Honeywell

Ultrasonic Flow Meter Series 6
Q.Sonic®

Manual
Wiring Instructions

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Content

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).

Be familiar with the safety instructions!

Before starting any work on the ultrasonic gas meter, familiarize yourself with ⇨ UFM Series 6 "Safety instructions".

1.2 Relevant user documentation

Elster Gas Metering business provides the user documentations such as manuals, certificates, technical information for your UFM Series 6 meter in a ZIP file. The download information for this ZIP file is delivered with your device. Manuals referenced by this manual are included in this ZIP, such as UFM Series 6 “Safety Instructions”.

Single documents are published in the Docuthek. The documents are updated regularly.

www.docuthek.com/
Use the device series or the device type as search term:
UFM Series 6 or **Q.Sonic-max**

1.3 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 conditions specified in the manufacturer's terms of delivery apply to the product. Warranty claims are excluded in the following cases:

- The repair or replacement of the equipment or parts thereof has been required by natural wear and tear, in whole or in part due to a catastrophe, or because of a defect or fault on the part of the purchaser.
- Maintenance or repair of the device or device parts has not been carried out by an authorized representative of the manufacturer, or modifications have been made to the device or device parts without prior express written consent of the manufacturer.
- No original parts are used.
- The device has been used incorrectly, carelessly, improperly or not in accordance with its nature and/or intended use.
- The product has been used with unauthorized components or peripherals such as cables, test equipment, computers, or with unauthorized voltages.

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

Read this manual carefully.

Read the wiring instructions carefully before starting any work.

The manufacturer accepts no liability for loss or defects resulting from failure to comply with this manual.

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

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

process.honeywell.com/us/en/site/elster-instromet/about-us

2 SPU overview

The SPU box contains two separated compartments: a main and a rear compartment (⇨ Fig. 2-1 und Fig. 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. We strongly recommend to open this compartment after consultation with Elster only.

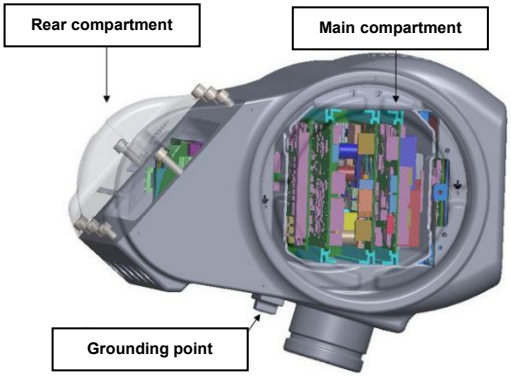


Fig. 2-1: SPU compartments

For all external connections to the meter, the connection openings on the bottom of the rear compartment should be used (⇨ Fig. 2-2).

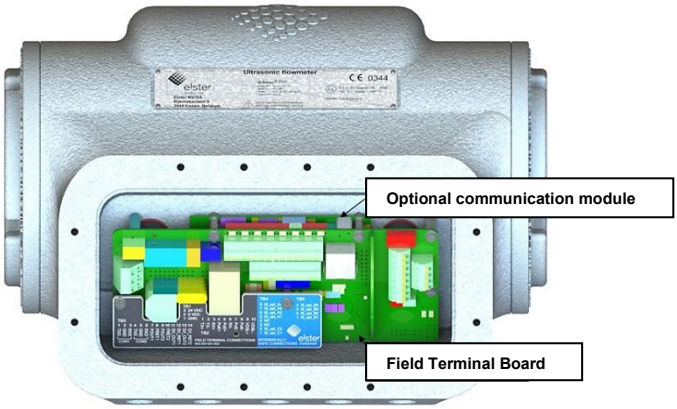


Fig. 2-2: Rear compartment

Five connection openings are provided; the thread type is either M20 or ½″ NPT. Unused openings should be plugged with appropriately certified plugs; plugs without appropriate certification (e.g., transport or storage plugs) should be replaced with appropriately certified plugs. It is the customer's responsibility to use appropriate threaded connections and plugs, taking into account e.g., thread type, certification for hazardous areas and ingress protection.

