Ultrasonic Flow Meter

# Series 6

Manual
## Wiring Instructions

Elster GmbH

Steinern Strasse 19-21

D - 55252    Mainz-Kastel, Germany

Tel.:   +49 6134 6050

Fax:   +49 6134 605 566

E-Mail:   **info@elster-instromet.com**

# Contents

# Contents

# 1   General Information

## 1.1   About these Instructions

This document provides detailed information for wiring a Series 6 Ultrasonic Flow Meter (UFM) from Elster. For general information, please refer to the Operation and Maintenance Manual for your particular flow meter (latest valid revision). Before performing any activity on the UFM, please familiarize yourself with the Safety Instructions. Both of these documents are available online at **http://www.docuthek.com/**.

Please also refer to ⇨ Appendix I – References at the end of this document for a complete list of UFM Series 6 resources.

## 1.2   Limitation of Liability

This manual is based on the latest information. It is provided subject to alterations. We reserve the right to change the construction and/or configuration of our products at any time without obligation to update previously shipped equipment.

The warranty provisions stipulated in the manufacturer's Terms of Delivery are applicable to the product. The manufacturer shall have no obligation in the event that:

- Repair or replacement of equipment or parts has been required through normal wear and tear, or by necessity in whole or part by catastrophe, or the fault or negligence of the purchaser;

- The equipment, or parts, have been maintained or repaired by other than an authorized representative of the manufacturer, or have been modified in any manner without prior express written permission of the manufacturer;

- Non-original parts are used;

- Equipment is used improperly, incorrectly, carelessly or not in line with its nature and/or purpose;

- Use of this product with unauthorized equipment or peripherals, including, but not necessarily limited to, cables, testing equipment, computers, voltage, etc.

The manufacturer is not responsible for the incidental or consequential damages resulting from the breach of any express or implied warranties, including damage to property, and to the extent permitted by law, damage for personal injury.

> ❗ Read through these Wiring Instructions carefully before beginning any work.
>
> The manufacturer assumes no liability for loss and malfunctions that result from non-compliance with these instructions.

We reserve the right to make technical changes within the scope of improving performance characteristics and continuous development of the device.

Current warranty conditions in the General Terms and Conditions are available on our website:

**http://www.elster-instromet.com/en/general-terms-of-business**

## 1.3   Text Labelling

This manual employs consistent visual cues and standard text formats to help you easily locate and interpret information. This information will help you quickly identify relevant content.

### 1.3.1   Presentation of Safety and Risk Instructions

**Hazard Warnings**

Hazard warnings indicate hazardous situations which may result in material damage and bodily harm or even death if disregarded.

Hazard warnings are described below:

> ⚠️ **DANGER WORD!**
>
> **Type of danger**
>
> **Consequences in case of non-compliance**
>
> Avoiding danger

**Safety Instructions**

Safety instructions include notes and information which if disregarded may lead to functions not working correctly or not working at all.

Safety instructions are described below:

> ❗ **Safety instruction (optional)**
>
> Safety instruction text

**Tips and Recommendations**

Tips include notes and information that make it easier for the user. Tips are described below:

> 📖 **Heading (optional)**
>
> Hint text

### 1.3.2    Paragraph Formats

►     This triangle prompts you for an action.
✓     This character will show you the immediate result of your action.

---

*Example*

Multi-row examples are marked by two continuous blue lines and the
keyword "Example".

---

### 1.3.3    Character Formats

| **Example** | **Use** |
|---|---|
| ⇨ See Chapter 4 Power Connection (TB1) (p.12) | References to additional information are marked with an arrow. If the arrow refers to information within the document, these references are formatted as hyperlinks in blue font. You can go directly to the corresponding section by clicking on the blue text. |
| **www.docuthek.com** | links (Hyperlink) |

Table 1: Character formats

# 2   SPU Overview

The SPU box contains two separated compartments; a main and a rear
compartment (see Figure 2-1 and Figure 2-2). The main compartment can
be opened from the side of the SPU and contains the most important circuit
boards. All connections herein are factory set and should not be adjusted on
site. It is strongly advised to only open this compartment after consultation
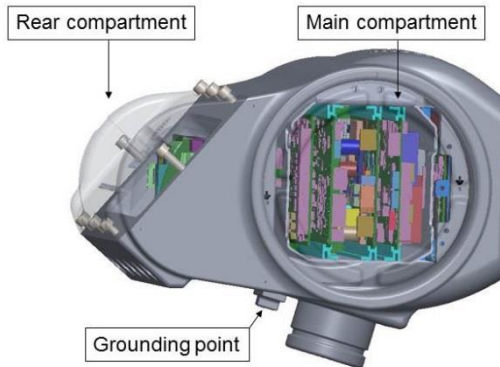with Elster.



Figure 2-1: SPU Compartments

For all external connections to the meter the connection holes in the bottom
of the rear compartment should be used (see Figure 2-2). Five connection
holes are provided; the thread type can be either M20 or ½" NPT. Unused
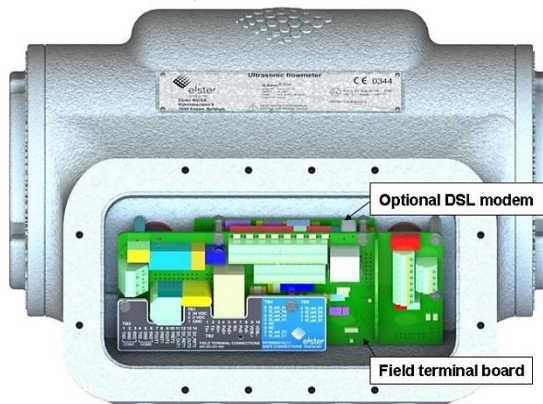


Figure 2-2: Rear Compartment

holes shall be equipped with certified stopping plugs; non-certified plugs (e.g. used for transport or storage) shall also be replaced by certified plugs. The client is responsible to provide suitable glands and stopping plugs, with regards to e.g. thread type, hazardous area certification, ingress protection.

