Digital E-BM-TES/LES drivers
DIN-rail panel format, for proportional valves with one or two spool position transducers

E-BM-TES/LES
Digital drivers ¹ supply and 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. TES execution operates direct operated directional/flow control valves with one integral spool position transducer. LES execution operates pilot operated directional valves with two integral spool position transducers. Option S adds the closed loop control of pressure (SP) or force (SF and SL) to the basic functions of proportional directional valves flow regulation (see section 7). Atos PC software allows to customize the driver configuration to the specific application requirements.

Electrical Features:
- up to 9 fast plug-in connectors
- USB port always present - Mini USB type B
- DB9 fieldbus communication connector for CANopen and PROFIBUS DP
- RJ45 ethernet communication connectors for EtherCAT, POWERLINK, EtherNet/IP, PROFINET
- 8 leds for diagnostics (see 6.1)
- Electrical protection against reverse polarity of power supply
- Operating temperature range: -20 ÷ +50 °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

MODEL CODE

<table>
<thead>
<tr>
<th>E-BM</th>
<th>TES</th>
<th>N</th>
<th>NP</th>
<th>01H</th>
</tr>
</thead>
</table>

Off-board electronic driver in DIN rail panel format

TES = digital full driver, for valves with one LVDT transducer
LES = digital full driver, for valves with two LVDT transducers

Alternated P/Q control:
N = none
S = closed loop pressure/force (see tech table GS002)

Fieldbus interface, USB port always present:
NP = Not Present
BC = CANopen
BP = PROFIBUS DP
EH = EtherCAT
EW = POWERLINK
EI = EtherNet/IP
EP = PROFINET RT/IRT

Options, see section 7:
A = max current limitation for Ex-proof valves
C = current feedback 4 ÷ 20 mA for remote transducers (only for option S) and LVDT transducers (only for option A)
I = current reference input and monitor 4 ÷ 20 mA (omit for voltage reference and monitor input +10 Vol)

Options:
- P = for pilot operated valves with one LVDT transducer (only for TES-N)

Set code (see section 7):
A
C
I

Series number:

01H = for single solenoid proportional valves
05H = for double solenoid proportional valves (only for TES)
**3 VALVES RANGE**

<table>
<thead>
<tr>
<th>Valves</th>
<th>Directional</th>
<th>Flow</th>
<th>Directional</th>
<th>Cartridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>DHZO-T, DKZOR-T</td>
<td>F165</td>
<td>DLHZO-T, DLKZOR-T</td>
<td>F180</td>
</tr>
<tr>
<td>Data sheet</td>
<td>F165, F192</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ex-proof</td>
<td>DHZA-T, DKZA-T</td>
<td>FX120</td>
<td>DLHZA-T, DLKZTA-T</td>
<td>FX140</td>
</tr>
<tr>
<td>Data sheet</td>
<td>FX120, FX192</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driver model</td>
<td>E-BM-TEB</td>
<td></td>
<td></td>
<td>E-BM-TEB</td>
</tr>
</tbody>
</table>

| Driver model | E-BM-TEB     |      |             | E-BM-TEB |

**4 ALTERNATED P/Q CONTROL** - only for S option

S option on digital drivers adds the closed loop control of pressure (SP) or force (SF and SL) to the basic functions of proportional directional valves flow regulation. The alternated P/Q control operates according to the two electronic reference signals by a dedicated algorithm that automatically selects which control will be active time by time.

The dynamics of the switching between the two controls can be regulated thanks to specific software setting, in order to avoid instability or vibrations. Flow regulation is active when the actual system pressure/force is lower than the relevant input reference signal - the valve works normally to regulate the flow by controlling in closed-loop the spool/poppet position through the integral LVDT transducer.

Pressure/force control is activated when the actual system pressure/force, measured by remote transducers, grows up to the relevant input reference signal - the driver reduces the valve's flow regulation in order to keep steady the system pressure/force. If the pressure/force tends to decrease under its input reference signal, the flow control returns active.

The dynamic response of pressure/force control can be adapted to different system's characteristics, by setting the internal PID parameters using Atos PC software.

Up to 4 different PIDs are selectable to optimize the system dynamic response according to different hydraulic working conditions.