The rear compartment contains the Field Terminal Board (⇨ Fig. 2-3). All connections for external wiring are on this board; therefore, only this connection should be used when connecting a flow computer. For remote network connections, an optional communication module can be plugged into the back of the Field Terminal Board.

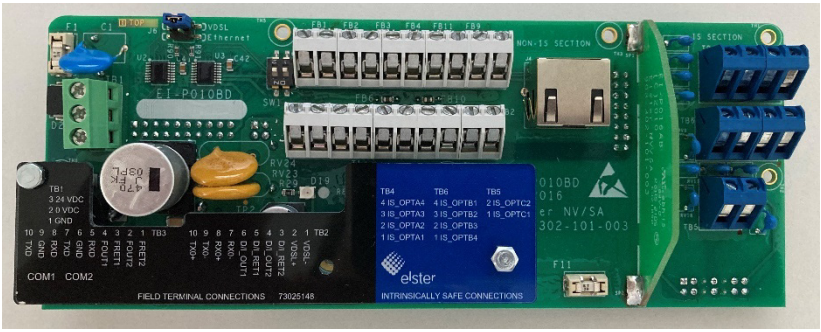


Fig. 2-3: Field Terminal Board

On the Field Terminal Board the original labels are used

Since the original communication module was a VDSL modem, the labels on the Field Terminal Board match the original modem. The labels and texts on the Field Terminal Board therefore still bear the original names. Newer optional communication modules can still be connected.

3 Installation instructions

Use sufficiently reinforced and shielded cables for wiring the meter (data transmission cables should also be twisted), and the cables must be protected against mechanical damage and electrical interference. Also make sure that the length, diameter, core and resistance of the cables are suitable for the application.

For reliable and durable connections to your ultrasonic gas meter, we recommend insulated cable end clamps. To prevent the cables from hanging in the threaded connections, they must be properly secured with clamps, and these must be close to the ultra-sonic gas meter connections. The SPU can be rotated nearly 360°; keep this in mind when wiring your meter. Ensure the wires can rotate as well, if needed.

Take special care when installing meters with approval

When installing series 6 ultrasonic gas meters in accordance with an approval, note the following:

- In accordance with **MID**
  Observe the current version of the ⇨ “Operation and Maintenance” manual for your gas meter.
- In accordance with **FM-** and **CSA Approval**
  Refer to the current version of the ⇨ “Operation and maintenance” manual for your gas meter, and the accompanying control drawings and installation markings in the ⇨ UFM Series 6 „ Safety Instructions.

Since the SPU can rotate through almost 360°, we recommend the use of suitable stop pins to prevent the SPU from over-rotating. (⇨ Fig. 3-1).