The rear compartment contains the field terminal board (see Figure 2-3 and Figure 2-4). All connections for external wiring are placed on this PCB, therefore when connecting to a flow computer only the connection on this PCB should be used. For long distance network connections an optional DSL modem can be placed behind the field terminal board.
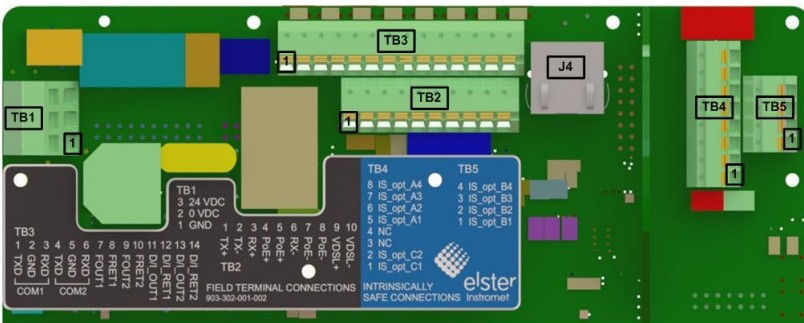


Figure 2-3: Field Terminal Board (EI-PO10AJ)



Figure 2-4: Field Terminal Board (EI-PO10BD)

If there are differences between the components of Field Terminal Board (FTB) EI-PO10AJ and EI-PO10BD, the two options are mentioned.

# 3   Installation Instructions

Suitable armored shielded cables must be used for wiring the meter (communication cables should also be twisted), whereby the cables are protected from mechanical damages as well as electrical interference. In addition, ensure the length, diameter, core, and resistance of the cables are an optimal match for the particular application.

For making reliable and durable connections to your UFM it is highly recommended to use insulated wire end terminals. To avoid cables hanging in the glands; all cables must be clamped and cleated properly and close to the UFM connections. The SPU can rotate almost 360°, keep this in mind when wiring your meter. Ensure the wires can rotate as well, if needed.
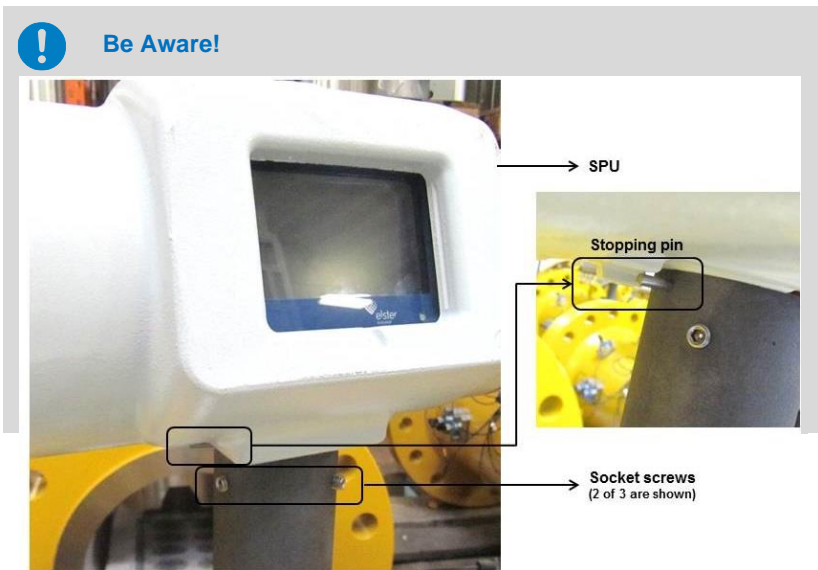


Figure 3-1: Rotation of the SPU

As the SPU can rotate almost 360°, a stopping pin should be in place to prevent the SPU from rotating beyond its limits. Please see Figure 3-1.

Before rotating, loosen the three socket screws. Rotation of the SPU should be smooth. When encountering resistance, stop rotating the SPU and check if the socket screws are loose enough. When the SPU does not rotate smoothly please contact Elster or your local representative. After rotating the SPU, fasten the three socket screws back on.

# 4  Power Connection (TB1)

In Table 2 an overview is given of the power connections of the Ultrasonic Flow Meter Series 6. The position of the power connection is stated in Figure 2-3.

| Pin Number | Signal Name | Description |
|---|---|---|
| 3 | 24 VDC | DC power input 24V nominal |
| 2 | 0 VDC | DC power ground |
| 1* | EARTH | Power earth |
| ⚠ | *ATTENTION! In case the ultrasonic flow meter body is connected to a cathodic protection system, leave pin number 1 unconnected; as in that case the 'earth' of the external power supply should not be connected. | |

Table 2: Power Connections (TB1)

For choosing the correct cable for wiring the power connection, please refer to the general instruction in ⇨ Chapter 3 - Installation Instructions (p.11) and specific instructions in Table 2.

| Power Connection | Wire Specification |
|---|---|
| Maximal cable core | 2.5 mm$^2$ |
| Maximal cable length | 700 m<br>(max. 5 ohm / wire) |
| Voltage at the field terminal board | 18 – 30 VDC<br>(24 V nominal) |
| Nominal power consumption* | 20 Watt |

\* For a very short period of time the power consumption can be higher at start up
(maximum 40W)

Table 3: Power Connection, Wire Specification

When wiring the meter ensure all requirements are fulfilled. In case of
accidental overvoltage the UFM contains built-in surge protection.

