Digital E-BM-TID/LID drivers
DIN-rail format, for proportional valves with one or two LVDT transducers

E-BM-TID/LID
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.

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

LID 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:
- 5 fast plug-in connectors
- Mini USB port always present
- 2 leds for diagnostics (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
- Linearity 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

Connectors 1 included

Table GS235-0/E

<table>
<thead>
<tr>
<th>MODEL CODE</th>
<th>TID</th>
<th>N</th>
<th>NP</th>
<th>01H</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-BM</td>
<td>TID</td>
<td>N</td>
<td>NP</td>
<td>01H</td>
</tr>
</tbody>
</table>

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

**Options, see section 6:**
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) (1)

NP = Not Present

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

(1) No software selectable
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>Driver model</td>
<td>E-BM-TID</td>
<td>E-BM-LID</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4 MAIN CHARACTERISTICS

- **Power supply**: (see 7.1) Nominal: +24 Vcc, 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 (1A option)
- **Analog input signal**: (see 7.2) Voltage: range 10 Vcc (24 VMax tolerant), Input impedance: Ri > 50 kΩ, Current: range ±20 mA, Input impedance: Ri = 500 Ω
- **Monitor output**: (see 7.3) Output range: voltage ±10 Vcc @ max 5 mA, current ±20 mA @ max 500 Ω load resistance
- **Enable input**: (see 7.4) Range: 0 ÷ 5 Vcc (OFF state), 9 ÷ 24 Vcc (ON state), 5 ÷ 9 Vcc (not accepted), Input impedance: Ri > 10 kΩ
- **Fault output**: (see 7.5) Output range: 0 ÷ 24 Vcc (ON state > power supply - 2 V), OFF state < 1 V, 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 °C ÷ +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 2015/65/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
- **Max conductor size**: (see 7.11) 2.5 mm²

**Note**: A maximum time of 400 ms have be 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.

5 CONNECTIONS AND LEDS

- **USB CONNECTOR**: always present (female)
- **DIAGNOSTIC LEDS**: (see 5.1)

A,B,D,E,F connectors included

(1) F connector is available only for LID
5.1 Diagnostic LEDs

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

<table>
<thead>
<tr>
<th>LEDs</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PW</td>
<td>OFF = Power supply OFF                  ON = Power supply ON</td>
</tr>
<tr>
<td>ST</td>
<td>OFF = Fault present                           ON = No fault</td>
</tr>
</tbody>
</table>