**Alternated control configurations** - software selectable

**Flow Priority**

- flow regulation
- force limitation
- reference value
- actual value

**SP – flow/pressure control**

Adds pressure control to standard flow control and permits to limit the max force in one direction controlling in closed loop the pressure acting on one side of the hydraulic actuator. A single pressure transducer has to be installed on hydraulic line to be controlled.

**SF – flow/force control**

Adds force control to standard flow control and permits to limit the max force in two directions controlling in closed loop the delta pressure acting on both sides of the hydraulic actuator. Two pressure transducers have to be installed on both hydraulic line.

**SL – flow/force control**

Adds force control to standard flow control and permits to limit the max force in one or two directions controlling in closed loop the force performed by the hydraulic actuator. A load cell has to be installed on hydraulic actuator.

**General Notes:**

- auxiliary check valves are recommended in case of specific hydraulic configuration requirements in absence of power supply or fault - see tech table EY105
- for additional information about alternated P/Q controls configuration please refer to tech table GS002
- Atos technical service is available for additional evaluations related to specific applications usage
5 MAIN CHARACTERISTICS

Power supplies (see 8.1, 8.2) Nominal: +24 Vcc Rectified and filtered: Vin = 20 - 32 Vmax (ripple max 10 % Vmax)

Max power consumption 50 W

Current supplied to solenoids Max = 3.0 A for standard driver Max = 2.5 A for ex-proof driver (IA option)

Analog input signals (see 8.3, 8.4) Voltage: range ±10 Vcc (24 Vmax tolerant) Input impedance: Ri > 10 kΩ Current: range ±20 mA Input impedance: Ri = 500 Ω

Monitor outputs (see 8.5, 8.6) Output range: voltage ±10 Vcc @ max 5 mA current ±20 mA @ max 500 Ω load resistance

Enable input Digital inputs (see 8.7) Range: 0 = 5 Vcc (OFF state), 9 = 24 Vcc (ON state), 5 = 9 Vcc (not accepted), Input impedance: Ri > 10 kΩ

Fault output (see 8.8) Output range: 0 = 24 Vcc (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

Pressure/Force transducers power supply Pressure/Force transducers transducers wiring cable please consult the transducers datasheet

Communication interface USB Atos ASCII coding EN50325-4 / D5408 PROFIBUS DP EN50170-2/IEC61158 Ethernet/IP EtherCAT, POWERLINK, CANopen optical insulated PROFIBUS DP EC 61158

Communication physical layer not insulated USB 2.0 + USB OTG optical insulated CAN ISO11898 Fast Ethernet, insulated 100 Base TX

Recommended wiring cable LIYCY shielded cables: 0.5 mm² max 50 m for logic, 1.5 mm² max 50 m for power supply

Max conductor size (see 12) 2.5 mm²

Note: a maximum time of 800 ms (depending on communication type) have been considered between the driver energizing with the 24 Vcc power supply and when the valve is ready to operate. During this time the current to the valve coils is switched to zero.

6 CONNECTIONS AND LEDS

A, B, C, D, E, F, J, K connectors included

(1) D connector is available only for TES-N versions 01H / 05H and LES-*
(2) E connector is available only for TES-* versions 01H / 05H and LES-*
(3) I, J and K connectors are available only for TES-S and LES-S

6.1 Diagnostic LEDs

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

<table>
<thead>
<tr>
<th>FIELDBUS CONNECTORS</th>
<th>NP</th>
<th>BC</th>
<th>BP</th>
<th>EH</th>
<th>EW</th>
<th>EI</th>
<th>EP</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>PW</td>
<td>L2</td>
<td>L3</td>
<td>PW</td>
<td>ST</td>
<td>OFF = Power supply OFF</td>
<td>ON = Power supply ON</td>
</tr>
<tr>
<td>L2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>OFF = Fault present</td>
<td>ON = No fault</td>
</tr>
<tr>
<td>L3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ST GREEN RED
### 6.2 Connectors - 4 pin