⚠ **WARNING!**

For compliance with EN-IEC 61010 (also harmonized under EU
Low Voltage directive 2006/95/EC) the SPU requires an external
power supply, limited-energy (< 30 Vdc max. 8A), and reinforced
insulation between input and output by the safety transformer and
appropriate distance between components on the PCB.

Do not open the rear compartment when device is energized.

For choosing the correct wires, ensure they are capable of
providing a maximum power of 40 Watts, to avoid startup
problems with the meter.

Depending on the switch 'SW4' it is also possible to power the meter through
the Ethernet connections.

# 5   Communication Connections

This chapter provides detailed information on communication wiring of the Ultrasonic Flow Meter Series 6. For choosing the correct cables, do not only follow the specifications in this chapter, but also refer to ⇨ Chapter 3 Installation Instructions (p.11).

Elster recommends to only wire those connections that will be used. Wires that are connected to the field terminal board but not connected to the flow computer can cause communication issues.

## 5.1   Network (TB2 and J4)

With the Elster software program SonicExplorer it is possible to perform parameterizations on the meter. Software packages are only able to connect with the meter through a network connection. This network connection can be either Ethernet or DSL.

It is only possible to connect through DSL when the field terminal board is equipped with the optional DSL modem print board (see Figure 5-1). Using DSL it is possible to get a network communication over a total maximum length of 1 km.
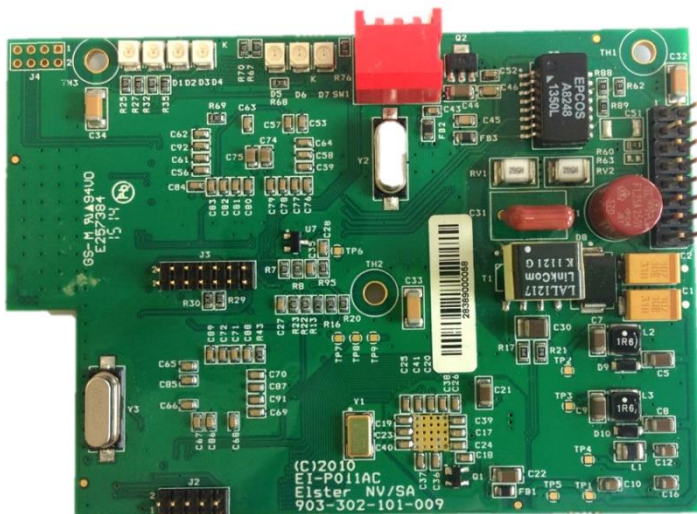


Figure 5-1: Optional DSL Modem Print Board

When connecting through DSL, certain switches on the field terminal board need to be aligned, as seen in ⇨ Chapter 6.1.2 - Ethernet and DSL (p.26). With the switches on the DSL modem itself, it is possible to fine-tune the quality of the communication. ⇨ Please see Chapter 7 - Optional DSL Modem (p.28).

### 5.1.1    Connector TB2

Table 4 and * Only possible with the optional DSL modem print board

Table 5 show an overview of the connections on TB2. Maximum cable core is 1.5 mm².

When connecting the communication through these connectors, the J4 connector should be left disconnected. ⇨ See Chapter 5.1.2 - Connector J4 (Ethernet RJ45 Connection) (p.17).

| Pin number | Signal name | Description |
|---|---|---|
| 10 | VDSL - | DSL - * |
| 9 | VDSL + | DSL + * |
| 8 | PoE - | Power over Ethernet (Power -) ** |
| 7 | PoE - | Power over Ethernet (Power -) ** |
| 6 | RX- | Ethernet receive - *** |
| 5 | PoE + | Power over Ethernet (Power +) ** |
| 4 | PoE + | Power over Ethernet (Power +) ** |
| 3 | RX+ | Ethernet receive + *** |
| 2 | TX- | Ethernet transmit - *** |
| 1 | TX+ | Ethernet transmit + *** |

* Only possible with the optional DSL modem print board

** Power over Ethernet (POE) requires an external power supply, limited-energy (max. 48 Vdc max. 3 A), reinforced insulation is provided between input and output by safety transformer and distances on PCB. Power over Ethernet complies with IEEE 802.3af

*** Cable must be UTP, STP or FTP with category 5E or 6. Maximum cable length is 100 meters.

Table 4: Communication Connector, TB2 (EI-PO10AJ)

| Pin number | Signal name | Description |
|------------|-------------|-------------|
| 10 | TX0 + | Ethernet transmit + |
| 9 | TX0 - | Ethernet transmit - |
| 8 | RX0 + | Ethernet receive + |
| 7 | RX0 - | Ethernet receive - |
| 6 | D/I_OUT1 | Digital output 1 (open collector) / current output 1 |
| 5 | D/I_RET1 | Digital output 1 / current output 1 return |
| 4 | D/I_OUT2 | Digital output 2 (open collector) / current output 2 |
| 3 | D/I_RET2 | Digital output 2 / current output 2 return |
| 2 | VDSL + | DSL + * |
| 1 | VDSL - | DSL - * |

* Only possible with the optional DSL modem print board

Table 5: Communication Connector, TB2 (EI-PO10BD)

### 5.1.2    Connector J4 (Ethernet RJ45 Connection)

Table 6 shows an overview of the connections on J4.

