

# Electronic Turbine Meter TERZ 94



## OPERATING INSTRUCTIONS

**Serving the Gas  
Industry Worldwide**

STATUS FEBRUARY 2015



by Honeywell

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## Note:

Unfortunately, paperwork does not automatically update itself but technical developments are constantly being made. Therefore, we reserve the right to change the descriptions and statements contained in our operating instructions without prior notice. However, you can conveniently download the most recent version of this manual (and those of other devices) from our website [www.rmg.com](http://www.rmg.com).



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# Introduction

The TERZ 94 / 94-S turbine meter complements the RMG TRZ 03, TRZ 03-L and TRZ 03 K turbine meters (see RMG Publication Nos. 3.161-E and 3.171-E).

The TERZ 94 / 94-S directly measures the flow rate at measurement conditions and integrates the measured values, so that, as a result, the gas volume which flowed through the meter is registered by an electronic totalizing unit. The gas flow drives a turbine wheel whose speed is recorded through non-contact measurement by a sensor. Therefore, the meter is characterized by long-term stability and low wear.

The TERZ 94 / 94-S is provided with HF and LF outputs which allow the device to be used as a flow transducer for control applications and remote transmission.

## Features

- For secondary applications
- With electronic totalizing unit
- Flow display
- Display of maximum flow values
- Alarm output
- Detachable meter head (for use as a remote totalizer)
- Digital transmission of meter readings

The two variants TERZ 94 and TERZ 94-S differ in the following features:

### TERZ 94

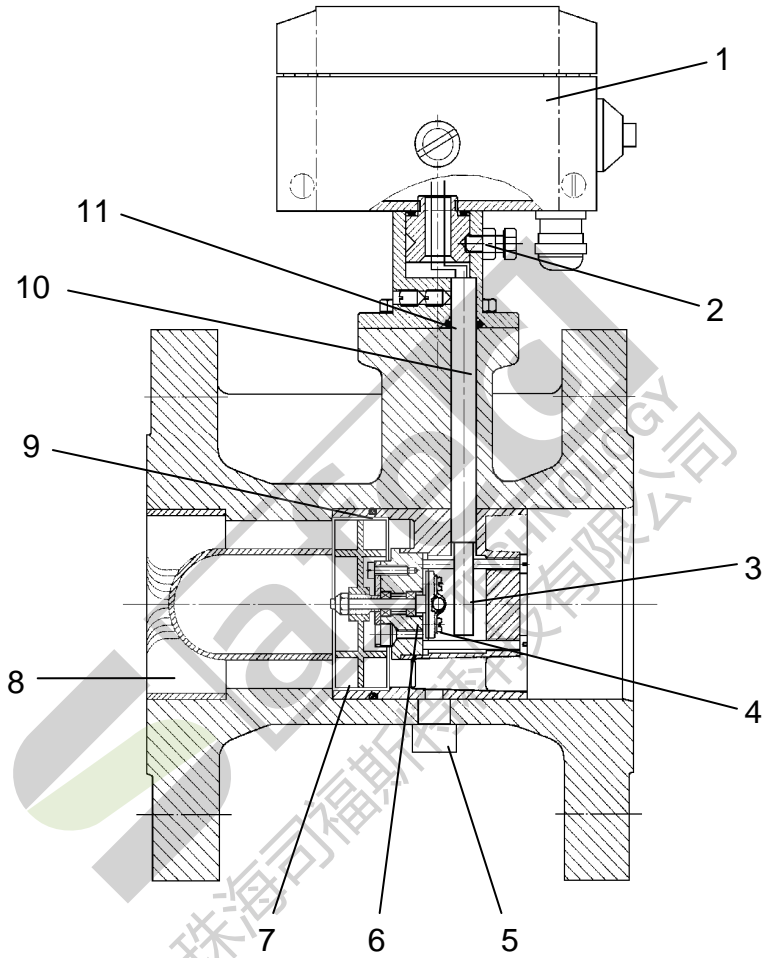
- Battery operation
- Electronic suppression of the slow-down effect of the turbine wheel after flow stop by external shut-down of the totalizer

### TERZ 94-S

- External power supply
- 4-20 mA current output for outputting the flow rate

# Functional Description

## Construction



Part	Designation	Material
1	Meter head	
2	Set screw	Steel
3	Sensor WF01 (1-channel) or WF02 (2-channels)	
4	Permanent magnet	Oerstit 500
5	Lubricator (from DN 200)	
6	Radial ball bearing	Nirosta steel
7	Turbine wheel	Delrin / aluminium
8	Flow straightener	Hostaform
9	O-ring	
10	Sensor sleeve with sensor	Nirosta steel
11	O-ring 8x2.5	83FKM592

The TERZ 94 / 94-S volumeters form a series of uniform construction.

The meters consist of the following principal components:

- meter case
- measuring element (with turbine wheel and sensor) and
- electronic totalizing unit.

An aerodynamic flow straightener (8) fitted into the meter case constricts the effective cross section of the pipe to form a ring-shaped cross-sectional area and substantially eliminates turbulences. The velocity of the flowing gas increases and the gas is directed to the turbine blades.

The turbine wheel (7) is dynamically balanced and mounted with dust-proof ball bearings (6). A permanent magnet (4) located at the end plate of the turbine shaft induces the sensor element (3) to give a voltage pulse with each rotation of the turbine wheel. This pulse is further processed by the electronic system of the meter head (1).

## Meter head

Inside the meter head, the number of pulses is divided by the meter factor (number of pulses per m<sup>3</sup>) and the result is used to calculate the volume at measurement conditions. In the main totalizer, the sum of the volume at measurement conditions which flowed through the meter is formed and you can read the gas volume which flowed through the meter per time unit on the flow rate display.

At the HF output, the unchanged signal frequency of the sensor element is outputted, whereas, for the LF output, this HF frequency can be reduced by two programmable scaling factors.

## Block diagram

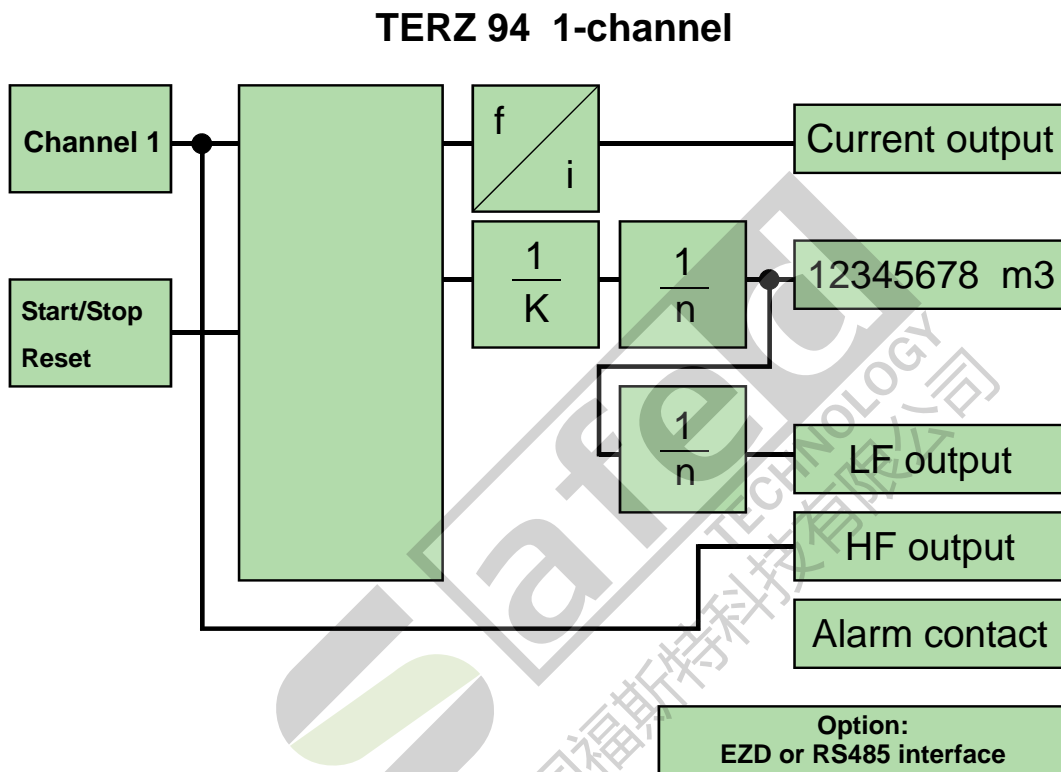
### TERZ 94

In the display field of the TERZ 94 (not with the TERZ 94-S), a start-stop totalizer or a resettable totalizer can be optionally displayed. Through the free sensor input X5, either the volume metering of the start-stop totalizer is interrupted or the resettable totalizer is reset (depending on the programming of the TERZ 94).

## FUNCTIONAL DESCRIPTION

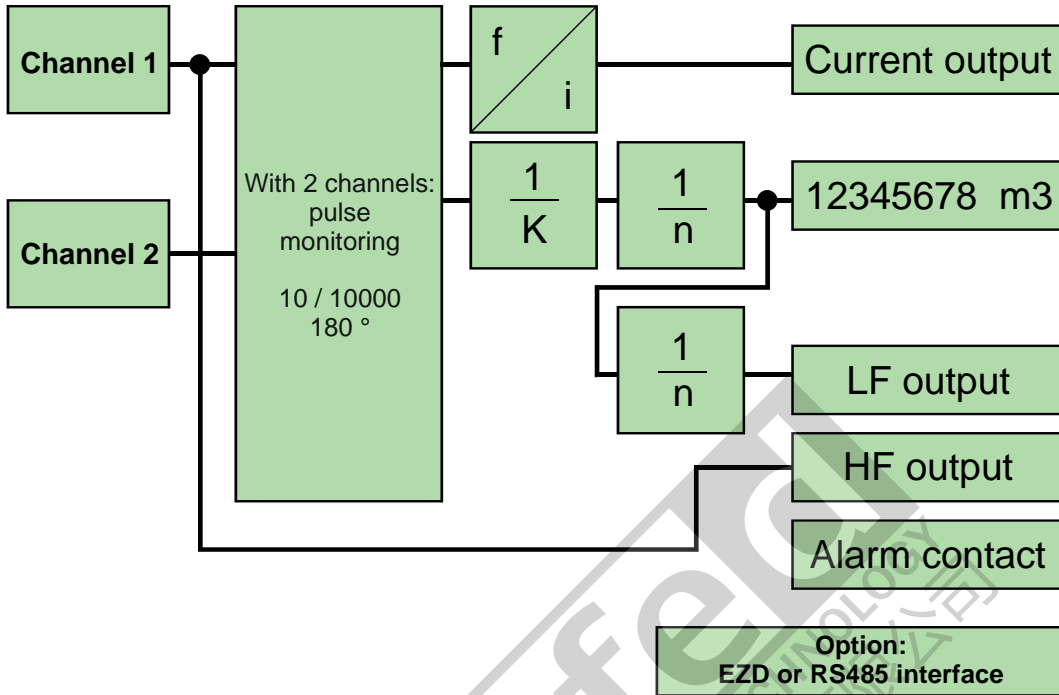
### TERZ 94-S

The TERZ 94-S volumeter has a current-loop connection (X2\_0 with current module TERZ94trm) which serves as power supply and 4 to 20 mA current output at the same time. For this purpose, a power supply unit is required which is to be connected to this output. The TERZ 94-S cannot be battery-operated.





TERZ 94 2-channel



## Safety Instructions

The TERZ 94 / 94-S volumeter is used for measuring the volume at measurement conditions of non-corrosive gases and fuel gases. Measurement of corrosive gases is only permitted if the special designs are used which have been developed for such purpose. These meters are not suitable for measuring liquids, otherwise they will be destructed.

The TERZ 94 / 94-S complies with currently applicable standards and regulations. However, failure to operate them properly may cause hazards.

Persons who install or operate the TERZ 94 / 94-S volumeter in areas subject to explosion hazards, must be familiar with the currently applicable explosion protection standards and regulations.