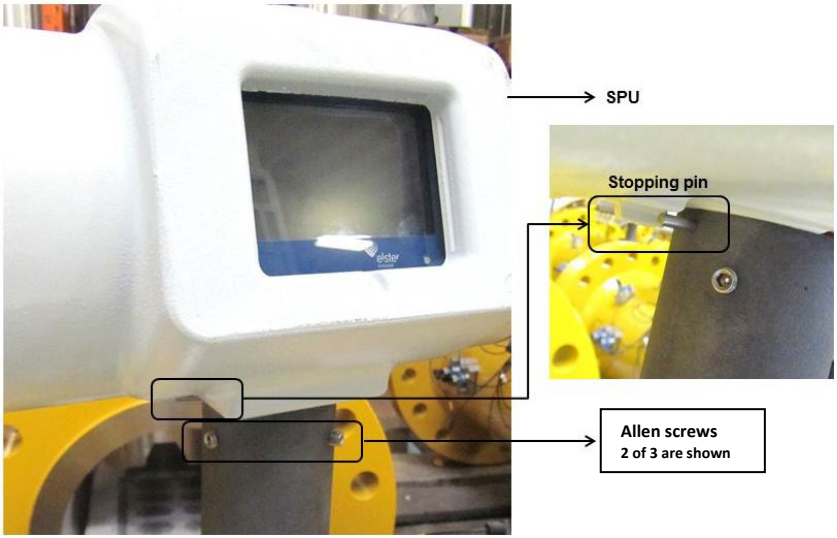


Fig. 3-1: SPU rotation

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. If the SPU still does not turn smoothly, contact Elster or your local Elster representative. After rotating the SPU, tighten the three socket screws again.

4 Power connection (TB1)

In the following table, you will find an overview of the power connections of the Ultrasonic Flow Meter Series 6. The position of the power connection is shown in ⇨ Fig. 2-3.

Pin no.	Signal name	Description
3	24 V DC	DC power input 24V nominal
2	0 V DC	DC power ground
1	EARTH	Power earth

Table 1: Power connections, TB1

ATTENTION!

If the ultrasonic gas meter is connected to a cathode protection system, pin 1 must remain free of connections, as the "earth" of the external power supply is not connected in this case. Otherwise, the intended corrosion protection is not guaranteed. Please observe the installation instructions of the cathodic protection system used.

For choosing the correct cable for wiring the power connection, to the general instruction in ⇨ 3 Installation instructions (p. 10) and the specific instructions in ⇨ Table 1.

Power connection	Wire specification
Maximal cable core	2.5 mm²
Maximal cable length	700 m (max. 5 ohm / wire)
Voltage at the Field Terminal Board	18 − 30 V DC (24 V nominal)

Nominal power consumption [1]	20 Watt

Table 2: Power connection, wire specification

When wiring the meter, make sure that all requirements are met. The ultrasonic gas meter is equipped with built-in overvoltage protection for accidental overvoltage.

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 V DC 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 part under any circumstances while the device is in operation.

or the selection of the correct wires, make sure that they are rated for a maximum power of 40 watts to prevent problems when starting up the meter.

Depending on the position of the TB2 connector, the meter can also be operated via Ethernet connections.

⇨ 5.1.1 Connector TB2 (p. 15)

[1] For a very short period of time the power consumption can be higher at start up (max. 40 W).

5 Communication connections

This section provides detailed information on data transmission wiring for Ultasonic Flow Meter Series 6. For the correct cables, not only refer to the specifications in this section, but also refer to ⇨ 3 Installation instructions (p 10).

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 PC software enSuite you perform parameterizations on the meter. Software packages are only able to connect with the meter via a network connection.
⇨ UFM Series 6 “Configuration and analysis with enSuite”

This network connection can be made either via the Ethernet interface or via an optional communication module, e.g., the Ethernet Range Extender.

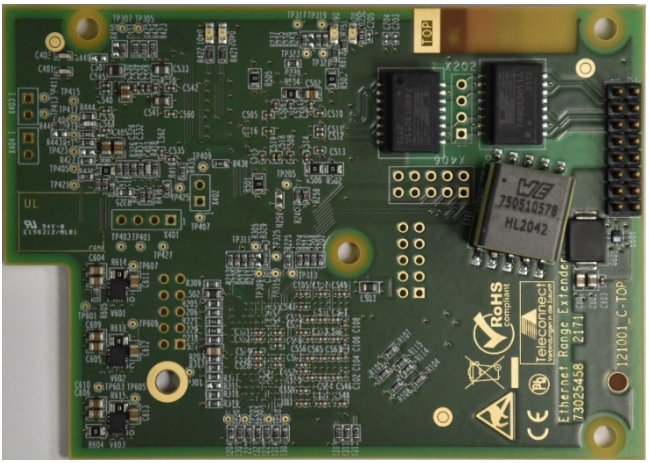


Fig. 5-1: Optional communication module

The distances to be bridged depend on the selected communication module approved by the meter manufacturer Elster/Honeywell. Contact our technical support before using and connecting a communication module.