<table>
<thead>
<tr>
<th>CONNECTOR</th>
<th>PIN</th>
<th>ALTERNATED PIQ CONTROL</th>
<th>TECHNICAL SPECIFICATIONS</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>A1</td>
<td>V+</td>
<td>Power supply 24 Vcc (see 8.1)</td>
<td>Input - power supply</td>
</tr>
<tr>
<td></td>
<td>A2</td>
<td>V0</td>
<td>Power supply 0 Vcc (see 8.1)</td>
<td>Gnd - power supply</td>
</tr>
<tr>
<td></td>
<td>A3</td>
<td>VL+</td>
<td>Power supply 24 Vcc for driver’s logic and communication (see 8.2)</td>
<td>Input - power supply</td>
</tr>
<tr>
<td></td>
<td>A4</td>
<td>VL0</td>
<td>Power supply 0 Vcc for driver’s logic and communication (see 8.2)</td>
<td>Gnd - power supply</td>
</tr>
<tr>
<td>B</td>
<td>B1</td>
<td>Q_INPUT+</td>
<td>Flow reference input signal: ±10 Vcc / ±20 mA maximum range Default are ±10 Vcc for standard and 4 ÷ 20 mA for /I option (see 8.3)</td>
<td>Input - analog signal Software selectable</td>
</tr>
<tr>
<td></td>
<td>B2</td>
<td>INPUT-</td>
<td>Negative reference input signal for Q_INPUT+ and F_INPUT+</td>
<td>Input - analog signal</td>
</tr>
<tr>
<td></td>
<td>B3</td>
<td>NC</td>
<td>Do not connect</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B4</td>
<td>EARTH</td>
<td>Connect to system ground</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>C1</td>
<td>Q_MONITOR</td>
<td>Flow monitor output signal: ±10 Vcc / ±20 mA maximum range, referred to AGND. Default are ±10 Vcc for standard and 4 ÷ 20 mA for /I option (see 8.7)</td>
<td>Output - analog signal Software selectable</td>
</tr>
<tr>
<td></td>
<td>C2</td>
<td>ENABLE</td>
<td>Enable (24 Vcc) or disable (0 Vcc) the controller, referred to VL0 (see 8.7)</td>
<td>Input - on/off signal</td>
</tr>
<tr>
<td></td>
<td>C3</td>
<td>F_MONITOR</td>
<td>Pressure/force monitor output signal: ±10 Vcc / ±20 mA maximum range, referred to AGND Default are ±10 Vcc for standard and 4 ÷ 20 mA for /I option (see 8.6)</td>
<td>Output - analog signal Software selectable</td>
</tr>
<tr>
<td></td>
<td>C4</td>
<td>FAULT</td>
<td>Fault (0 Vcc) or normal working (24 Vcc), referred to VL0 (see 8.8)</td>
<td>Output - on/off signal</td>
</tr>
<tr>
<td>D</td>
<td>D1</td>
<td>LVDT_L</td>
<td>Main stage valve position transducer signal (see 8.9)</td>
<td>Input - analog signal</td>
</tr>
<tr>
<td></td>
<td>D2</td>
<td>_15V</td>
<td>Main stage valve position transducer power supply -15V</td>
<td>Output power supply</td>
</tr>
<tr>
<td></td>
<td>D3</td>
<td>_15V</td>
<td>Main stage valve position transducer power supply +15V</td>
<td>Output power supply</td>
</tr>
<tr>
<td></td>
<td>D4</td>
<td>AGND</td>
<td>Common gnd for transducer power and monitor outputs</td>
<td>Common gnd</td>
</tr>
<tr>
<td>E</td>
<td>E1</td>
<td>LVDT_T</td>
<td>Direct valve or pilot valve position transducer signal (see 8.9)</td>
<td>Input - analog signal</td>
</tr>
<tr>
<td></td>
<td>E2</td>
<td>_15V</td>
<td>Direct valve or pilot valve position transducer power supply -15V</td>
<td>Output power supply</td>
</tr>
<tr>
<td></td>
<td>E3</td>
<td>_15V</td>
<td>Direct valve or pilot valve position transducer power supply +15V</td>
<td>Output power supply</td>
</tr>
<tr>
<td></td>
<td>E4</td>
<td>AGND</td>
<td>Common gnd for transducer power and monitor outputs</td>
<td>Common gnd</td>
</tr>
<tr>
<td>F</td>
<td>F1</td>
<td>SOL_S1-</td>
<td>Negative current to solenoid S1</td>
<td>Output - power PWM</td>
</tr>
<tr>
<td></td>
<td>F2</td>
<td>SOL_S1+</td>
<td>Positive current to solenoid S1</td>
<td>Output - power PWM</td>
</tr>
<tr>
<td></td>
<td>F3</td>
<td>SOL_S2-</td>
<td>Negative current to solenoid S2</td>
<td>Output - power PWM</td>
</tr>
<tr>
<td></td>
<td>F4</td>
<td>SOL_S2+</td>
<td>Positive current to solenoid S2</td>
<td>Output - power PWM</td>
</tr>
<tr>
<td>I</td>
<td>I1</td>
<td>NC</td>
<td>Do not connect</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I2</td>
<td>D_IN0</td>
<td>NP execution: multiple pressure/force PID selection, referred to VL0. (see 8.11) Fieldbus execution: general purpose digital input 0 = 24Vcc, referred to VL0 (see 8.11)</td>
<td>Input - on/off signal</td>
</tr>
<tr>
<td></td>
<td>I3</td>
<td>NC</td>
<td>Do not connect</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I4</td>
<td>NC</td>
<td>Do not connect</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>J1</td>
<td>VF +24V</td>
<td>Power supply: +24Vcc or OFF (default OFF)</td>
<td>Output - power supply Software selectable</td>
</tr>
<tr>
<td></td>
<td>J2</td>
<td>F_TR1</td>
<td>1st signal pressure/force transducer: ±10 Vcc / ±20 mA maximum range Default are ±10 Vcc for standard and 4 ÷ 20 mA for /C option (see 8.10)</td>
<td>Input - analog signal Software selectable</td>
</tr>
<tr>
<td></td>
<td>J3</td>
<td>AGND</td>
<td>Common gnd for transducer power and signals</td>
<td>Common gnd</td>
</tr>
<tr>
<td></td>
<td>J4</td>
<td>NC</td>
<td>Do not connect</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>K1</td>
<td>VF +24V</td>
<td>Power supply: +24Vcc or OFF (default OFF)</td>
<td>Output - power supply Software selectable</td>
</tr>
<tr>
<td></td>
<td>K2</td>
<td>F_TR2</td>
<td>2nd signal pressure/force transducer (only for SP and SL): ±10 Vcc / ±20 mA maximum range Default are ±10 Vcc for standard and 4 ÷ 20 mA for /C option (see 8.10)</td>
<td>Input - analog signal Software selectable</td>
</tr>
<tr>
<td></td>
<td>K3</td>
<td>AGND</td>
<td>Common gnd for transducer power and signals</td>
<td>Common gnd</td>
</tr>
<tr>
<td></td>
<td>K4</td>
<td>NC</td>
<td>Do not connect</td>
<td></td>
</tr>
</tbody>
</table>