The electronic totalizing unit of the explosion-protected design has been approved for use in areas subject to explosion hazards and its code is:

**II 2 G EEx ib[ia] IIC T3, T4**

The appropriate certificate of conformity can be found in the annex and its reference number is:

**TÜV 02 ATEX 1970**

Please observe the following signs:



### **Danger of explosion**

In the manual, this symbol warns you of an explosion hazard. Please observe the instructions given next to this symbol. As to the danger of explosion, please note the following in particular:

- Only the explosion-protected design of the TERZ 94 / 94-S may be used in areas subject to explosion hazards. Connect the pulse outputs of these devices only to intrinsically safe circuits.
- The battery must be changed in an area without explosion hazards.
- The specifications on cable type and cable length in this manual and in the ex-approval must be observed.
- Modifications to the device make the Ex approval invalid and are therefore prohibited.



### **Damage to property**

In the manual, this symbol warns you of possible damage to property. The instructions given next to this symbol inform you about what you can do to avoid damage to the TERZ 94 volumeter.

It is essential to observe the warning information in these operating instructions and the generally applicable safety rules.

No warranty claims can be asserted if there is unauthorized interference with the device!

## Instructions for the installer

### Marking



II 2 G Ex ib[ia] IIC T4 or T3

TÜV 02 ATEX 1970 / IECEx TUN 09.0002

Ta = -25°C ..... +40 / 60°C

For data, see the EG type examination certificate (see annex)



0044  
0085

### Manufacturer

RMG Messtechnik GmbH  
Otto-Hahn-Straße 5  
D-35510 Butzbach (Germany)

### Use

Device type	Description
TERZ 94***	Volumeter
EA ****	Volumeter
EZ ****	Volumeter
TRZ 03-***	Turbine meter
ENCO-*	Encoder index
EC 21	Temperature corrector
EC 24	Volume corrector
TEC 21	Volumeter + temperature corrector
TEC 24	Volumeter + volume corrector
ETC ****	Volumeter + temperature corrector
EVC ****	Volumeter + volume corrector

This device is an apparatus for areas subject to explosion hazards.

### Installation or removal

When installing the device, care must be taken that the degree of protection of the casing is complied with. Exposure to direct sunlight has to be avoided.

When removing the device, de-energize the signal circuits connected and remove the relevant cables properly.

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### Installation

If one or more than one signal circuit is used, make sure when choosing the cables that the permissible limits as per the EC type examination certificate are not exceeded.

Each explosion-protected signal circuit has to be installed in a separate cable which is to be taken through the relevant high-strength cable gland.

It is absolutely necessary that the intrinsically safe cables are permanently installed.

Make sure that the connecting cables are provided with wire-end sleeves.

### Commissioning

Before commissioning this equipment, make sure that all lines have been correctly installed and connected in the terminal compartment.

The casing must be completely closed.

For installation and commissioning, the IEC 60079-14 of 2004 / EN 60079-14 of 2006 standard has to be complied with.

National norms and/or regulations also need to be taken into consideration.

### Servicing and maintenance

The battery may only be changed in a non-incendive area.

This device may be repaired only by RMG Messtechnik.

### Modifications to the product

Changes or modifications made to this product by unauthorized persons may lead to incorrect malfunctions and are prohibited for safety reasons! In this case the [ATEX] approval will be no longer valid.

This device may be repaired only by RMG Messtechnik!

# Installation

## Operating conditions

### Permissible types of gases

The standard design of the TERZ 94 or TERZ 94-S can be used for all non-corrosive gases, such as

Natural gas	Air
Town gas	Argon
Methane	Helium
Ethane	Carbon dioxide (dry)
Propane	Nitrogen
Butane	Hydrogen

Special designs (PTFE lining, special lubrication, special material, etc.) can be used for corrosive and humid gases, such as

Ethylene	Digester gas
Biogas	Sulphur dioxide
Acid gas	etc.

### Permissible temperature ranges

For the standard design, the following fluid temperature and ambient temperature ranges are permitted:

Fluid temperature range:  $-10^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$

Ambient temperature range:  $-20^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$  resp.  $+40^{\circ}\text{C}$

## Pressure loss

The pressure loss is calculated using the following formula:

$$\Delta p = Z_P \cdot \rho \cdot \frac{Q_M^2}{DN^4}$$

where

$\Delta p$	is the pressure loss	[mbar]
$Z_P$	is the pressure loss coefficient	
$\rho$	is the density	[kg/m <sup>3</sup> ]
$Q_M$	is the flow rate at measurement conditions	[m <sup>3</sup> /h]
$DN$	is the nominal diameter of the meter	[mm]

## INSTALLATION

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The pressure loss coefficient  $Z_P$  is constant for all volumeters of the types TERZ 94 and TERZ 94-S. It is:

$$Z_p = 5040$$

This is an approximate mean value. The exact value is calculated from the pressure loss which is determined on testing the volumeter.

### Example of calculation:

$Q_M = 650 \text{ m}^3/\text{h}$ ; DN 150;  $\rho = 1.3 \text{ kg}/\text{m}^3$  [natural gas, 600 mbar]

$$\Delta p = Z_p \cdot \rho \cdot \frac{Q_M^2}{DN^4} = 5040 \cdot 1.3 \cdot \frac{650^2}{150^4} = 5.5 \text{ mbar}$$

Therefore, the pressure loss  $\Delta p$  with a volumeter of the type TERZ 94 is 5.5 mbar in this case.

## Installation

The gas flow must be free of shocks and pulsations as well as free of foreign particles, dust and liquids. Any components affecting the gas flow must absolutely be avoided directly upstream of the TERZ 94 volumeter.

To achieve the highest possible accuracy (measuring error <1%), an inlet pipe of 2 DN in length with a perforated-plate straightener should be installed upstream of the meter.

You can install the meters in any position (vertical or horizontal) up to and including the nominal diameter of DN 200. From the nominal diameter of DN 250, only the position stated in the purchase order is possible.

**When you install the volumeter, please observe the direction of flow indicated on the case!**

## Seals

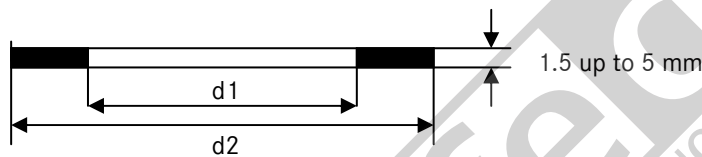
It must be guaranteed that flange seals of RMG turbine meters do not protrude from the flange into the gas line.

All seals approved as per DVGW can be used depending on the requirements for stability and reliability.

We recommend seals with the following maximum material characteristic values according to the AD2000 rules:

- gaskets:  $k_0 \times K_D = 20 \times b_D \mid k_1 = 1.3 \times b_D \text{ [N/mm]}$
- grooved seals:  $k_0 \times K_D = 15 \times b_D \mid k_1 = 1.1 \times b_D \text{ [N/mm]}$
- spiral seals:  $k_0 \times K_D = 50 \times b_D \mid k_1 = 1.4 \times b_D \text{ [N/mm]}$
- octagonal ring joint seal:  $K_D = 480 \text{ N/mm}^2$

For recommended dimensions, see the tables below.



Gaskets			PN 10	PN 16	ANSI 150	PN 25	PN 40
DN		d1	d2				
50	2"	77	107	107	105	107	107
80	3"	90	142	142	137	142	142
100	4"	115	162	162	175	168	168
150	6"	169	218	218	222	225	225
200	8"	220	273	273	279	285	292
250	10"	274	328	330	340	342	353
300	12"	325	378	385	410	402	418
400	16"	420	490	497	514	515	547
500	20"	520	595	618	607	625	628
600	24"	620	695	735	718	730	745

Grooved seals		ANSI 300 / ANSI 600		PN 64	
DN		d1	d2	d1	d2
50	2"	107	107	107	107
80	3"	142	142	142	142
100	4"	162	162	168	168
150	6"	218	218	225	225
200	8"	273	273	285	292
250	10"	328	330	342	353
300	12"	378	385	402	418
400	16"	490	497	515	547
500	20"	595	618	625	628
600	600	695	735	730	745

## INSTALLATION

Spiral seals		ANSI 300		PN 64		ANSI 600	
DN		d1	d2	D1	d2	d1	d2
50	2"	69.9	85.9	66	84	69.9	85.9
80	3"	101.6	120.7	95	119	101.6	120.7
100	4"	127.0	149.4	120	144	120.7	149.4
150	6"	182.6	209.6	174	200	174.8	209.6
200	8"	233.4	263.7	225	257	225.6	263.7
250	10"	287.3	317.5	279	315	274.6	317.5
300	12"	339.9	374.7	330	366	327.2	374.7
400	16"	422.4	463.6	426	466	412.8	463.6
500	20"	525.5	577.9	530	574	520.7	577.9
600	24"	628.7	685.8	630	674	628.7	685.8

## Screws

		Temperature ranges for screws and nuts		
		-10°C to +80°C	-40°C to +80°C	
Pressure		Variant 1	Variant 2	Variant 3
up to and including 40 bar	Screws complying with DIN EN ISO 4014 made of material 5.6,  Nuts complying with DIN EN ISO 4032 made of material 5-2	Screws complying with DIN EN ISO 4014 made of material 25CrMo4,  Nuts complying with DIN EN ISO 4032 made of material 25CrMo4		
from 40 bar	Screw bolts complying with ANSI B1.1 made of material ASTM A193 Grade B7,  Nuts complying with ANSI B1.1 made of material ASTM A194 Grade 2H	Screw bolts complying with ANSI B1.1 made of material ASTM A320 Grade L7,  Nuts complying with ANSI B1.1 made of material ASTM A320 Grade L7	Screw bolts complying with ANSI B1.1 made of material 42CrMo4,  Nuts complying with ANSI B1.1 made of material 42CrMo4	Anti-fatigue bolts complying with DIN 2510 made of material 25CrMo4,  Nuts complying with DIN 2510 made of material 25CrMo4



## Meter head

The meter head (1) can be turned after the set screw (2) has been loosened. Turn the meter head by max. 360°, otherwise the signal wires can become twisted and break.

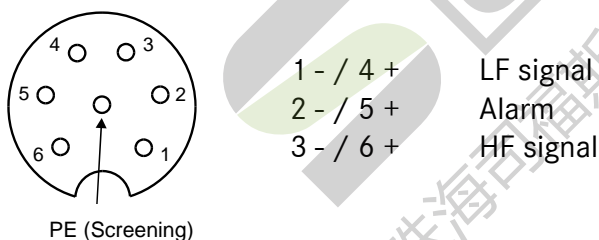
You can install the meter head also vertically. To do this, you must proceed as follows:

- Unscrew the cover of the meter head.
- Disconnect the two wires from terminal X5 (remember the polarity!).
- Loosen the set screw (2). Now you can remove the case of the meter head and an aluminium assembly part will appear.
- On the side of the case, there is a hole which is covered with a screw. Mount the retainer part to this hole and close the hole in the rear panel by means of the screw.
- Thread the signal wires through the retainer part, place the meter head onto the turbine case, turn it into the desired position and retighten the set screw (2).
- Connect the signal wires again to terminal X5 (make sure that the polarity is correct!) and screw on the cover again.

## Electrical connections

The LF and HF volume pulses and the alarm output are led out of the meter head by a 7-pin connector (Binder). All other connections have to be made at the terminals on the board.

**Standard connection TERZ 94 and TERZ 94-S:**



The supply/current-loop (TERZ 94-S only) is connected to the terminals X22 on the transmitter board TERZ94trm.



In areas subject to explosion hazards, the TERZ 94 must only be connected to certified intrinsically safe circuits.

Make sure that the limiting values from the conformity certificate (see appendix) for the devices, which have to be connected, are not exceeded.

If one or more electric circuits are used, it is to ensure that with the cable selection the permissible limiting values according to the EEC design inspection certificate are not exceeded.