When connecting the communication through this connector, the TB2 connectors should be left disconnected. ⇨ See Chapter 5.1.1 - Connector TB2 (p.15).

| Pin Number | Signal name | Description |
|------------|-------------|-------------|
| 8 | Unused / PoE Power - | RJ45 Power over Ethernet (Power -) * |
| 7 | Unused / PoE Power - | RJ45 Power over Ethernet (Power -) * |
| 6 | Receive - / PoE Receive - | RJ45 Ethernet receive - ** |
| 5 | Unused / PoE Power + | RJ45 Power over Ethernet (Power +) * |
| 4 | Unused / PoE Power + | RJ45 Power over Ethernet (Power +) * |
| 3 | Receive + / PoE Receive + | RJ45 Ethernet receive + ** |
| 2 | Transmit - / PoE Transmit - | RJ45 Ethernet transmit - ** |
| 1 | Transmit + / PoE Transmit + | RJ45 Ethernet transmit + ** |

* Power over Ethernet (POE) complies with IEEE 802.3af. It requires an external power supply, limited-energy (max. 48 Vdc max. 3 A), reinforced insulation is provided between input and output by safety transformer and distances on PCB.

** Cable must be UTP, STP or FTP with category 5E or 6. Maximum cable length is 100 meter.

Table 6: Communication Connector, J4

## 5.2   Communication Connector TB3

Besides a network connection, the Ultrasonic Flow Meter Series 6 is capable of communicating through:

- Serial communication (either RS232 or RS485), protocol U_DATA or ModBus
    - Cable cross-sectional size area (CSA) min 0.5 mm²

- - o  RS232: 3 x 2 cable max. 15m and 2.5ohm/wire
    - o  RS485: 2 x 2 cable max. 700m
- Frequency output
    - o  Externally powered: 24 VDC, 10 kOhm pull-up resistor (max 30VDC @ 12mA)
    - o  Range programmable up to 5kHz
    - o  Possible outputs can be selected with SonicExplorer
- Analogue output
    - o  Internally powered (active): 24VDC, 40 mA maximum
    - o  Possible outputs can be selected with SonicExplorer.
- Digital output
    - o  Externally powered: 24 VDC, 10 kOhm pull-up resistor
    - o  Can be set as 'Low frequency' or as a status output (e.g. data valid, flow direction)
    - o  Possible outputs can be selected with SonicExplorer.

All these communication possibilities are located on the TB3 connector. Maximum cable core is 1.5 mm². Table 7 and Table 9 show an overview of the connections.

| Pin Number | Signal Name | Description |
|---|---|---|
| 14 | D/I_RET2 | Digital output 2 / current output 2 return |
| 13 | D/I_OUT2 | Digital output 2 (open collector) / current output 2 |
| 12 | D/I_RET1 | Digital output 1 / current output 1 return |
| 11 | D/I_OUT1 | Digital output 1 (open collector) / current output 1 |
| 10 | FRET2 | Frequency output 2 (return) |
| 9 | FOUT2 | Frequency output 2 (open collector) |
| 8 | FRET1 | Frequency output 1 (return) |
| 7 | FOUT1 | Frequency output 1 (open collector) |
| 6 | RXD COM2 | Serial port 2 RS232 receive / RS485 B |
| 5 | GND COM2 | Serial port 2 RS232 ground |
| 4 | TXD COM2 | Serial port 2 RS232 transmit / RS485 A |
| 3 | RXD COM1 | Serial port 1 RS232 receive / RS485 B |
| 2 | GND COM1 | Serial port 1 RS232 ground |
| 1 | TXD COM1 | Serial port 1 RS232 transmit / RS485 A |

Table 7: Field Terminal Board, TB3 (EI-PO10AJ)

TB3 is factory set according to Elster's standard settings (see Table 8 below), unless for a specific order, other settings have been agreed upon. The user can change the settings using the SonicExplorer software through a network connection. ⇨ See Chapter 5.1 Network (TB2 and J4) (p.14) for more information.

| Pin Number | Signal name | Description |
|---|---|---|
| 13 - 14 | Digital output 2 | Flow direction<br>    Open: Flow direction positive<br>    Closed: Flow direction negative |
| 11 - 12 | Digital output 1 | Partial Failure<br>    Open: Performance of at least one path is below 10%<br>    Closed: Performance of all paths are above 10% |
| 9 - 10 | Frequency output 2* | Q-line Reverse flow, 0 – 3000 Hz |
| 7 - 8 | Frequency output 1 | Q-line Positive flow, 0 – 3000 Hz |
| 4 - 6 | Serial comm. 2 | RS 485, U_DATA, Baudrate 4800 |
| 1 - 3 | Serial comm. 1 | RS 485, ModBus RTU, Baudrate 9600 |

* It is also possible to 'link' the second frequency to the first, then it has the same output, only 90° phase shifted.