(1) D connector is available only for TES-N versions 01HP / 05HP and LES-*
(2) E connector is available only for TES-* versions 01H / 05H and LES-*
6.3 Pressure/force transducers connection - example - only for S option

![Pressure/force transducers connection diagram]

6.4 Communication connectors

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 |

4 BC fieldbus execution, connector - DB9 - 9 pin

- **PIN** |
  | **SIGNAL** |
  | **TECHNICAL SPECIFICATION (1)** |
  | 2 | CAN_L | Bus line (low) |
  | 5 | CAN_SHLD | Signal zero data line |
  | 7 | CAN_H | Bus line (high) |

5 BP fieldbus execution, connector - DB9 - 9 pin

- **PIN** |
  | **SIGNAL** |
  | **TECHNICAL SPECIFICATION (1)** |
  | 1 | SHIELD | Bus line (low) |
  | 3 | DGND | Data line and termination signal zero |
  | 6 | +5V | Termination supply signal |
  | 8 | LINE-A | Bus line (high) |

6 EH, EW, EI, EP fieldbus execution, connector - RJ45 - 8 pin

- **PIN** |
  | **SIGNAL** |
  | **TECHNICAL SPECIFICATION (1)** |
  | 1 | TX+ | Transmitter - white/orange |
  | 2 | RX- | Receiver - white/green |
  | 3 | TX- | Transmitter - orange |
  | 6 | RX+ | Receiver - green |

(1) shield connection on connector’s housing is recommended

7 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 7). 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.