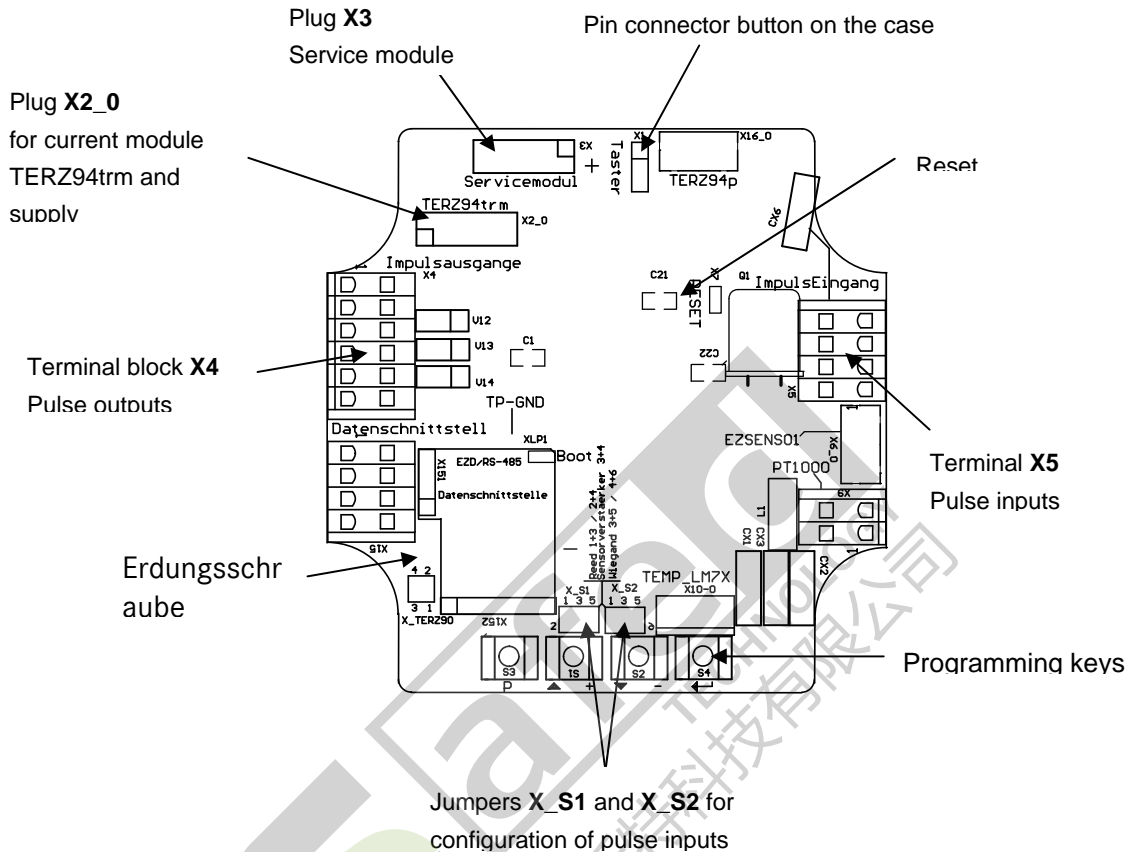
Each ex signal circuit has to be wired in its own cable, which is to be led through the appropriate cable gland.

A fixed installation of the intrinsically safe cables is mandatory.

The connecting cables have to be provided with core-end sleeves.

## INSTALLATION

To reach the electrical connections on the board, you must first remove the cover of the meter head.



To convert from the meter head directly mounted on the meter case to the remote totalizing unit and vice versa it is necessary to change the positions of some jumpers (see inputs and outputs in the annex).

	X_S1	X_S2	X_TERZ90
Meter head mounted on meter case	3-5 and 4-6	3-5 and 4-6	all open
Remote totalizing unit	3-4	3-4	1-2 and 3-4
Start / stop totalizer	3-5 and 4-6	1-3 and 2-4	all open

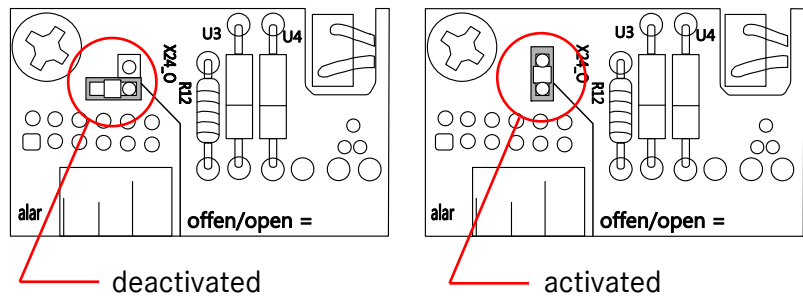
### TERZ 94:

Controlling the start-stop totalizer or resetting the resettable totalizer (depending on the programming of the electronic totalizing unit) is performed through input X5 terminals 3 and 4. As soon as input X5 terminals 3 / 4 has been short-circuited through an external contact, interruption or resetting is performed.

⇒ For this purpose, set jumpers at the positions identified with XS 2 to the “reed contact” function.

**TERZ 94-S:**

Before commissioning, the device must be activated.  
The jumper must be plugged as shown in the drawing.



In the case of the TERZ 94-S, terminal X22 (on current module TERZ94trm which is plugged in the main card) is used as current-loop connection to supply the device and as output current (4-20 mA).

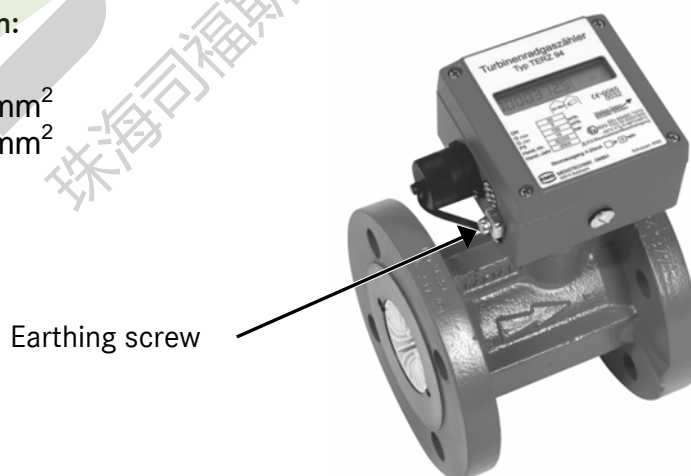
To connect cables to the spring terminals, you need a screwdriver with a blade width of a maximum of 2.5 mm. Introduce the blade into the intended slot and press down the screwdriver to open the spring terminal.

**Earthing**

To prevent measuring errors caused by electromagnetic interference, you must not fail to earth the case of the meter head via the earthing screw on the left side of the case.

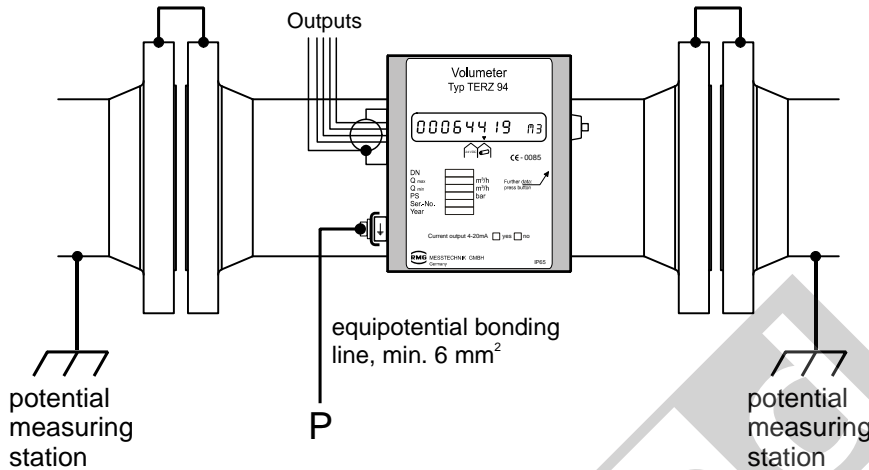
**Minimum cable cross section:**

up to a length of 10 m: 6 mm<sup>2</sup>  
from a length of 10 m: 10 mm<sup>2</sup>



## INSTALLATION

Thereby make sure that you have an electrical link between TERZ 94 and the piping, as it is shown in the drawing below.



### Cables

Use 2-core or multicore **shielded** cables which are twisted together in pairs for the signal lines (LF output, HF output, current-loop connection, control input). The shielding must always be connected to earth on both sides. In the case of the TERZ 94, you must proceed as described in the chapter “Cable glands”.

We recommend that cable cross sections between 0.25 mm<sup>2</sup> and 0.5 mm<sup>2</sup> are used. Due to the cable gland, the outside diameter must be between 4.5 mm and 6.5 mm.



When the device is used in areas subject to explosion hazards, the maximum cable length is limited by the limit values for intrinsically safe circuits and depends on the inductance and capacitance of the cable!

In particular: The maximum cable length between the TERZ 94-S and the transmitter supply unit of type KFD2-STC3-Ex1, in connection with the cable type LiYCY 2 x 0.75 mm<sup>2</sup>, is 250 m for the current output.

You can also use other cable types, if the following cable values are not exceeded:

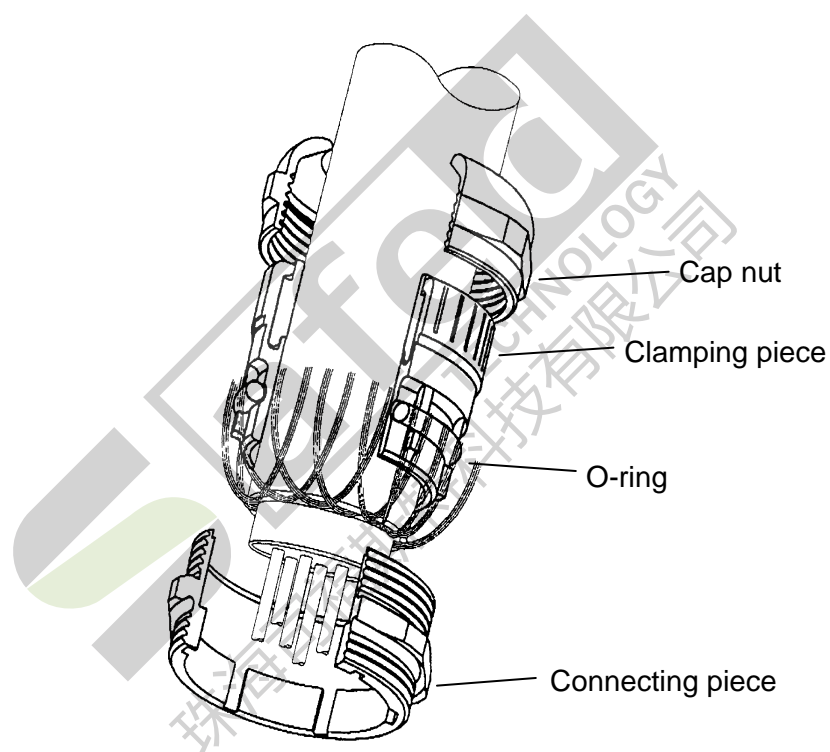
Capacitance < 200 nF/km

inductance < 1 mH/km

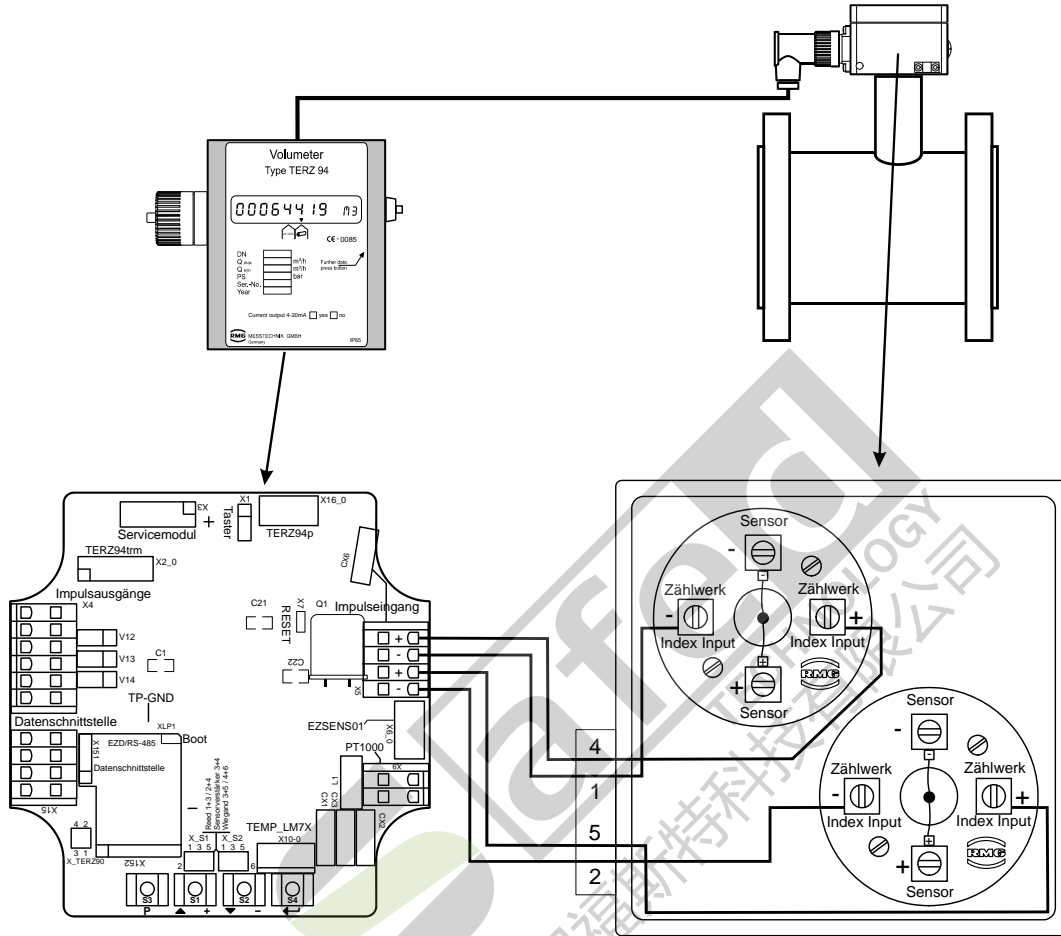
## Cable glands

Clamp the shielding on both sides, as shown in the picture below, into the cable glands located on the outside of the case:

- Unscrew the cap nut.
- Pull out the plastic clamping piece.
- Push the cable end through the cap nut and the clamping piece and bend the shielding backwards.
- Put the clamping piece back into the connecting piece.
- Screw on the cap nut again.



## Installing the remote totalizing unit



If your TERZ 94 is designed for remote totalizing, you can install the totalizing unit at a distance of up to 50 m from the meter case. Usually, the cable has already been connected to the totalizing unit when the TERZ 94 is delivered. Should this not be the case, you will have to connect the connecting cable to Input-terminal X5, clamp S1+ and clamp S1- of the board. For 2-channel meters connect the second sensor to the clamps S2+ and S2-. Use only shielded cables of the type:

LIYCY - 2 x 0.75 blue (standard)

LIYCY - 2 x 2 x 0.75 blue (2-channel version)

Maximum cable length: 50 m

Furthermore, you must check the plug-in jumpers XS1, XS2 and XTERZ90 on the display board.

**Settings at XS1 and XS2: jumpers 3-4**

# Start-up

## Connecting the gas flow



Do not fill any downstream pipelines or station sections through the TERZ 94. This may speed up the turbine wheel and lead to excessively high flow rates with resultant damage.

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Short-time overload operation of 20% above the maximum flow rate  $Q_{\max}$  is permissible. No damage will occur in the case of a return flow without shocks.

Before starting up the device, make sure that all lines have been correctly installed and connected in the terminal compartment.

The case must be completely closed.

## Initializing the totalizing unit

When you start up the device for the first time, set the totalizing unit in the desired condition. Check the programming of the pulse width, the LF pulse scaler, etc.

TERZ94-S:

Check the programming of the current output mode.

Note:

All parameters can only be changed after the cover of the meter has been removed.

# Operation

## Display

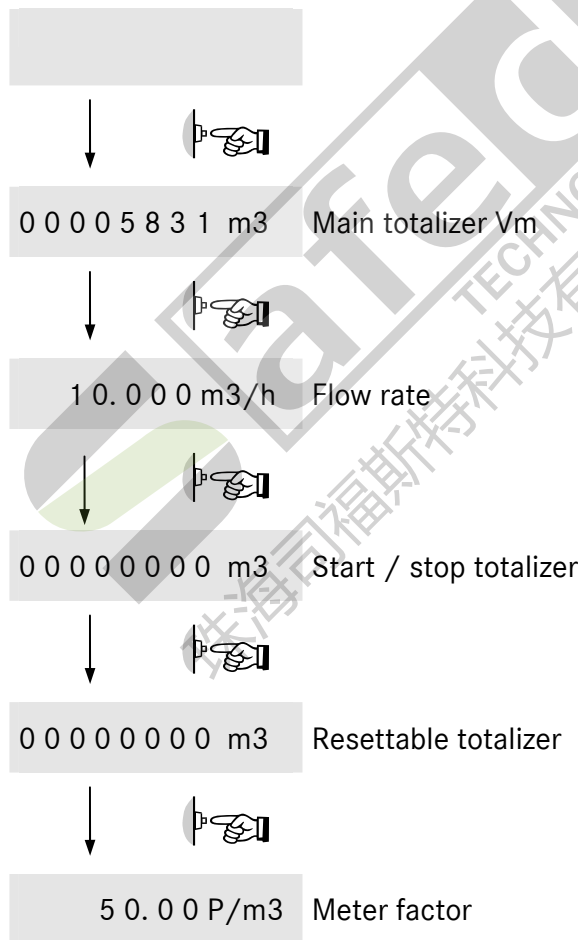
In normal operating mode, the main totalizer is displayed.

When you press the control button on the right side of the case, all values will be shown.

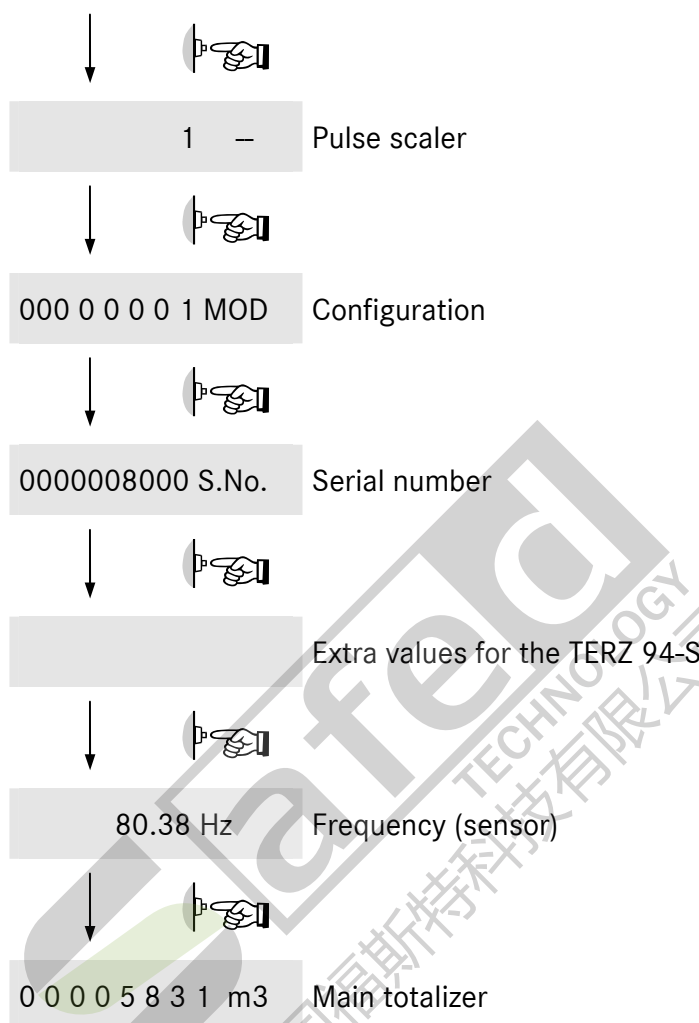
After the preset display wake-up time has elapsed, the main totalizer will appear again.

If the display of the TERZ 94 does not show anything, the device is in energy-saving mode. In this mode, the display is switched off. However, incoming pulses are processed and the outputs are set. As soon as you press the control button, the display values will appear again.

Display switched off:







An overview of parameters and the complete matrix are shown in the annex.

**NOTE:**

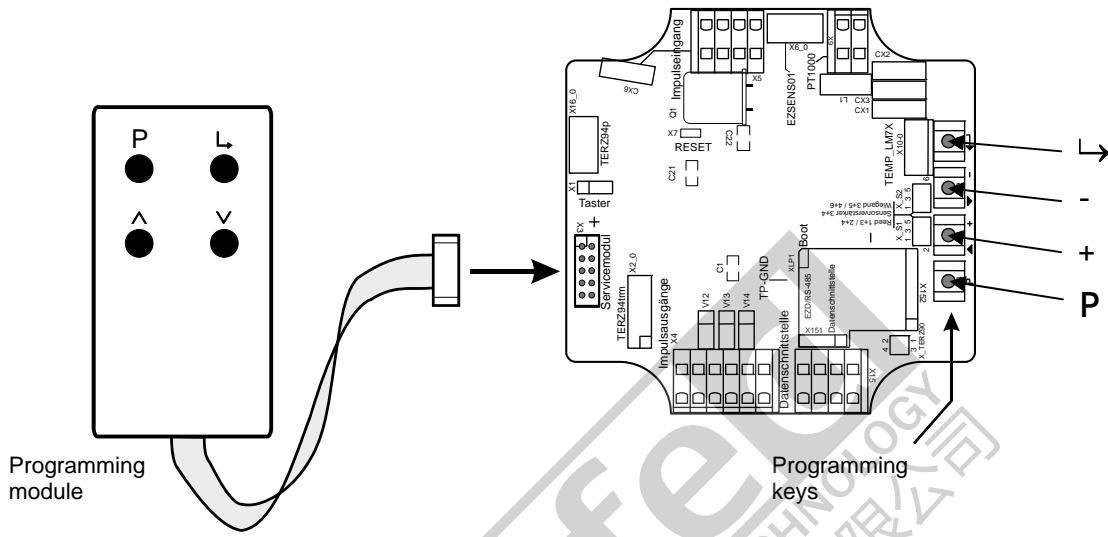
The button located externally on the case reacts when it is released and not when it is pressed. The duration of pressing the button is evaluated and results in different reactions of the device.

Pressing the button for a short time causes the display to show the next display value, while pressing the button for a longer time (more than 2 seconds) will activate all segments of the display (segment test) and then the display will switch over to showing the Vm totalizer.

The following text describes procedures where the button is normally pressed for a short time.

## Programming

For programming the TERZ 94 / 94-S, there are four buttons on the rear side of the board. Alternatively, you can program the device with the programming module. The programming module is to be connected to the pin connector indicated in the picture below.



Programming with the programming module is to be performed in the same way as with the buttons.

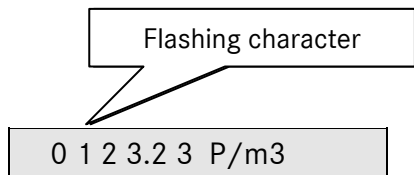
The external and internal buttons correspond to each other in the following way:

Int. button	Ext. button	Meaning
P	P	<p><b>Display mode:</b> Switch over to programming mode (Press the button longer than 2 seconds)</p> <p><b>Programming mode:</b> Set the decimal point.</p>
+	^	<p><b>Display mode:</b> Switch over to the next higher level.</p> <p><b>Programming mode:</b> - Increase the decimal by 1. - Scroll in the list. (Value identified with "L")</p>
-	v	<p><b>Display mode:</b> Switch over to the next lower level.</p> <p><b>Programming mode:</b> - Decrease the decimal by 1. - Scroll in the list. (Value identified with "L")</p>
↳	↳	<p><b>Display mode:</b> Short-time view of the coordinate (e.g. A01)</p> <p><b>Programming mode:</b> Go to the right by one decimal place (if the last decimal has been reached: Quit programming mode).</p>

## Principle of programming

For programming, you must always proceed as follows:

- First change over to the display value to be modified.
  - To do this, press either the control button (only forwards)
  - or the internal buttons “+” and “-” or the external buttons “^” and “v” (forwards and backwards).
- Change to programming mode by pressing “P” for at least 2 seconds. On the left side of the display, a flashing character or cursor will appear. If necessary press the „↳“ key so many times until a flashing character appears.



