pin D1) for the valve's spool position.
Reference input signal is factory preset according to selected valve code, defaults are ±10 V_{DC} 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 V_{DC} or ± 20 mA.

10.3 Flow monitor output signal (Q_MONITOR)

The driver generates an analog output signal (pin D3) 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 V_{DC} 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 V_{DC} or ± 20 mA.

10.4 Enable input signal (ENABLE)

To enable the driver, supply 24 V_{DC} on pin A3: 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.

10.5 Fault output signal (FAULT)

Fault output signal (pin A4) 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 V_{DC}, normal working corresponds to 24 V_{DC}.
Fault status is not affected by the status of the Enable input signal.

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

Main stage (LVDT_L pin F1) and direct or pilot (LVDT_T pin E1) position transducer integrated to the valve have to be directly connected to the driver using ±15 V_{DC} supply output available at pin F2, F3 and pin E2, E3.
Note: transducer input signals working range is ±10 V_{DC} for standard or 4 ÷ 20 mA for /C option and **cannot** be reconfigured via software (input signals setting depends to the driver set code).
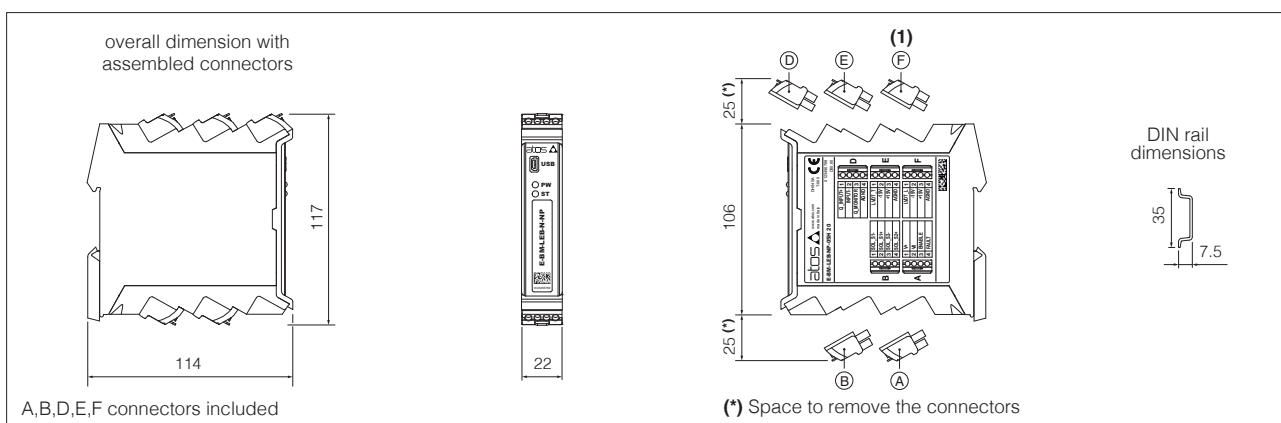
10.7 Possible combined options: /AC, /AI, /ACI

11 MAIN SOFTWARE PARAMETER SETTINGS

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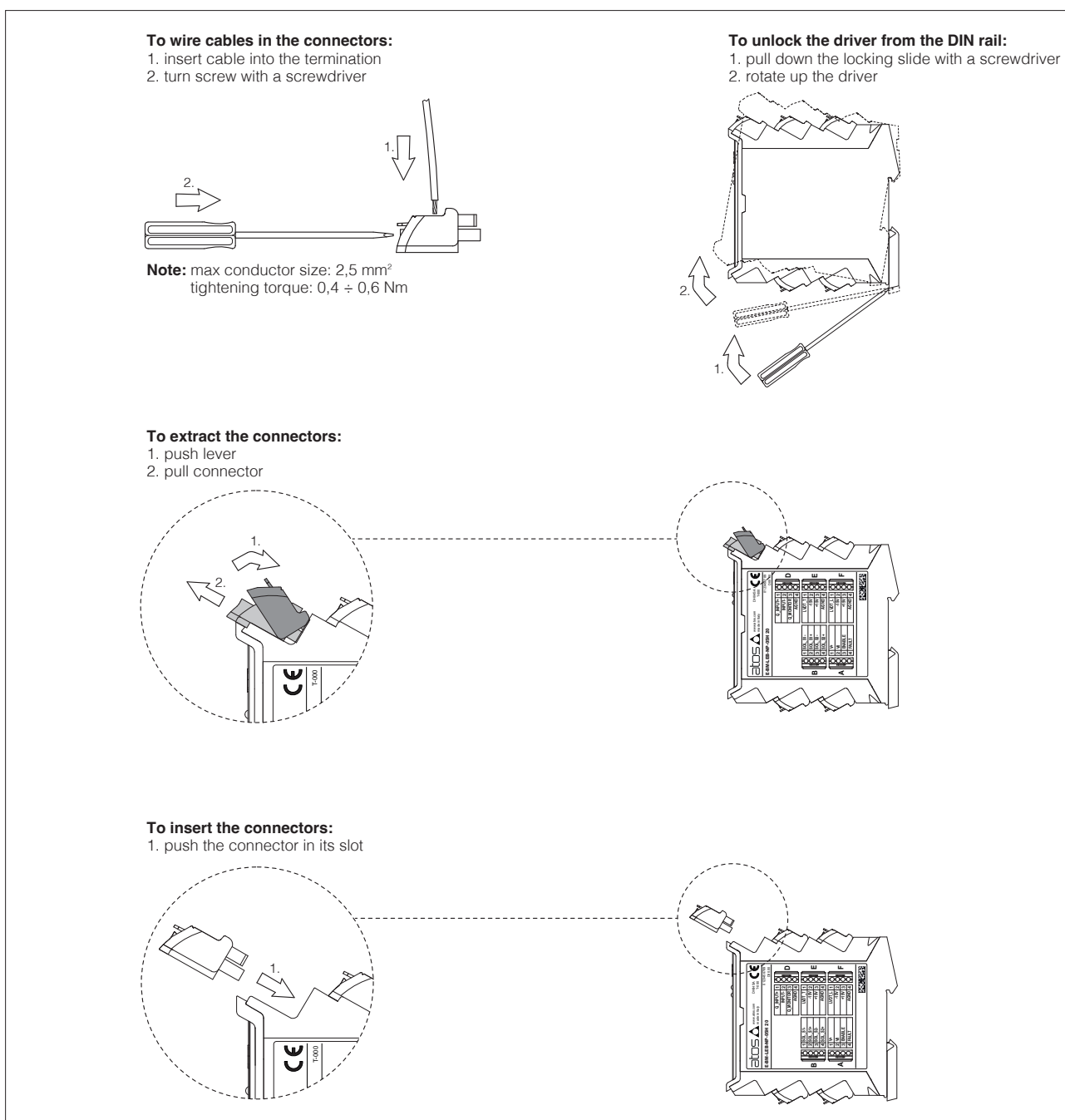
E-MAN-BM-LEB - user manual for **E-BM-TEB** and **E-BM-LEB** digital drivers

12 OVERALL DIMENSIONS [mm]

overall dimension with
assembled connectors

(1)

117

114

A,B,D,E,F connectors included

22

25 (*)

106

25 (*)

DIN rail
dimensions

35

7.5

(*) Space to remove the connectors

(1) F connector is available only for LEB

13 INSTALLATION

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

1.

2.

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

2.

1.

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

1.

2.

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

1.

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,D,E,F)