8 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 tech table F003 and 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).

8.1 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.

8.2 Power supply for driver’s logic and communication (VL+ and VL0)

The power supply (pin A3 and A4) for driver’s logic and communication 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.

The separate power supply for driver’s logic, allow to remove solenoid power supply from pin A1 and A2 maintaining active the diagnostics, USB and fieldbus communications.

A safety fuse is required in series to each driver’s logic and communication power supply; 500 mA fast fuse.

8.3 Flow reference input signals (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 Vcc for standard and 4 – 20 mA for S option.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 Vcc or ± 20 mA.

Drivers with fieldbus interface can be software set to receive reference signal directly by the machine control unit (fieldbus reference).

Analog reference input signal can be used as on-off commands with input range 0 – 24 Vcc.

8.4 Pressure or force reference input signal (F_INPUT+) - only for S option

Functionality of pressure or force input reference signal (pin B3), is used as reference for the driver pressure/force closed loop, see section 8.

Reference input signal is factory preset according to selected valve code, defaults are ±10 Vcc for standard and 4 – 20 mA for S option.

Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 Vcc or ± 20 mA.

Drivers with fieldbus interface can be software set to receive reference signal directly by the machine control unit (fieldbus reference).

Analog reference input signal can be used as on-off commands with input range 0 – 24 Vcc.

GS240
8.5 Flow monitor output signal (Q_Monitor)

The device 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, fieldbus 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.

8.6 Pressure or force monitor output signal (F_Monitor) - only for S option

The device generates an analog output signal (pin C3) proportional to a selected pressure/force control; the monitor output signal can be software set to show other signals available in the driver (e.g. analog reference, force reference).

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.

8.7 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 valve (USB port enabled). Use it with /AC option and it can be used digital input by software selection.

8.8 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 break, 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. Fault output signal can be used as digital output by software selection.

8.9 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. The software is available in different versions according to the driver’s options (see table GS002).

8.10 Remote pressure/force transducer input signals (F_TR1 and F_TR2) - only for S option

Analog remote pressure transducers or load cell can be directly connected to the driver. Analog input signals are factory preset according to selected valve code, defaults are ±10 VDC for standard and 4 + 20 mA for /C option. Input signal can be reconfigured via software selecting between voltage and current, within a maximum range of ±10 VDC or ± 20 mA for /AC option.

Refer to pressure/force transducer characteristics to select the transducer type according to specific application requirements (see tech table GS02).

8.11 Multiple PID selection or digital input signals (D_IN0 and D_IN1) - only for S option

Two on-off input signals are available on the I/O module: l and K. For NP executions pin I2 and pin K2 are used to select one of the four pressure (force) PID parameters setting, stored into the driver. Switching the active setting of pressure PID during the machine cycle allows to optimize the system dynamic response in different hydraulic working conditions (maximum pressure, flow, etc.). Supply a 24 VDC or 0 VDC on pin I2 and pin K2, to select one of the four PID settings as indicated by the binary code table at side. Gray code can be selected by software.

For fieldbus executions pin I2 and/or K2 can be used as generic purpose on-off input signals.

8.12 Possible combined options: /AC, /AI, /ACI, /CI - combined options /CI is only available for E-BM-LES/S.

**5 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 (see table GS003).

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 GS005):

- **E-SW-BASIC**
  - support: NP (USB) PS (Serial) IR (Infrared)
  - support: BC (CANopen) BP (PROFIBUS DP) EH (EtherCAT)
  - support: EW (POWERLINK) Ei (EtherNet/IP) EP (PROFINET)

- **E-SW-FIELDBUS**
  - support: valves with SP, SF, SL alternated code (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.

**WARNING:** see tech table GS005 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

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.

**10 MAIN SOFTWARE PARAMETER SETTINGS**

For basic information about main setting parameters by E-SW programming software, see tech table GS003.

For detailed descriptions of settings, wirings and installation procedures, please refer to the user manual included in the E-SW programming software:

OVERALL DIMENSIONS [mm]

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

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

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

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,I,J,K)

(1) D connector is available only for TES-N versions 01HP / 05HP and LES-*
(2) E connector is available only for TES-* versions 01H / 05H and LES-*
(3) I, J and K connectors are available only for TES-S and LES-S