- You can now modify the flashing decimal by pressing either “+” or “^” (+1) or “-” or “v” (-1). Example: If you press the “^” button three times, the first decimal will be increased from 0 to 3. If an “L” appears on the far left side of the display, this value is a list. With a list, you can only scroll in the specified values.
- After you have completed your programming of the first decimal, press “↳” once and the next character will start to flash. Now proceed with your programming until you have reached the last decimal place.
- Then you must press „⏏“ once again to have the set value accepted and quit programming mode.
- Press the “P” button to set the decimal point behind the flashing digit. With totalizers, modes and integers, no decimal point is permitted.
- Press the control button if you have made an error or if you want to discontinue inputting data.

## Display values

Measured values, such as flow rate, frequency, etc. are display values and cannot be directly modified. However, there are many parameters which influence the formation of these measured values. These parameters are described in the following section.

Examples of display values: Flow rate, Version number, Year of construction, Serial number, Value of the current output in mA etc.

## Parameters and Modes of the TERZ 94 / 94-S

In the following text, the individual parameters are described in detail.

### 1. Meter factor (pulse value) TERZ 94 / 94-S

With the meter factor (pulse value), the relevant flow rate at measurement conditions is calculated from the signal frequency of the sensor element in the electronic totalizing unit:

$$Q_M = \frac{f}{K} \cdot 3600 \left[ \frac{\text{m}^3}{\text{h}} \right]$$

f: Signal frequency (Hz)

K: Meter factor (pulses/m<sup>3</sup>)

QM: Flow rate at measurement conditions (m<sup>3</sup>/h)

The meter factor has been calibrated in the factory in such a way that working cubic metres are directly displayed. Its value can be read from a label located on the left side of the case.

**Any modification of this adjustment is within the sphere of responsibility of the operating company.**



#### NOTE!

The new value is immediately used for all calculations performed after each modification of the meter factor.

The uninfluenced signal frequency of the sensor element is available at the HF output. The frequency range can be determined from the meter factor K and the minimum and maximum flow rates at measurement conditions of the meter in accordance with the following formulae:

$$f_{\min} = \frac{Q_{M\min}}{3600} \cdot K \qquad f_{\max} = \frac{Q_{M\max}}{3600} \cdot K$$

QMmin: Minimum flow rate at measurement conditions

QMmax: Maximum flow rate at measurement conditions

K: Meter factor (pulse value)

Example:

$$Q_{M\min} = 16 \text{ m}^3/\text{h} \qquad Q_{M\max} = 250 \text{ m}^3/\text{h} \qquad K = 2362 \text{ pulses}/\text{m}^3$$

$$f_{\min} = \frac{16}{3600} \cdot 2362 \text{ Hz} = 10.5 \text{ Hz} \qquad f_{\max} = \frac{250}{3600} \cdot 2362 \text{ Hz} = 164 \text{ Hz}$$

## 2. LF pulse scaler

The frequency of the LF pulses is set by a pulse scaler (A07). There are the following **setting options: 0.01; 0.1; 1; 10; 100.**

Other values can not be programmed, it is only possible to scroll in the list of these values ('t' key vesp. '\_' key).

This pulse scaler has only effect on the frequency of the LF pulses not on the display. The number of displayed digits after decimal point or a multiplier are programmed as an operating mode (A08)

Recommended values (= values set in the factory)

DN [mm]	Pulsescaler [pulses/m <sup>3</sup> ]	LF decade scaler	Pulse rate [pulses/m <sup>3</sup> ]	Maximum output frequency [Hz] <sup>1)</sup>
25	10	1	10	0.1
40	10	10	1	0.1
50	10	10	1	0.1
80	10	10	1	0.1
100 <sup>2)</sup>	10	10	1	0.1
150	1	1	1	0.3
200	1	1	1	0.6
250	1	1	1	0.7
300	1	1	1	1.1
400	1	10	0.1	0.2
500	1	10	0.1	0.3
600	1	10	0.1	0.4

1) Rounded values

2) In the case of the design with Q<sub>max</sub>=650 m<sup>3</sup>/h, the LF decade scaler is set at 1.

### 3. Configuration

The basic configuration of the TERZ-94 is implemented via an 8-character display value (A08). This “TERZ mode” defines the operating mode of the device.

Some parameters require a specific hardware or hardware configuration.

#### NOTE!

**Hardware and software configurations must coincide.**

**Any modifications of these parameters can cause malfunctions.**

Let's start on the left side of the display: (operating alignment italic)

#### – Internal parameters

For testing and diagnostics (no influence on the metering result).

*0: Menu for standard operation.*

*1: Menu for service*

*9: All parameters visible.*

#### – Main totalizer mode

This parameter defines the unit for the gas volume

*0: m3 (cubic meter).*

*1: cf (cubic foot).*

#### – LF pulse width

The LF pulse width can be set at 125 ms or 250 ms.

*0: 125 ms*

*1: 250 ms*

#### – Cut-off time of the display

A few minutes after you have operated the device for the last time, the display will switch off to expand the service life of the battery of the TERZ-94. There are the following times for selection:

*0: 1 minute*

*1: 5 minutes*

*2: 10 minutes*

*3: 15 minutes*

*4: 1 hour (for test purpose only!)*

#### – Interface protocol

*0: OFF*

*4: Modbus / Modbus ASCII, only with suitable hardware  
(no longer available).*

## OPERATION

### – Pulse scale

In this operating mode the display is set. To get the real totalizer readings the displayed value must be multiplied with the multiplier.

- 0: 2 digits after decimal points, multiplier: 1
- 1: 1 digit after decimal points, multiplier: 1
- 2: no digits after decimal points, multiplier: 1
- 3: no digits after decimal points, multiplier: 10
- 4: no digits after decimal points, multiplier: 100

### – Current output

- 0: OFF
- 1: Current output is active
- 2: Current output is active and faults are signalled (3,5 mA)
- 3: Current output is active and faults are signalled (21,8 mA)

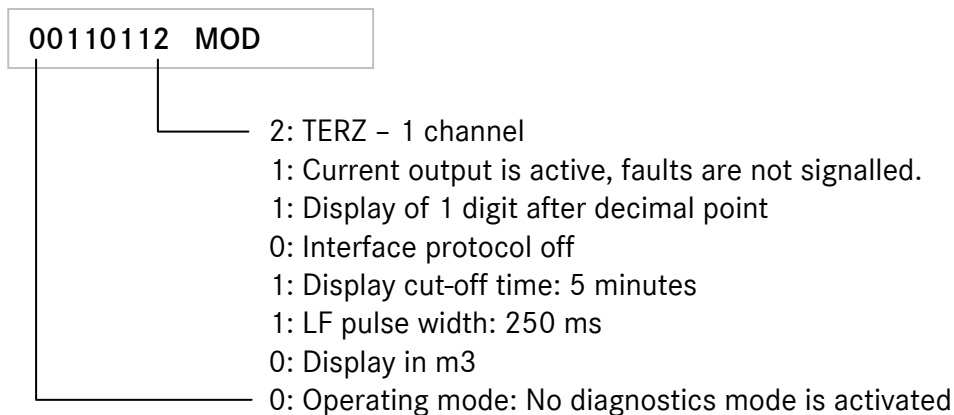
### – TERZ operating modes

There are the following operating modes at the moment:

- 0: ENCO-F
- 1: ENCO-M
- 2: TERZ 94           1 channel
- 3: TERZ 94           1 channel with start / stop totalizer
- 4: TERZ 94           1 channel with reset totalizer
- 5: TRZ03-TE/TEL 2 channels with pulse monitoring (SW), Vm Stop
- 6: TRZ03-TE/TEL 2 channels with pulse monitoring (SW), Vm Run
- 7: TRZ03-TE/TEL 2 channels with pulse monitoring (HW), Vm Stop
- 8: TRZ03-TE/TEL 2 channels with pulse monitoring (HW), Vm Run
- 9: TRZ03-TE/TEL 2 channels without pulse monitoring

SW means “pulse monitoring by software”, HW by hardware; Vm Stop means totalizer is stopped in case of a fault whereas the counting continues in the mode Vm Run.

### Example:





#### 4. Pulse comparator

The 2-channel version of the TERZ-94 (TRZ03 TE / TEL) provides for pulse monitoring.

Pulse monitoring requires two input pulses which are out of phase.

If a pulse occurs at the same time on channel 1 and channel 2, a fault counter is increased. If there is a missing pulse on one of the two channels, a fault counter is increased, too.

If this fault counter reaches the value X(A10) before Y(A11) undisturbed pulses have entered one of the two channels, a fault will be outputted.

This fault will not be erased until Y undisturbed pulses have been counted.

#### 5. Flow rate at 4 mA

With this parameter, you set the flow rate (in m<sup>3</sup>/h) which corresponds to an outputted current of 4 mA. Generally, the minimum flow rate Q<sub>min</sub> of the meter is set here. (This setting is made in the factory.)

#### 6. Flow rate at 20 mA

With this parameter, you set the flow rate (in m<sup>3</sup>/h) which corresponds to an outputted current of 20 mA. Generally, the maximum flow rate Q<sub>max</sub> of the meter is set here. (This setting is made in the factory.) Then the current which will be outputted for flow rates within the programmed limits will be between 4 and 20 mA and results from linear conversion.

#### 7. Current default value (calibration current)

With this parameter, you set the value of the calibration current. A constant calibration current is outputted if the current output mode parameter is set to default. The value of the calibration current must be within the following limits:

Minimum value: 4 mA

Maximum value: 20 mA

### 8. Current output mode

Here you define the measured or default value which is to be outputted.

0: Default value (see above)

1: Flow rate Qm

All other values are not permitted!

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### 9. Current damping

Here you define how the current output is to be damped.

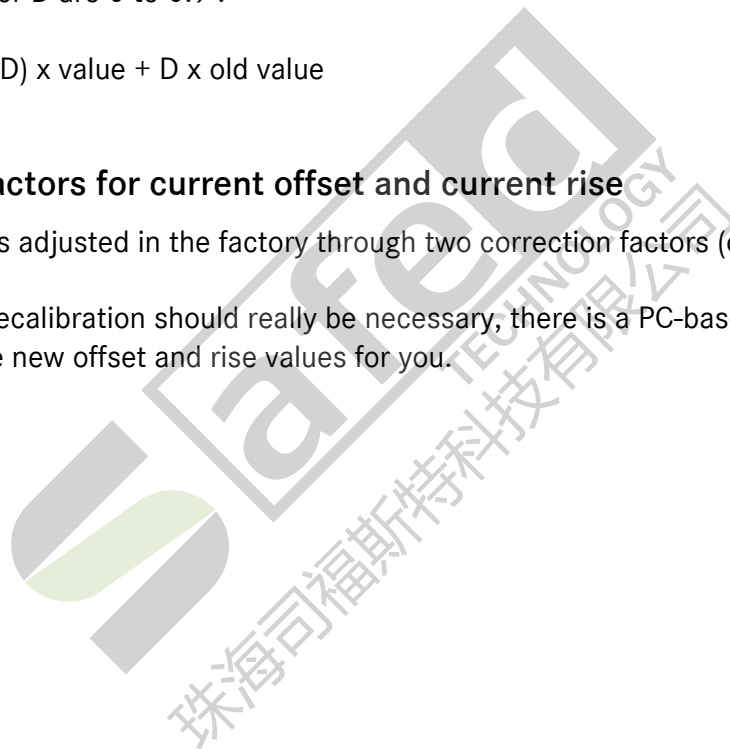
Permissible values for D are 0 to 0.9 !

Output current = (1-D) x value + D x old value

### 10. Correction factors for current offset and current rise

The current output is adjusted in the factory through two correction factors (offset and rise).

In the event that a recalibration should really be necessary, there is a PC-based program available which will define the new offset and rise values for you.



# Power Supply

Depending on the type of the device, there are different options of power supply.

1. The basic TERZ 94 model is supplied by an internal lithium battery which enables to operate the device continuously for a period of approx. six years. This, however, is conditional on the device being read once a week or “woken up” by pressing the external button.
2. If an interface module is used for transmitting data, such as the ENCO with external supply, the service life of the battery is more than 10 years.
3. The TERZ 94-S (current transmitter) is completely supplied through a current loop. If pulse processing is to be maintained even in the case of a power failure of the current loop, a standby battery (available as an option) should be installed which will bridge the power supply during a period of up to 6 months.