When connecting via a communication module, certain switches on the Field Terminal Board must be adjusted as shown in ⇨ 6.1.1 Jumper J6 (p. 22). Refer to the ⇨ "Q.Sonic Ethernet Range Extender" installation instructions for an example of how to set up a corresponding communication module.

5.1.1 Connector TB2

In addition to a network connection, the Ultrasonic Flow Meter Series 6 can also transmit data via the following connections:

- Analog output
  - Internal power supply (active):
    24 V DC, 40 mA max.
  - Possible outputs can be selected with enSuite.
- Digital output
  - External power supply:
    24 V DC, 10 kOhm pull-up resistor
  - Can be set as "low frequency" or as status output (e.g., data valid, flow direction).
  - Possible outputs can be selected with enSuite.

The following table shows an overview of the connections to TB2. The maximum cable cross-section is 1.5 mm².

If a connection for data transmission is established via these connectors, jumper J4 should not be connected.
⇨ 5.1.2 Jumper J4 (Ethernet RJ45 connector) (p. 18)

In the table, the names VDSL+ and VDSL- are representative for the signal names of the optional communication module.

Pin no.	Signal name	Description
10	TX0+	Ethernet transmit + [2,3]
9	TX0−	Ethernet transmit − [2,2]
8	RX0+	Ethernet receive + [2,2]
7	RX0−	Ethernet receive − [2,2]
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+	SIGNAL_P
1	VDSL−	SIGNAL_N

Table 3: Communication connector, TB2

[2] The cable must be of type UTP, STP or FTP with category 5E or 6 with max. 100 m cable length.

Pin no.	Signal name	Description
9 − 10	Ethernet transmit	
7 − 8	Ethernet receive	
5 − 6	Digital output 2	Flow direction • Open: Flow direction positive • Closed: Flow direction negative
3 − 4	Digital output 1	Partial failure • Open: Performance of at least one path is below 10%. • Closed: Performance of all paths is above 10%.
2	VDSL+ [3]	Communication line A
1	VDSL− [3]	Communication line B

Table 4: Default factory settings of communication connector TB2

[3] Since the original communication module was a VDSL modem, the labels on the Field Terminal Board match the original modem. The labels and texts on the Field Terminal Board therefore still bear the original names. Newer optional communication modules can nevertheless be connected.

5.1.2 Jumper J4 (Ethernet RJ45 connector)

The following table shows an overview of the connections on J4.

If a connection for data transmission is established via this connector, the TB2 connectors should not be connected.
⇨ 5.1.1 Connector TB2 (p. 15)

Pin no.	Signal name	Description
8	Unused / PoE Power −	RJ45 Power over Ethernet (Power −) [4]
7	Unused / PoE Power −	RJ45 Power over Ethernet (Power −) [4]
6	Receive − / PoE Receive −	RJ45 Ethernet receive − [5]
5	Unused / PoE Power +	RJ45 Power over Ethernet (Power +) [4]
4	Unused / PoE Power +	RJ45 Power over Ethernet (Power +) [4]
3	Receive + / PoE Receive +	RJ45 Ethernet receive + [5]
2	Transmit − / PoE Transmit −	RJ45 Ethernet transmit − [5]
1	Transmit + / PoE Transmit +	RJ45 Ethernet transmit + [5]

Table 5: Communication connector, J4

[4] Power over Ethernet complies with IEEE 802.3af. It requires an external power supply, current limited (max. 48 V DC, max. 3 A), reinforced isolation between input and output is ensured by safety transformer and clearances on the PCB.

[5] Cable must be UTP, STP or FTP type with category 5E or 6. Max. 100 m cable length.