Table 8: Standard factory settings of communication connector TB3 (EI-PO10AJ)

Factory settings can be changed by using the software package SonicExplorer. Communication between the meter and SonicExplorer can only be made through a network connection. ⇨ Please see Chapter 5.1 - Network (TB2 and J4) (p.14).

| Pin Number | Signal Name | Description |
|---|---|---|
| 10 | TXD COM1 | Serial port 1 RS232 transmit / RS485 A |
| 9 | GND COM1 | Serial port 1 RS232 ground |
| 8 | RXD COM1 | Serial port 1 RS232 receive / RS485 B |
| 7 | TXD COM2 | Serial port 2 RS232 transmit / RS485 A |
| 6 | GND COM2 | Serial port 2 RS232 ground |
| 5 | RXD COM2 | Serial port 2 RS232 receive / RS485 B |
| 4 | FOUT1 | Frequency output 1 (open collector) |
| 3 | FRET1 | Frequency output 1 (return) |
| 2 | FOUT2 | Frequency output 2 (open collector) |
| 1 | FRET2 | Frequency output 2 (return) |

Table 9: Field Terminal Board, TB3 (EI-PO10BD)

TB3 is factory set according to Elster's standard settings (see * It is also possible to 'link' the second frequency to the first, then it has the same output, only 90° phase shifted.

Table 10 below), unless for a specific order, other settings have been agreed upon.  The user can change the settings using the SonicExplorer software through a network connection. ⇨ See Chapter 5.1 Network (TB2 and J4) (p.14) for more information.

| Pin Number | Signal name | Description |
|---|---|---|
| TB2: 3 - 4 | Digital output 2 | Flow direction<br>    Open: Flow direction positive<br>    Closed: Flow direction negative |
| TB2: 5 - 6 | Digital output 1 | Partial Failure<br>    Open: Performance of at least<br>    one path is below 10%<br>    Closed: Performance of all paths<br>    are above 10% |
| TB3: 1 – 2 | Frequency output 2* | Q-line Reverse flow, 0 – 3000 Hz |
| TB3: 3 – 4 | Frequency output 1 | Q-line Positive flow, 0 – 3000 Hz |
| TB3: 5 – 7 | Serial comm. 2 | RS 485, U_DATA, Baudrate 4800 |
| TB3: 8 - 10 | Serial comm. 1 | RS 485, ModBus RTU, Baudrate 9600 |

* It is also possible to 'link' the second frequency to the first, then it has the same output, only 90° phase shifted.

Table 10: Standard factory settings of communication connector TB2 and TB3 (EI-PO10BD)

Factory settings can be changed by using the software package SonicExplorer. Communication between the meter and SonicExplorer can only be made through a network connection. ⇨ Please see Chapter 5.1  - Network (TB2 and J4) (p.14).

# 6   Switches and LED Indication

## 6.1   Switches on the Field Terminal Board

The field terminal board contains four switches, SW1 to SW4 (see Figure 6-1) to control communication lines and power input.
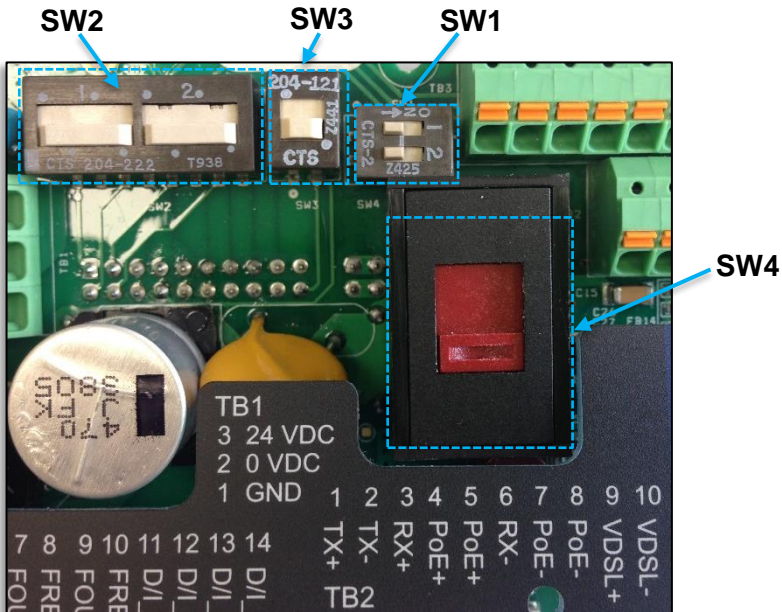


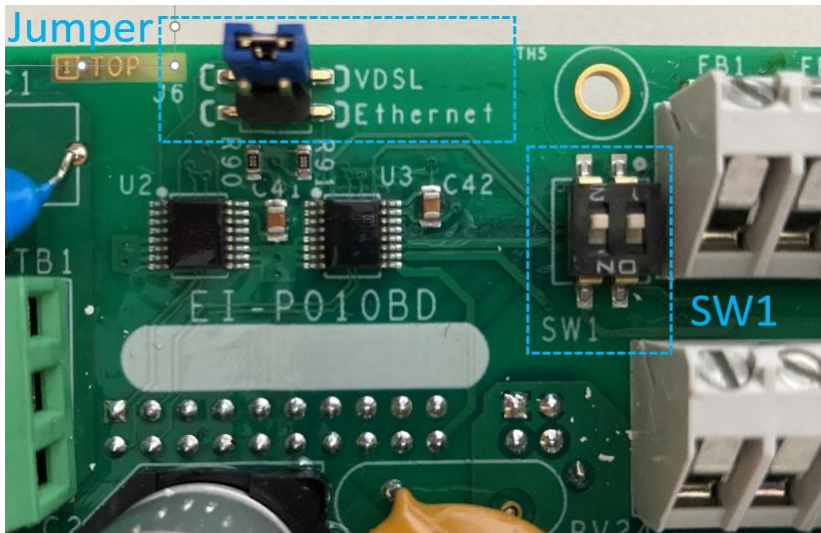Figure 6-1: Switches on the Field Terminal Board (EI-PO10AJ)