# Maintenance

## Lubrication

The TERZ 94 is fitted with permanently lubricated bearings up to and including the nominal diameter of DN 150. From the nominal diameter of DN 200, the meter is fitted with a lubricator. The type of lubricator and the lubrication instructions depend on the nominal diameter and the pressure rating:

Nominal dia.	Pressure rating	Lubricator	Lubrication instructions
<i>DN 200</i>	<i>Meters produced before November 2007 (pressure classes PN 10, PN 16 and ANSI 150)</i>	<i>Oil gun (supplied)</i>	<i>Every 3 months 2 strokes</i>
DN 200	all pressure classes	Small oil pump (pushbutton-operated)	Every 3 months 6 strokes
DN 250	PN 10 to 16 ANSI 150		
DN 250	PN 25 to 100 ANSI 300 to 600	Large oil pump (lever-operated)	Every 3 months 2 strokes
from DN 300	all pressure classes		

Please observe also the instruction plate on the case.

In the case of unfavourable operating conditions, such as the formation of water or hydrocarbon condensate or the use of dust-laden gas, we would recommend performing lubrication at shorter intervals, even daily under extreme conditions (permanent formation of condensate).

### Recommendations for lubricating oils:

Shell Tellus S2 MA 10 or another oil with 2 to 4°E at 25°C.

## Changing the battery

For the TERZ 94 use only lithium batteries of the type **SL 770/P Size C, 3.6 V** produced by Sonnenschein or type **LS 33600** produced by Saft.

These batteries have a service life of approx. 6 years and can be ordered ready for installation from RMG under the following order number:

**For Ex and Non-Ex devices:**                    **207626**  
Emergency battery for TERZ 94-S:        207658



- If you use other batteries than the replacement batteries from RMG, you run the risk of the TERZ 94 not being approved for areas subject to explosion hazards any more.
- In areas subject to explosion hazards, you must never insert or remove the battery. Remove the display board from the case and change the battery in an area without explosion hazards.

To change the battery, you must proceed as follows:

- Remove the cover of the meter head – on the rear side, there is the battery fixed with cable ties.
- If the meter is located in an area subject to explosion hazards, disconnect the sensor wires from terminal X5 (see chapter “Electrical connections” – Remember the terminals and colours!) and take the display board to an area without explosion hazards.
- Remove the connecting wires of the battery from the contacts on the bottom of the terminal board.
- Screw off the four screws with which the battery board is fixed.
- Remove the cable ties with which the battery is fixed and take out the battery.
- Insert the new battery and fix it with cable ties.
- Plug the connecting wires of the battery on the contacts of the terminal board. Make sure that the polarity is correct.
- Reinsert the battery-board into the case and screw it on. In case you have previously disconnected the wires of the sensor and the control button, you must connect them again (make sure that the polarity of the sensor wires is correct!).
- Close the case.

# Specifications

## Measuring range

Under atmospheric pressure: 1:16

If the pressure increases, the measuring range of the meter extends. Measuring ranges of up to 1:50 can be reached.

## Measuring error

For  $Q_{min}$  to  $0.2 \cdot Q_{max}$ :  $\leq \pm 2\%$  (DN 25 to DN 80:  $\pm 3\%$ )  
 For  $0.2 \cdot Q_{max}$  to  $Q_{max}$ :  $\leq \pm 1\%$  (DN 25:  $\pm 2\%$ , DN 40/50:  $\pm 1.5\%$ )  
 Reproducibility:  $\leq \pm 0.1\%$

## Temperature ranges

Fluid temperature range:		-10°C to +50°C
TERZ 94	II2 G EEx ib IIC T4	-20°C to +40°C
	II2 G EEx ib IIC T3	-20°C to +60°C
TERZ 94-S	II2 G EEx ib IIC T4	-20°C to +60°C

In the case of special designs, even higher or lower fluid temperatures are possible in non-Ex versions.

## Inputs and outputs

### Sensor input S1 (Measuring input)

(For Ex connected loads, see approval certificate)

Terminals:	X5,1 (+) X5,2 (-)
Sensor type:	
Wiegand sensor, direct	Line length < 50 cm Jumpers X_S1 / 3-5 and 4-6
Wiegand sensor, remote totalizer	Line length < 30 m Jumpers: X_S1 / 3-5 and 4-6 Jumpers: X_TERZ90 / 1-2
Reed contact	Jumpers X_S1 / 1-3 and 2-4

## Sensor input S2 (Comparative input or start/stop/reset)

(For Ex connected loads, see approval certificate)

Terminals:	X5,3 (+) X5,4 (-)
Sensor type:	
Wiegand sensor, direct	Line length < 50 cm Jumpers X_S2 / 3-5 and 4-6
Wiegand sensor, remote totalizer	Line length < 50 m Jumpers: X_S2 / 3-5 and 4-6 Jumpers: X_TERZ90 / 3-4
Reed contact	Jumpers X_S2 / 1-3 and 2-4

## HF output

In the case of the explosion-protected (Ex) design, the device can only be connected to a certified intrinsically safe circuit.

Terminals:	X4,4 (+) X4,3 (-)
Output:	Open-drain transistor
T <sub>pulse</sub>	1 ms ± 10%
F <sub>max</sub> :	300 Hz

	Ex	Non-Ex
U <sub>min</sub> :	4.0 V	4.0 V
U <sub>max</sub> :	28 V	30 V
I <sub>max</sub> :	60 mA* (total current)	400 mA
External inductance	1 H	
External capacitance	25 µF	

\* maximum total current of the 3 pulse outputs (LF + HF + Alarm)

## SPECIFICATIONS

### LF output

In the case of the explosion-protected (Ex) design, the device can only be connected to a certified intrinsically safe circuit. (For Ex connected loads, see approval certificate.)

Terminals:	X4,2 (+) X4,1 (-)
Output:	Open-drain transistor
T <sub>pulse</sub>	125 ms ± 10% (F <sub>max</sub> : 4 Hz) 250 ms ± 10% (F <sub>max</sub> : 2 Hz)

	Ex	Non-Ex
U <sub>min</sub> :	4.0 V	4.0 V
U <sub>max</sub> :	28 V	30 V
I <sub>max</sub> :	60 mA* (total current)	400 mA
External inductance	1 H	
External capacitance	25 µF	

\* maximum total current of the 3 pulse outputs (LF + HF + Alarm)

### Alarm output

In the case of the explosion-protected (Ex) design, the device can only be connected to a certified intrinsically safe circuit. (For Ex connected loads, see approval certificate.)

Terminals:	X4,6 (+) X4,5 (-)
Output:	Open-drain transistor

	Ex	Non-Ex
U <sub>min</sub> :	4.0 V	4.0 V
U <sub>max</sub> :	28 V	30 V
I <sub>max</sub> :	60 mA* (total current)	400 mA
External inductance	1 H	
External capacitance	25 µF	

\* maximum total current of the 3 pulse outputs (LF + HF + Alarm)



## Vo or RS-485 data interface

In the case of the explosion-protected (Ex) design, the device can only be connected to a certified intrinsically safe circuit. (For Ex connected loads, see approval certificate.)

Vo data interface:	Internal Connector (Binder)
Terminals:	X15,4 (+) 4 X15,3 (-) 1 X15,1 and X15,2 open
U <sub>min</sub> :	7.0 V
U <sub>i</sub> :	13.5 V
I <sub>i</sub> :	15 mA
P <sub>i</sub> :	210 mW
External capacitance:	2,5 µF
External inductance:	1 H
Ex separating unit:	KFD2-ST2-Ex1.LB (Pepperl+Fuchs)

## RS-485 data interface:

Terminals:	X15,4 (+ supply) X15,3 (- supply) X15,2 (line A) X15,1 (line B)
U <sub>min</sub> :	7.0 V
U <sub>i</sub> :	10.5 V
I <sub>i</sub> :	428 mA
P <sub>i</sub> :	900 mW
Internal capacitance:	1,32 µF
Internal inductance:	600 µH
External capacitance:	23,7 µF
External inductance:	1 H
Ex separating unit:	17-21S1-S111 / EExi (Bartec)

**Note:** If the EZD protocol or the RS485 bus is used, the device is supplied via the data interface.

## SPECIFICATIONS

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### Temperature input (hardware and software options)

For Ex connected loads, see approval certificate.

Terminals:	X9,2 (+) X9,1 (-)
Sensor type:	PT 1000
Measuring range:	-20°C to 60°C
Resolution:	± 0.2°C

### Current-loop connection (TERZ 94-S only!)

Terminals:	X22.1 (+) X22,2 (-)
U <sub>ext</sub> (min):	12 V
U <sub>ext</sub> (max):	28 V
I <sub>min</sub> :	3.5 mA
I <sub>max</sub> :	23 mA
External load (max.):	$RL_{max} = (U_{ext} - 10 V) / I_{max}$ (in $\Omega$ ) e.g. $U_{ext} = 16 V$ $\Rightarrow RL_{max} = (16 V - 10 V) / 23 mA = 260 \Omega$
Current output with	
- minimum flow rate:	4 mA
- maximum flow rate:	20 mA
- Warning:	3.5 mA
- Alarm:	23 mA
Accuracy, current output:	Better than 1% of the final value

### Data for the use in hazardous areas:

U <sub>i</sub>	=	28 V
I <sub>i</sub>	=	110 mA
P <sub>i</sub>	=	770 mW
C <sub>i</sub>	=	2,2 nF
L <sub>i</sub>	=	110 $\mu$ F

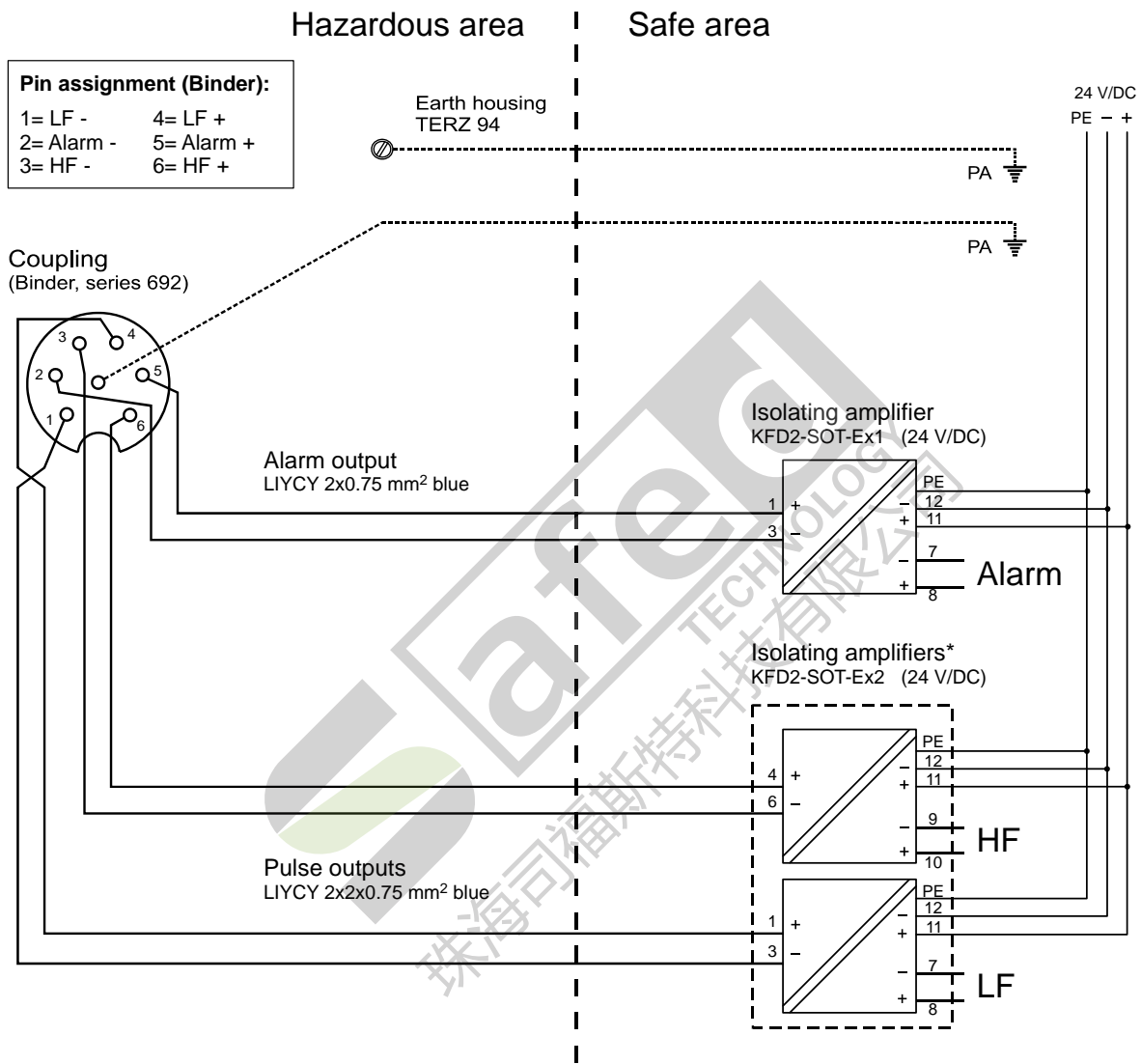
### Materials used for the meter case

Spheroidal cast iron or steel, depending on the pressure class and the nominal diameter.