5.2 Connectors - 4 pin

<table>
<thead>
<tr>
<th>CONNECTOR</th>
<th>PIN</th>
<th>SIGNALS</th>
<th>TECHNICAL SPECIFICATIONS</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>V+</td>
<td>Power supply 24 Vdc (see 7.1)</td>
<td>Input - power supply</td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td>V0</td>
<td>Power supply 0 Vdc (see 7.1)</td>
<td>Gnd - power supply</td>
<td></td>
</tr>
<tr>
<td>A3</td>
<td>ENABLE</td>
<td>Enable (24 Vdc) or disable (0 Vdc) the controller, referred to V0 (see 7.4)</td>
<td>Input - on/off signal</td>
<td></td>
</tr>
<tr>
<td>A4</td>
<td>FAULT</td>
<td>Fault (0 Vdc) or normal working (24 Vdc), referred to V0 (see 7.5)</td>
<td>Output - on/off signal</td>
<td></td>
</tr>
<tr>
<td>B1</td>
<td>SOL_S1-</td>
<td>Negative current to solenoid S1</td>
<td>Output - power PWM</td>
<td></td>
</tr>
<tr>
<td>B2</td>
<td>SOL_S1+</td>
<td>Positive current to solenoid S1</td>
<td>Output - power PWM</td>
<td></td>
</tr>
<tr>
<td>B3</td>
<td>SOL_S2-</td>
<td>Negative current to solenoid S2</td>
<td>Output - power PWM</td>
<td></td>
</tr>
<tr>
<td>B4</td>
<td>SOL_S2+</td>
<td>Positive current to solenoid S2</td>
<td>Output - power PWM</td>
<td></td>
</tr>
<tr>
<td>D1</td>
<td>Q_INPUT+</td>
<td>Flow reference input signal: ±10 Vdc for standard and 4 ÷ 20 mA for /I option (see 7.2)</td>
<td>Input - analog signal</td>
<td></td>
</tr>
<tr>
<td>D2</td>
<td>INPUT-</td>
<td>Negative reference input signal for Q_INPUT+</td>
<td>Input - analog signal</td>
<td></td>
</tr>
<tr>
<td>D3</td>
<td>Q_MONITOR</td>
<td>Flow monitor output signal: ±10 Vdc for standard and 4 ÷ 20 mA for /I option, referred to AGND (see 7.3)</td>
<td>Output - analog signal</td>
<td></td>
</tr>
<tr>
<td>D4</td>
<td>AGND</td>
<td>Common gnd for monitor output</td>
<td>Common gnd</td>
<td></td>
</tr>
<tr>
<td>E1</td>
<td>LVDT_T</td>
<td>Direct valve or pilot valve position transducer signal (see 7.6)</td>
<td>Input - analog signal</td>
<td></td>
</tr>
<tr>
<td>E2</td>
<td>-15V</td>
<td>Direct valve or pilot valve stage position transducer power supply -15V</td>
<td>Output power supply</td>
<td></td>
</tr>
<tr>
<td>E3</td>
<td>+15V</td>
<td>Direct valve or pilot valve stage position transducer power supply +15V</td>
<td>Output power supply</td>
<td></td>
</tr>
<tr>
<td>E4</td>
<td>AGND</td>
<td>Common gnd for transducer power</td>
<td>Common gnd</td>
<td></td>
</tr>
<tr>
<td>F1</td>
<td>LVDT_L</td>
<td>Main stage valve position transducer signal (see 7.6)</td>
<td>Input - analog signal</td>
<td></td>
</tr>
<tr>
<td>F2</td>
<td>-15V</td>
<td>Main stage valve position transducer power supply -15V</td>
<td>Output power supply</td>
<td></td>
</tr>
<tr>
<td>F3</td>
<td>+15V</td>
<td>Main stage valve position transducer power supply +15V</td>
<td>Output power supply</td>
<td></td>
</tr>
<tr>
<td>F4</td>
<td>AGND</td>
<td>Common gnd for transducer power</td>
<td>Common gnd</td>
<td></td>
</tr>
</tbody>
</table>

(1) F connector is available only for LID

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 2). 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 tech table FS900 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 power 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 D1) for the valve’s spool position.

Standard (voltage reference input)

Default is ±10 Vdc and can be reconfigured via software, within a maximum range of ±10 Vdc.

Option /I (current reference input)

Default is 4 – 20 mA and can be reconfigured via software, within a maximum range of ± 20 mA.

7.3 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).

Standard (voltage monitor output)

Default is ±10 Vdc and can be reconfigured via software, within a maximum range of ±10 Vdc.

Option /I (current monitor output)

Default is 4 – 20 mA and can be reconfigured via software, within a maximum range of ± 20 mA.

7.4 Enable input signal (ENABLE)

To enable the driver, supply 24 Vdc 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 activate 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 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 Vdc, normal working corresponds to 24 Vdc.

Fault status is not affected by the status of the Enable input signal.

7.6 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 Vdc supply output available at pin F2, F3 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).

7.7 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 (see table FS900).

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)

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

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 basic information about main setting parameters by E-SW programming software, see tech table FS900

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-LID - user manual for E-BM-TID and E-BM-LID digital drivers
**OVERALL DIMENSIONS [mm]**

A, B, D, E, F connectors included

(1) F connector is available only for LID

**INSTALLATION**

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

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, D, E, F)

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

Note: max conductor size: 2.5 mm²
tightening torque: 0.4 ÷ 0.6 Nm