Figure 6-2: Switches on the Field Terminal Board (EI-PO10BD)

### 6.1.1    SW1

EI-PO10AJ:

This switch is placed for the line termination of the serial communication lines (see Table 7).

Every transmission line has to be terminated with the right impedance. Certainly, with long lines, like with RS 485 connections, a correct line termination is important. In transmission lines without termination, the signal reflects at the end of the cable. This reflection interferes with the original signal, so a cacophony of signals is seen at the receiver.

In practice the line is terminated at the last meter in the RS485 multidrop network with a resistor. The 'SW1' switch has two separate line terminations, one for each RS 485 port.

- 'SW1-1': is the line termination of port 1: (pin number 1-3 of TB3, see Table 7).

- 'SW1-2': is the line termination of port 2: (pin number 4-6 of TB3, see Table 7).

The line termination is enabled when the switch is placed to the 'ON' position.

EI-PO10BD:

This switch is placed for the line termination of the serial communication lines (see Table 9).

Every transmission line has to be terminated with the right impedance. Certainly, with long lines, like with RS 485 connections, a correct line termination is important. In transmission lines without termination, the signal reflects at the end of the cable. This reflection interferes with the original signal, so a cacophony of signals is seen at the receiver.

In practice the line is terminated at the last meter in the RS485 multidrop network with a resistor. The 'SW1' switch has two separate line terminations, one for each RS 485 port.

- 'SW1-1': is the line termination of port 1: (pin number 8-9 of TB3, see Table 9).
- 'SW1-2': is the line termination of port 2: (pin number 5-7 of TB3, see Table 9).

## 6.1.2    Ethernet and DSL Connection

EI-PO10AJ:

'SW2' and 'SW3' are both used to switch the communication of the meter from Ethernet to DSL. 'SW2' consists of two separate switches; together with 'SW3' they all should be aligned in the same direction (either up or down).

- For communication through DSL: 'SW2' and 'SW3' should be up. Communication should now be taken at pin number 9 -10 of TB2, see Table 4.
- For communication through Ethernet: 'SW2' and 'SW3' should be down. Communication should now be taken at TB2 or J4. Please see Table 4 and Table 6.

Please keep in mind, that it is not possible to have communication with the Ultrasonic Flow Meter Series 6 through Ethernet and DSL at the same time.

EI-PO10BD:

For this version of the FTB, here is a jumper for changing between Ethernet and DSL.

- For communication through DSL: Jumper should be on upper position. communication should now be taken at pin number 1 – 2 of TB2, see * Only possible with the optional DSL modem print board
- Table 5
- For communication through Ethernet: Jumper should be on lower position. Communication should now be taken at TB2 or J4, please see * Only possible with the optional DSL modem print board
- Table 5 and Table 6.

### 6.1.3    SW4

This switch controls if the meter needs to be powered through TB1 or through the Ethernet connection.

- If the switch is up: the power should be foreseen through TB1 connector (see Table 2).
- If the switch is down: the power should be foreseen through the Ethernet connection (see Table 4 and Table 6).

This switch is not applicable for EI-PO10BD, as there is no Power over Ethernet.

## 6.2   LED Indication on the Display

The display at the front of the SPU contains LED's to visualize the status of the power, connection and performance of the meter. Please see the Operation and Maintenance Manual of your particular meter for detailed information.

This is not applicable for EI-PO10BD.

# 7   Optional DSL Modem

For DSL communication the SPU must be equipped with the optional DSL modem (Figure 5-1) behind the field terminal board (Figure 2-3). Wiring of the DSL communication to the UFM should be done as described in Table 4 (p.16).

In the 'control room', it is recommended to use the VDD DSL modem designed by Elster. Detailed information about this modem can be found in the External VDSL Range Extender User Manual. The PDF version is available online at **http://www.docuthek.com/** , otherwise please refer to ⇨ Appendix I – References at the end of this document for more information.

## 7.1   Switches

The DSL modem contains 4 DIP switches (see Figure 7-1), whereby the DSL communication can be fine-tuned and aligned. The external VDD DSL modem also contains these 4 DIP switches. For optimal communication ensure both modems are aligned, as described below.
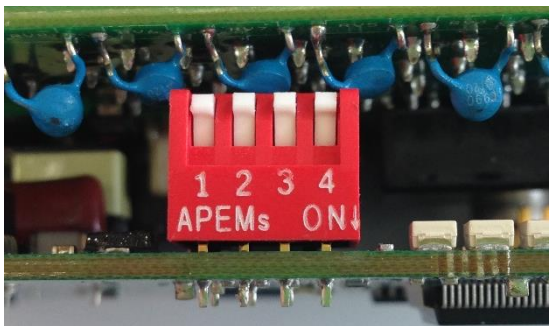


Figure 7-1: Switches on optional DSL Modem

### 7.1.1    DIP Switch 1

This switch is to set the modem configuration:

- ON, RT/CPE: DSL modem acts as Remote type / Customer premise equipment side (slave).
- OFF, OT/CO: DSL modem acts as Office type / Central office side (master).