Aluminium is used for the threaded-end design.

# Examples of connection

## Battery-operated device



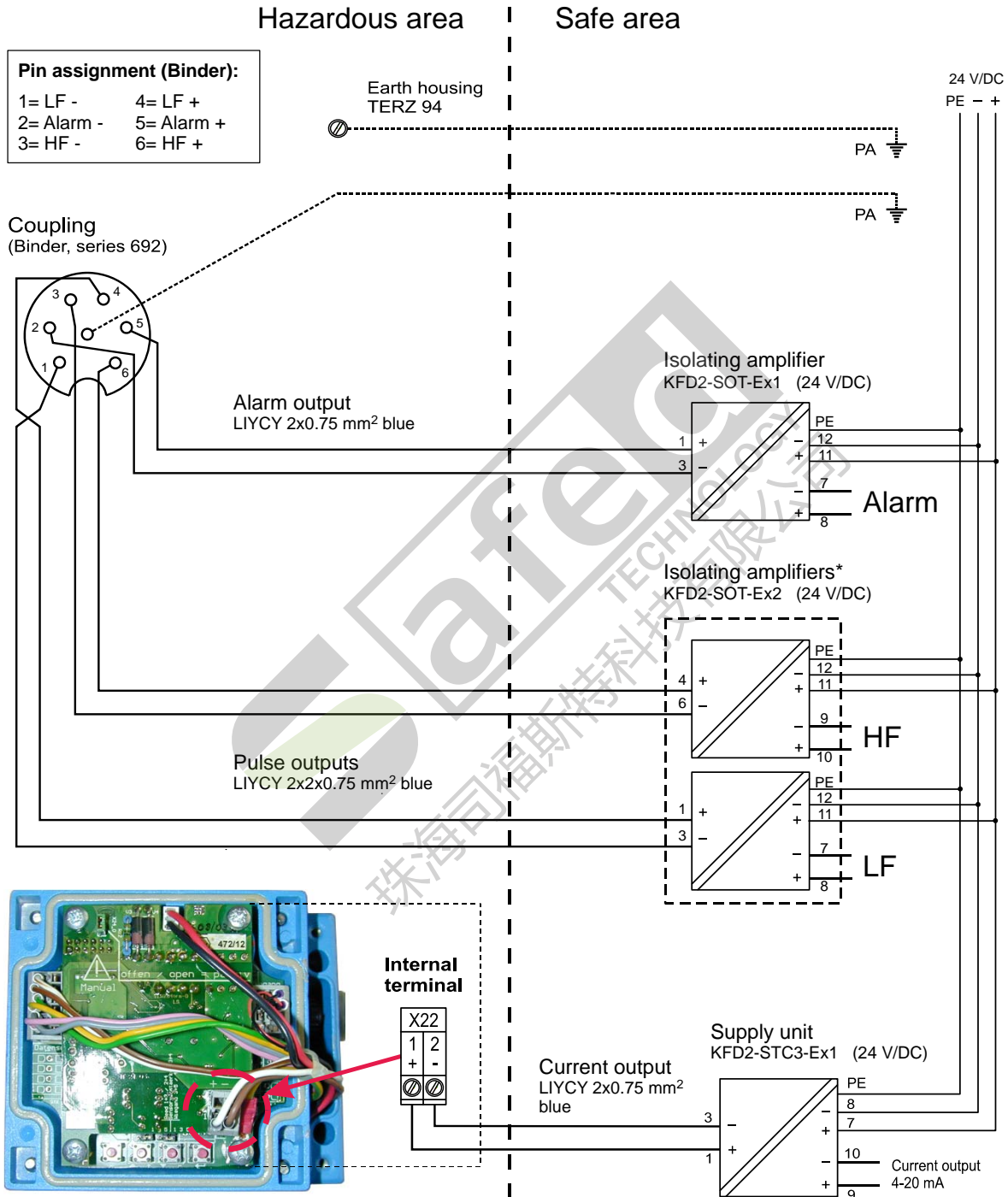
\* If 2-channel isolating amplifiers are used, the two inputs must be separated!

# SPECIFICATIONS

## Main-powered device (Ex design)

(Connection only via the current module with built in backup battery)

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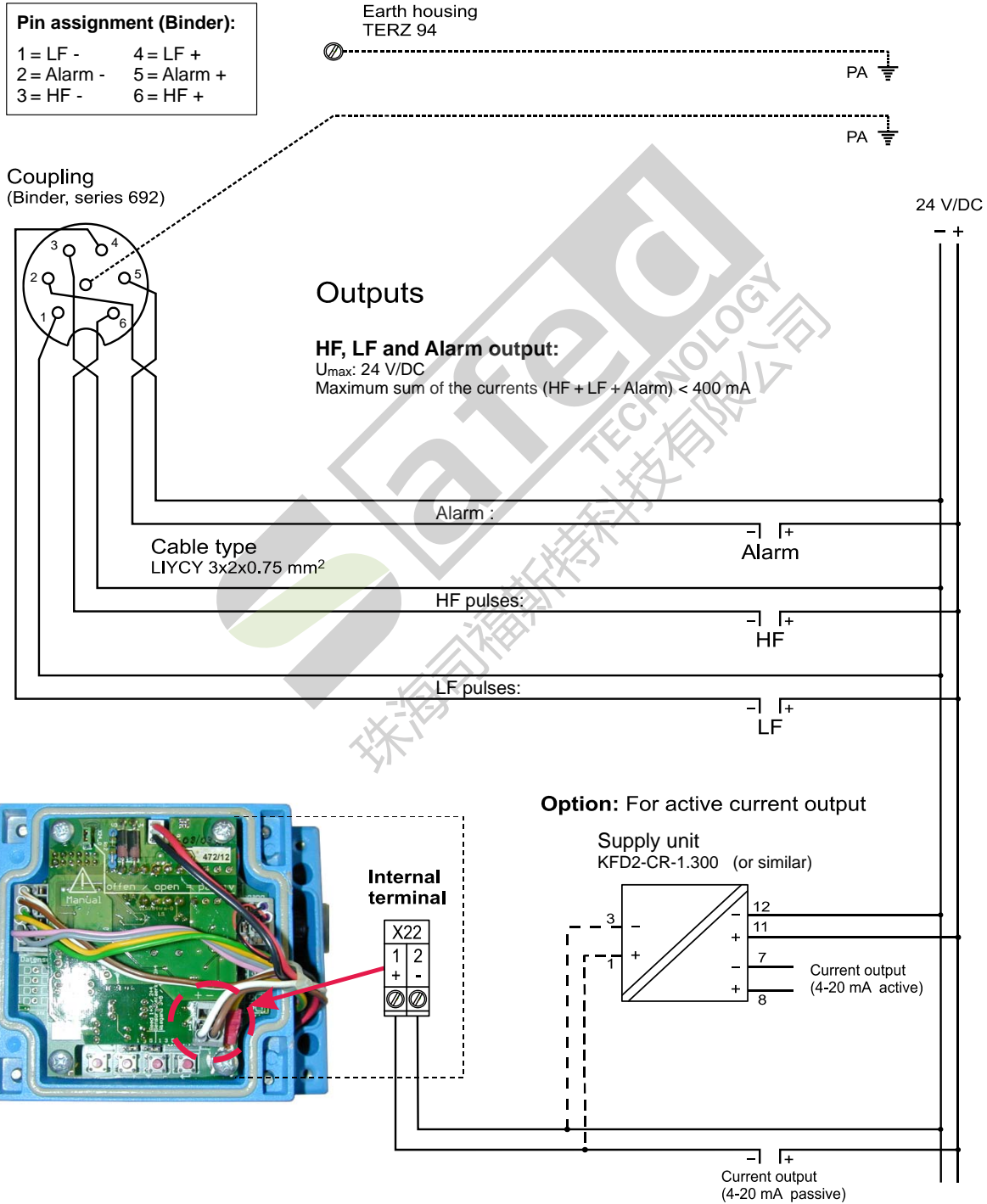


\* If 2-channel isolating amplifiers are used, the two inputs must be separated!

### Main-powered device (Non-Ex design)

(Connection only via the current module with built in backup battery)

### Safe area



# Annex

## Overview of Parameters for the TERZ 94/94-S

	Parameter	Setting	Example (display)
A01	Main totalizer (Vm)	0 to 99999999	12345678 m <sup>3</sup>
A02	Flow rate (Qm)		12.3 m <sup>3</sup> /h
A03	Disturbing quantity totalizer	0 to 99999999	123 m <sup>3</sup>
A04	Start-stop totalizer	0 to 99999999	12345678 m <sup>3</sup>
A05	Resettable totalizer	0 to 99999999	12345678 m <sup>3</sup>
A06	Meter factor	in all: six digits	12.3456 P/m <sup>3</sup>
A07	Pulse scaler	0.01; 0.1; 1; 10; 100	L 1 –
A08	Configuration	TERZ operating mode	00011021 MOD
A09	Error	Rolling display	0 ERR
B01	Serial number	0 to 99999999	12345678 MOD
C01	Current output	<b>TERZ 94-S</b>	12.345 mA
C02	Flow rate at 4 mA	0 to 999999.99	20.00 –
C03	Flow rate at 20 mA	0 to 999999.99	650.00 –
C04	Calibration current	4.000 to 20.000	4.000 mA
C05	Current output mode	0 – Default value 1 – Flow rate Qm	3 MOD
C06	Correction factor - Offset	0 to 99999999	1234.5678 –
C07	Correction factor - Rise	0 to 99999999	1234.5678 –
C08	Damping display / current output	0 to 0.9	0.4 –
Z06	Frequency display		651 Hz

## Standard Parameters (values set in the factory) up to DN 150

Internal parameters:		Menu for standard operation		Pulse width LF output:		Units:		Cubic meter (m3)	
Cut-off time of the display:		5 minutes		250 ms		Off			
<b>Settings</b>									
<b>Parameter</b>	<b>DN25</b>	<b>DN40</b>	<b>DN50</b>	<b>DN80</b>	<b>DN80</b>	<b>DN80</b>	<b>DN100</b>	<b>DN150</b>	<b>DN150</b>
<b>Nominal diameter</b>									
<b>Qm max (m3)</b>	25	65	100	250	160	250	400	650	1000
<b>Meter factor</b>	13000	7750	7700	2380	2380	2380	1060	580	330
<b>Pulse scaler (pulses/m3)</b>	10	1	1	1	1	1	1	1	1
<b>Configuration</b>									
<b>1 channel</b>	00110102	00110102	00110102	00110102	00110102	00110102	00110102	00110202	00110202
<b>2 channels, X:Y deactivated</b>	00110109	00110109	00110109	00110109	00110109	00110109	00110109	00110209	00110209
<b>1 channel with 4 - 20 mA without faults</b>	00110112	00110112	00110112	00110112	00110112	00110112	00110112	00110212	00110212
<b>2 channels, X:Y deactivated with 4 - 20 mA without faults</b>	00110119	00110119	00110119	00110119	00110119	00110119	00110119	00110219	00110219
<b>C01 Output current</b>									
<b>C02 Flow rate at 4 mA</b>	0	0	0	0	0	0	0	0	0
<b>C03 Flow rate at 20 mA</b>	25	65	100	250	160	250	400	650	1000
<b>C04 Calibration current</b>	← variable, programmable from 4 - 20 mA →								
<b>C05 Current output mode</b>	1	1	1	1	1	1	1	1	1
<b>C06 Correction factor (offset)</b>	← variable, programmable from 4 - 20 mA →								
<b>C07 Correction factor (rise)</b>	← variable, programmable from 4 - 20 mA →								
<b>C08 Damping</b>	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7