5.2 Communication connector TB3

In addition to a network connection, the Ultrasonic Flow Meter Series 6 can also transmit data via the following connections:

- Serial communication (either RS232 or RS485), UNIFORM or Modbus protocol
  - Cable cross-sectional area (CSA) min 0,5 mm²
  - RS232: 3 × 2 cable max. 15 m und 2,5 Ohm/wire
  - RS485: 2 × 2 cable max. 700 m
- Frequency output
  - External power supply:
    24 V DC, 10 kOhm pull-up resistor (max. 30 V DC at 12 mA)
  - Range programmable up to 5 kHz
  - Possible outputs can be selected with enSuite.

These data communication options are available at connector TB3. The maximum permissible cable cross-section is 1.5 mm². The following table shows an overview of the connections.

Pin no.	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 6: Field Terminal Board, TB3 (EI-PO10BD)

TB3 has been set according to Elster's default factory settings (⇨ Table 7) unless other settings have been agreed for a special order. The user can change these factory settings via enSuite and a network connection.
⇨ 5.1 Network (TB2 and J4 (p. 14)

Pin no.	Signal name	Description
8 − 10	Serial comm. 2	RS485, Modbus RTU, Baudrate 9600
5 − 7	Serial comm. 1	RS485, UNIFORM, Baudrate 4800
3 − 4	Frequency output 1	Q-line positive flow, 0 − 3000 Hz
1 − 2	Frequency output 2 [6]	Q-line negative flow, 0 − 3000 Hz

Table 7: Default factory settings for communication connector, TB3

[6] The second frequency can be "linked" to the first and then has the same output (only 90° out of phase).

6 Switches and LED indication

6.1 Jumper and switch on the Field Terminal Board

The Field Terminal Board includes a jumpers J6 (⇨ Fig. 6-1), which controls the communication lines.

6.1.1 Jumper J6

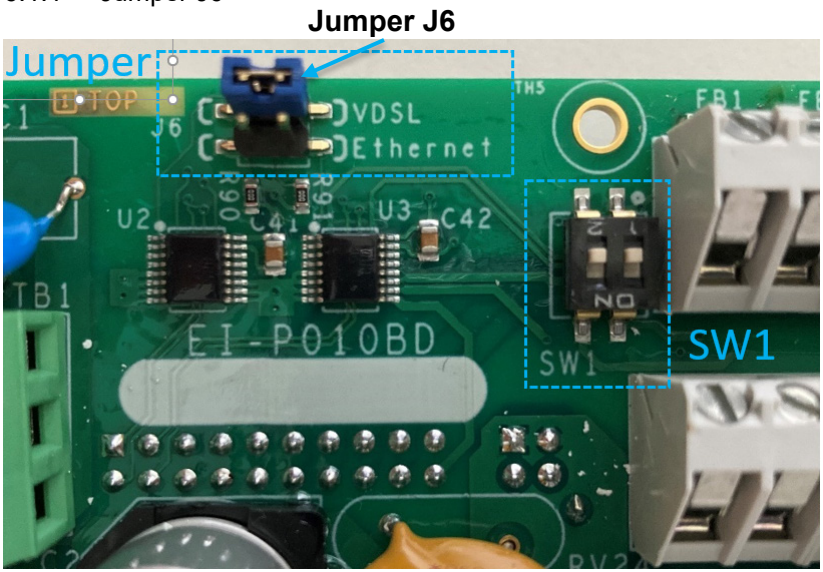


Fig. 6-1: Field Terminal Board, J6

On the Field Terminal Board the original labels are used

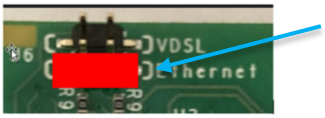
Since the original communication module was a VDSL modem, the labels on the Field Terminal Board match the original modem. The labels and texts on the Field Terminal Board therefore still bear the original names. Newer optional communication modules can still be connected.

To switch the data transmission between Ethernet and the optional communication module, set the jumper J6 as follows:

- For data transmission via the optional communication module:
  Plug jumper J6 to position **VDSL** [3].