> **Please Note!**
>
> The setting of this switch must be the opposite as on the modem on the other side of the communication line.

## 7.1.2   DIP Switch 2

This switch is to set the data transmission mode:

- ON, Fast mode: Direct data transmitting with latency less than 1 ms.
- OFF, interleave mode: Provides communication protection for up to 250 ms impulse noise with latency less than 6 ms.

> This switch is only relevant if this modem is the master modem. ⇨ See Chapter 7.1.1 - DIP Switch 1 (p.28)

## 7.1.3   DIP Switch 3

This switch is to set the Band plan:

- ON, 998 ISDN: DSL modem acts as per 998 ISDN band plan.
- OFF, 997 symmetric ISDN: DSL modem acts as per 997 symmetric band plan.

> This switch is only relevant if this modem is the master modem. ⇨ See Chapter 7.1.1 - DIP Switch 1 (p.28)

### 7.1.4 DIP Switch 4

This switch is to set the noise reduction level:

- ON, 6dB SNR: Standard noise reduction level (6 dB).
- OFF, 9dB SNR: Higher noise reduction level (9 dB).

This switch is only relevant if this modem is the master modem. ⇨ See Chapter 7.1.1 - DIP Switch 1 (p.28)

## 7.2 LED Indication

The DSL modem contains LED's that provide communication status information. Figure 7-2 shows the position of the LED's on the modem. The first 4 LED's are regarding the VDSL connection. The last 3 LED's are regarding the internal LAN connection. Table 11 shows their functionality.
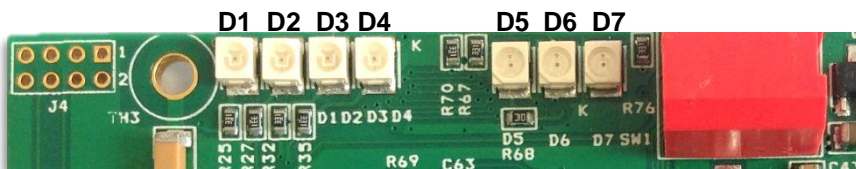


Figure 7-2: LED Indication on the DSL Modem

| LED | ON | OFF | Flashing |
|-----|-----|-----|----------|
| D1 | Power ON | Power OFF | (Not applicable) |
| D2 | Slave (⇨ Chapter 7.1.1) | Master (⇨ Chapter 7.1.1) | (Not applicable) |
| D3 | VDSL connection established and OK (it can blink occasionally when data is transferred) | VDSL link fail | Slow flashing: VDSL connection is IDLE, system start-up Fast flashing: establishing VDSL connection |
| D4 | (Not applicable) | No VDSL link | Number of consecutive blinks shows the speed of the VDSL connection. *Example:* - blinking 6 times: speed 50 – 60M - blinking 9 times: speed 80 – 90M |
| D5 | LAN link ok | LAN link fail | TX/RX activity |
| D6* | 100M speed | 10M speed | (Not applicable) |
| D7* | LAN connection: Full duplex (4-wire connection) | LAN connection: Half duplex (2-wire connection) | LAN connection: Collision (communication fail) |

* Only applicable when LAN connection is good (LED D5 is ON or blinking)

Table 11: LED Indication on the DSL Modem

# 8   IS Connections TB4, TB5, TB6

EI-PO10AJ:

IS connections TB4 and TB5 are described below in Table 12 and Table 13. Use these tables together with the instructions in ⇨ Chapter 3 Installation Instructions (p.11) to choose the correct cable. Maximum cable core is 1.5mm².

TB4 and TB5 are connections for an Intrinsically Safe optional board.

If this board is not fitted in your SPU, these connections should not be used. If used, the intrinsically safe connections must comply with the applicable intrinsic safety approval. For more information see the UFM Series 6 Safety Instructions. This document also contains the Control drawings required for FM and CSA Approved flow meters. ⇨ See Appendix I – References for more information.

## TB4 (IS Connections 1)

| Pin Number | Signal Name | Description |
|---|---|---|
| 8 | IS_opt_A4 * | PT 100 I- |
| 7 | IS_opt_A3 * | PT 100 U- |
| 6 | IS_opt_A2 * | PT 100 U+ |
| 5 | IS_opt_A1 * | PT 100 I+ |
| 4 | NC | Not Connected |
| 3 | NC | Not Connected |
| 2 | IS_opt_C2 ** | Analogue input 4-20 mA - / HART |
| 1 | IS_opt_C1 ** | Analogue input 4-20 mA + / HART |

* 4-wire PT 100 (external) temperature sensor input with label
"IS_opt_A1", "IS_opt_A4" ,"IS_opt_A2" and "IS_opt_A3" circuit
(terminals I+, I-, U+ and U-):
In type of protection intrinsic safety, with the following maximum values:

$U_o$ = 5.9 V
$I_o$ = 9.8 mA
$P_o$ = 15 mW
$L_o$ = 10 mH
$C_o$ = 0.5 µF

** 4-20 mA connection with HART, label "IS_opt_C1" and "IS_opt_C2"
circuit (terminals P+ and P-; for Pm flow pressure sensor):
In type of protection intrinsic safety, with the following maximum values:

$U_o$ = 23.1 V
$I_o$ = 109 mA
$P_o$ = 629 mW
$L_o$ = 1 mH
$C_o$ = 0.1 µF

Table 12: Field Terminal Board, TB4

## TB5 (IS Connections 2)

| Pin Number | Signal Name | Description |
|---|---|---|
| 4 | IS_opt_B4 | IS pulse input 2 + (Z2+) |
| 3 | IS_opt_B3 | IS pulse input 1 - (Z1-) |
| 2 | IS_opt_B2 | IS pulse input 2 - (Z2-) |
| 1 | IS_opt_B1 | IS pulse input 1 + (Z1+) |
| Namur pulse input #1 and pulse input #2, with label "IS_opt_B1", "IS_opt_B3", "IS_opt_B2" and "IS_opt_B4"  circuit (terminals respectively Z1+, Z1-, Z2- and Z2+):<br><br>    In type of protection intrinsic safety, with the following maximum values:<br>    $U_o$ = 9.1 V<br>    $I_o$ = 37 mA<br>    $P_o$ = 84 mW<br>    $L_o$ = 10 mH<br>    $C_o$ = 0.5 µF | | |

Table 13: Field Terminal Board, TB5

EI-PO10BD:

IS connections TB4, TB5 and TB6 are described below in Table 14 to Table 16. Use these tables together with the instructions in ⇨ Chapter 3 Installation Instructions (p.11) to choose the correct cable. Maximum cable core is 1.5mm².

TB4, TB5 and TB5 are connections for an Intrinsically Safe optional board.

If this board is not fitted in your SPU, these connections should not be used. If used, the intrinsically safe connections must comply with the applicable intrinsic safety approval. For more information see the UFM Series 6 Safety Instructions. This document also contains the Control drawings required for FM and CSA Approved flow meters. ⇨ See Appendix I – References for more information.

## TB4 (IS Connections 1)

| Pin Number | Signal Name | Description |
|------------|-------------|-------------|
| 4 | IS_opt_A4 | PT 100 I- |
| 3 | IS_opt_A3 | PT 100 U- |
| 2 | IS_opt_A2 | PT 100 U+ |
| 1 | IS_opt_A1 | PT 100 I+ |

Table 14: Field Terminal Board, TB5

## TB5 (IS Connections 2)

| Pin Number | Signal Name | Description |
|------------|-------------|-------------|
| 4 | IS_opt_B1 | IS pulse input 1 + (Z1+) |
| 3 | IS_opt_B2 | IS pulse input 2 - (Z2-) |
| 2 | IS_opt_B3 | IS pulse input 1 - (Z1-) |
| 1 | IS_opt_B4 | IS pulse input 2 + (Z2+) |

Table 15: Field Terminal Board, TB5

## TB6 (IS Connections 3)

| Pin Number | Signal Name | Description |
|------------|-------------|-------------|
| 2 | IS_opt_C2 | Analogue input 4-20 mA - / HART |
| 1 | IS_opt_C1 | Analogue input 4-20 mA + / HART |

Table 16: Field Terminal Board, TB5

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# Appendix I – References

All references listed below can be obtained from Elster. Additionally, most references are available online at: **http://www.docuthek.com/**.

**[1]** UFM Series 6 Q.Sonic[plus] Operation and Maintenance Manual
SAP Ref.:    73023467
Doc. No.:    10000050188 (last valid revision)

**[2]** UFM Series 6 CheckSonic Operation and Maintenance Manual
SAP Ref.:    73023471
Doc. No.:    10000050192 (last valid revision)

**[3]** UFM Series 6 Q.Sonic[max] Operation and Maintenance Manual
SAP Ref.:    73023477
Doc. No.:    10000051506 (last valid revision)

**[4]** UFM Series 6 Wiring Instructions
SAP Ref.:    73023470
Doc. No.:    10000050191 (last valid revision)

**[5]** UFM Series 6 Shipping and Storage Manual
SAP Ref.:    73023469
Doc. No.:    10000050190 (last valid revision)

**[6]** UFM Series 6 Safety Instructions
SAP Ref.:    73023465
Doc. No.:    10000050186 (last valid revision)

**[7]** UFM Series 6 Modbus Protocol
SAP Ref.:    73023466
Doc. No.:    10000050187 (last valid revision)

**[8]**    UFM Series 6 Transducer Exchange at Atmospheric Conditions
SAP Ref.:        73023472
Doc. No.:        03.200.001.001/02/2 (last valid revision)

**[9]**    Retraction Tool NG Transducers
SAP Ref.:        73023473
Doc. No.:        03.203.101.001.02/2 (last valid revision)

**[10]**   UFM Series 6 Exchanging PCB boards in TIP
SAP Ref.:        73023474
Doc. No.:        03.303.101.000.02/2 (last valid revision)

**[11]**   UFM Series 6 Exchanging Boards at the Rear Compartment of
the SPU
SAP Ref.:        73023475
Doc. No.:        03.302.101.000.02/2 (last valid revision)

**[12]**   External VDSL Range Extender User Manual
SAP Ref.:        73023483
Doc. No.:        10000050357 (last valid revision)

**[13]**   UFM Series 6 SonicExplorer Software Application Manual
SAP Ref.:        73023308
Doc. No.:        10000050563 (last valid revision)