Standard Parameters (values set in the factory) from DN 200

Internal parameters:		Menu for standard operation		Pulse width LF		250 ms		Units:		Cubic meter (m3)	
Cut-off time of the display:		5 minutes		Interface protocol::		Off					
<b>Settings</b>											
<b>Parameter</b>	<b>DN200</b>	<b>DN200</b>	<b>DN250</b>	<b>DN250</b>	<b>DN250</b>	<b>DN300</b>	<b>DN300</b>	<b>DN400</b>	<b>DN400</b>	<b>DN500</b>	<b>DN600</b>
<b>Nominal diameter</b>	1600	2500	2500	4000	4000	4000	4000	6500	6500	10000	16000
<b>Qm max (m3)</b>	135	80	75	44	44	48	48	24	24	12	6
<b>Meter factor</b>	1	1	1	1	1	1	1	1	1	0.1	0.1
<b>Pulse scaler (pulses/m3)</b>											
<b>Configuration</b>											
<b>1 channel</b>	00110202	00110202	00110202	00110202	00110202	00110202	00110202	00110202	00110202	00110302	00110302
<b>2 channels, X:Y deactivated</b>	00110209	00110209	00110209	00110209	00110209	00110209	00110209	00110209	00110209	00110309	00110309
<b>1 channel with 4 - 20 mA without faults</b>	00110212	00110212	00110212	00110212	00110212	00110212	00110212	00110212	00110212	00110312	00110312
<b>2 channels, X:Y deactivated with 4 - 20 mA without faults</b>	00110219	00110219	00110219	00110219	00110219	00110219	00110219	00110219	00110219	00110319	00110319
<b>Output current</b>											
<b>Flow rate at 4 mA</b>	0	0	0	0	0	0	0	0	0	0	0
<b>Flow rate at 20 mA</b>	1600	2500	2500	4000	4000	4000	4000	6500	6500	10000	16000
<b>Calibration current</b>											
<b>Current output mode</b>											
<b>0=default value / 1=flow rate Q<sub>m</sub></b>	1	1	1	1	1	1	1	1	1	1	1
<b>Correction factor (offset)</b>											
<b>Correction factor (rise)</b>											
<b>Damping</b>	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7



## Fault and Event Display (coordinate A09)

In the TERZ 94/94-S there are 16 error messages.

The error numbers are indicated in a roll mode, if more than one error is active, the display changes each second to the next active error (1... 5... 1... 5...).

Number "0" means faultless operation.

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Fault No.	Fault description	Remedy
0	No fault	—
1	wrong EEPROM version, invalid constant	TERZ 94 PCB board must be exchanged
2	Pulse fault: (sensor loss / 10:10000 (X:Y))	Check the electrical connection of the sensor. Possibly the sensor must be exchanged.
3	EEProm Hardware fault	TERZ 94 PCB board must be exchanged
4	—	—
5	Current output min/max fault: (wrong range values)	Entered range values (C02 and C03) are wrong or the value of the counter factor is wrong. Check the values and change them if necessary.
6	—	—
7	—	—
8	Pulse output LF: (more than 500 NF pulses accumulated in the memory)	Value of the LF output pulse factor (A07) is too high and must be adapted.
9	—	—
10	Configuration ist wrong	Selected mode of operation is wrong. Change the operation mode in coordinate A8.8 to 2.
11	—	—
12	—	—
13	—	—
14	—	—
15	—	—
16	—	—

## Reset

In case of malfunctions a Reset may reestablish the state of readiness. For this purpose the voltage supply has to be interrupted and the meter head is switched off for this time. The program and the operating parameters are not lost by this and also the totalizer readings remain valid. A Reset is performed with the TERZ 94 by disconnecting the battery as well as a possibly existing external voltage supply.

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## Booting

In case of serious disturbances it may be necessary to reboot the device.

**With the booting all parameter settings and totalizer readings are lost! Therefore make a list of all parameters of the meter before booting.**

To reboot the device proceed as follows:

- For mains supplied devices switch off the power supply.
- For battery powered devices disconnect the battery (see section "Changing the battery"). Also a possibly existing backup battery for mains supplied devices must be disconnected.
- Press the "P" key and keep it pressed.
- Connect the battery again and/or switch on the power supply again.
- Now the text "JEL ALL" appears in the display. Press the ↵key (Enter).
- As soon as the addresses are counted up in the display, you can release the "P" key.
- The booting procedure has finished, if the totalizer is displayed (now set to 0).

Now enter all meter parameters again.

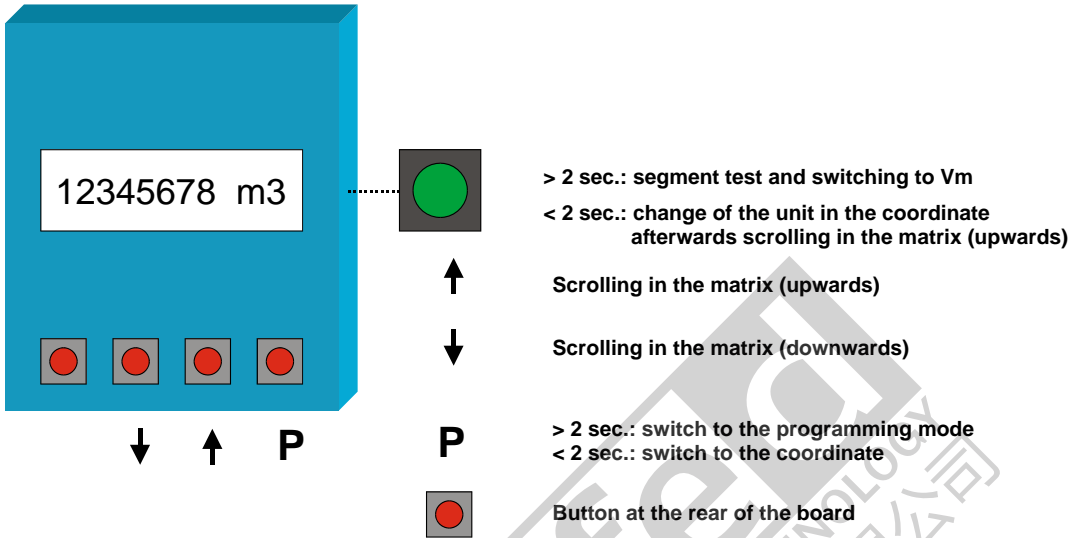
## Matrix of the TERZ 94 / 94-S

Coordinate	Specification	Terz94 1 Channel	Terz94 2 Channel	Terz94-S 1 Channel	Terz94-S 2 Channel
A01	Main Totalizer Vm	X	X	X	X
A02	Flow rate (Qm)	X	X	X	X
A03	Disturbing quantity totalizer	NO	X	NO	X
A04	Start / Stop totalizer	X	NO	X	NO
A05	Resettable totalizer	X	NO	X	NO
A06	Meter factor	X	X	X	X
A07	Pulse scaler	X	X	X	X
A08	Configuration	X	X	X	X
A09	Error	X	X	X	X
A10	Operating mode Pulse X from X:Y	NO	X	NO	X
A11	Operating mode Pulse Y from X:Y	NO	X	NO	X
B01	Serial number	X	X	X	X
C01	Current output	NO	NO	X	X
C02	Flow rate at 4 mA	NO	NO	X	X
C03	Flow rate at 20 mA	NO	NO	X	X
C04	Calibration current	NO	NO	X	X
C05	Current output mode	NO	NO	X	X
C06	Correction factor - offset	NO	NO	X	X
C07	Correction factor - Rise	NO	NO	X	X
C08	Damping display / current output	NO	NO	X	X
Z01	Number of digit positions following a Decimal point	NO	NO	NO	NO
Z02	Factor	NO	NO	NO	NO
Z03	Divisor	NO	NO	NO	NO
Z04	Direction of rotation for ENCO	NO	NO	NO	NO
Z05	Totalizer	NO	NO	NO	NO
Z06	Frequency	X	X	X	X
Z07	Maximum flow value	0	0	0	0
Z08	Frequency-mode	0	0	0	0
Z09	Error state	0	0	0	0
Z10	Number of pulses	X	X	X	X
Z11	Version number	X	X	X	X
	Not available	NO			
	Available	X			
	Available in service mode	0			

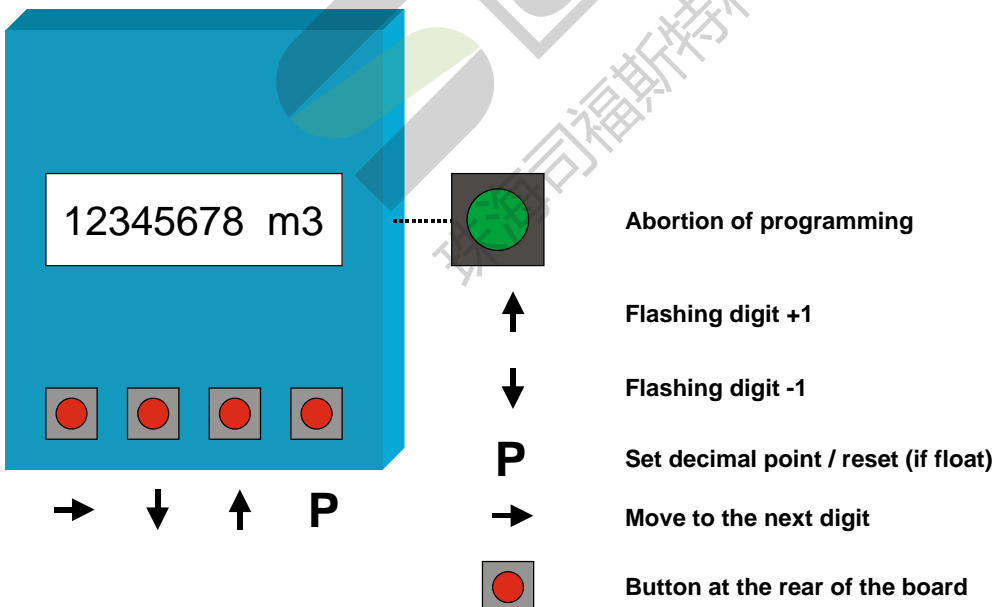
In case only a part of the matrix is displayed. It any depends on the operating mode, which fields are displayed. Fields, which have no function in the selected operating mode are blanked out.

## TERZ 94 Button Assignments

### Terz 94 Display Mode



### Terz 94 Programming Mode



## Converting the TERZ 94 into the TERZ 94-S

The TERZ 94 can be converted into a TERZ 94-S by installing another board.

- Remove the battery (see chapter “Changing the battery”).
- Remove the jumper for battery-powered mode (1-2) on the socket X2\_0 of the board.
- Screw the 4 short stay bolts onto the present stay bolts on the board.
- Plug the current module TERZ94trm with a 12-pin connector (X2\_1) into the socket X2\_0.
- Apply the supply voltage (24V) to terminal X22 (1 +, 2 -).
- Switch on the power supply (24 V).
- Check the current output:
  - Set the current output in channel A08 to I-Out (mode 1 or 2).
  - Channel C02: enter flow rate at 4 mA.
  - Channel C03: enter flow rate at 20 mA.
  - Set channel C04 (default value) to 10.0 mA.
  - Set channel C05 (output mode) to 1 (current output is proportional to the flow rate).
  - Channel C06: enter correction value for the current offset (see value on the board)
  - Channel C07: enter correction value for the current rise (see value on the board)
  - In the event that a recalibration should be necessary, there is a PC-based program available which will define the new offset and rise values.
- Now the TERZ94-S is operational.