Jumper J6

- For data transmission via Ethernet:
  Plug jumper J6 to position **Ethernet** [3].



Jumper J6

Note that simultaneous data transmission via Ethernet and a communication module is not possible with the Ultrasonic Flow Meter Series 6.

6.1.2 Switch SW1

Each transmission line must be terminated with the correct impedance. Especially for long lines like the RS485 connections a correct line termination is important. With transmission lines without line termination, the signal is reflected at the end of the line. This reflection interferes with the original signal, so that the receiver detects a cacophony of the signals

In practice, the line is terminated with a resistor at the last gas meter in the RS485 multidrop network. Switch SW1 has two separate line terminators, one for each RS485 port.

- SW1-1 is the line termination for port 1
  (Pin number 8 − 10 of TB3, ⇨ Table 6)
- SW1-2 is the line termination for port 2:
  (Pin number 5 − 7 of TB3, ⇨ Table 6)

Line termination is activated when the switch is in the **ON** position.

6.2 LED indication on the display

The display on the front of the SPU contains LEDs that indicate the status of the meter's power supply, connection, and performance. For more information, refer to the ⇨ „Operation and Maintenance“ manual for your meter.

7 IS connections TB4, TB5, TB6

IS connections TB4, TB5 and TB6 are described in the following sections. Use the tables and follow the instructions in ⇨ 3 Installation instructions (p. 10) to select the appropriate cable. The maximum permissible cable cross-section is 1.5 mm².

TB4, TB5 and TB6 are connections for an intrinsically safe optional board.

If your ultrasonic gas meters are not equipped with such a circuit board, you should not use these connections. If such a board is installed, the intrinsically safe connections must comply with the corresponding intrinsic safety approval. Refer to the ⇨ UFM Series 6 "Safety Instructions" for more information. This document also contains the control drawings required for FM and CSA approved flow meters.
⇨ 1.2 Relevant user documentation (p. 4)

7.1 TB4 – IS connections 1

Pin no.	Signal name	Description
4	IS_opt_A4	Pt100 I−
3	IS_opt_A3	Pt100 U−
2	IS_opt_A2	Pt100 U+
1	IS_opt_A1	Pt100 I+

Table 8: Field Terminal Board, TB4

The Pt100 (external) temperature sensor input labeled "IS_opt_A1", "IS_opt_A4", "IS_opt_A2" and "IS_opt_A3" circuit (terminals I+, I−, U+ and U−) is 4 wire.
The intrinsic safety has the following maximum values:

- Uo = 5,9 V
- Io = 9,8 mA
- Po = 15 mW

- Lo = 10 mH
- Co = 0,5 µF

7.2 TB5 – IS connections 2

Pin no.	Signal name	Description
2	IS_opt_C2	Analog input 4−20 mA − / HART
1	IS_opt_C1	Analog input 4−20 mA + / HART

Table 9: Field Terminal Board, TB5

The connection has a range of 4-20mA for HART protocol and has the circuit designations "IS_opt_C1" and "IS_opt_C2" (terminals P+ and P-) (for pm gas meter sensor).
The intrinsic safety has the following maximum values:

- Uo = 23,1 V
- Io = 109 mA
- Po = 629 mW
- Lo = 1 mH
- Co = 0,1 µF

7.3 TB6 – IS connections 3

Pin no.	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+)

Table 10: Field Terminal Board, TB6

The Namur pulse input is at #1 and at pulse input #2, with the designations "IS_opt_B1", "IS_opt_B3", "IS_opt_B2" and "IS_opt_B4". The circuit has the terminal designations: Z1+, Z1−, Z2− and Z2+.
The intrinsic safety has the following maximum values:

- Uo = 9,1 V
- Io = 37 mA
- Po = 84 mW
- Lo = 10 mH
- Co = 0,5 µF

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