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**Magnetic-Inductive Flow Velocity Sensor**

**PIT  
UMF2 (B)**

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**Operating Manual**



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## Introduction

These Installation and Operating Instructions serve as a tool for the correct installation, operation and maintenance of the device. They are a supplement to the PIT-UMF2 (B) device description. Read these manuals carefully before the device is installed and put into use. They do not include special versions or applications.

All devices were thoroughly checked for order compliance and operability before delivery. Upon receipt, please conduct a visual inspection of possible damage that may be identified as having occurred during shipment. If you discover any defect, please contact our head office in Cologne or the local sales office responsible for your area (see our Web site). Apart from a description of the error, we will need the equipment type and serial number of the delivery.

Heinrichs Messtechnik shall not furnish guarantee for any repair work done without prior notice. Unless otherwise agreed on, the rejected parts must be made available to us in case a claim is made.

## 1 Identification

### 1.1 Manufacturer/supplier

Heinrichs Messtechnik GmbH  
Robert-Perthel-Str. 9 · D-50739 Cologne  
Phone +49 (221) 49708 - 0  
Fax +49 (221) 49708 - 178  
Internet: <http://www.heinrichs.eu/>  
E-mail: <mailto:info@heinrichs.eu>

### 1.2 Product type

Magnetic – inductive flow sensor based upon Faraday's law of induction

### 1.3 Product name

PIT-UMF2 (B)

### 1.4 Issue date

13.02.2014

### 1.5 Version No.

File: PIT-UMF2 (B)\_BA\_02\_EN\_REV1.DOC

## 2 Application

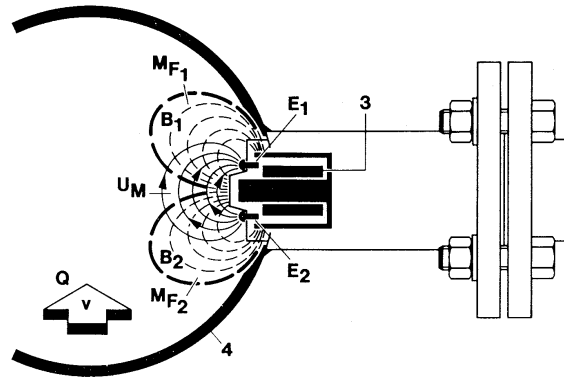
The magnetic-inductive flow velocity sensor PIT-UMF2 (B) is used to measure or monitor the volume flow of liquids with and without solids concentration and also other electrically conductive media while minimizing pressure drops. The conductivity of the medium must be at least 20  $\mu\text{S}/\text{cm}$ . Pressure, temperature, density and viscosity do not affect the volume measurements. Smaller portions of solid particles and small gas bubbles are also measured as part of the volume flow. A larger number of solid particles or gas bubbles will lead to failures. Special electrodes are available for media that tend to form greasy films or crusts.

### 3 Mode of Operation and System Design

#### 3.1 Mode of operation

It was back in 1832 that Faraday suggested utilizing the principle of electromagnetic induction for measuring flow velocities. His experiments in the Thames, though unsuccessful due to superimposed polarization effects, are nonetheless regarded as the first ones in the field of magnetic-inductive flow measurement.

According to Faraday's law of electromagnetic induction, an electrical field  $E$  is produced in a conductive liquid moving through a magnetic field  $B$  at a velocity  $v$  in accordance with the vector product  $E = [v \times B]$ . A liquid at flow velocity  $v$  and a flow rate  $Q$  flows through a meter tube (4), producing a measuring-circuit voltage  $U_M$  at the two electrodes ( $E_1$  and  $E_2$ ) at right angles to the direction of flow and the magnetic field  $B$  generated by the field coils (3). The size of this measuring-circuit voltage is proportional to the mean flow velocity and thus the volume flow rate.



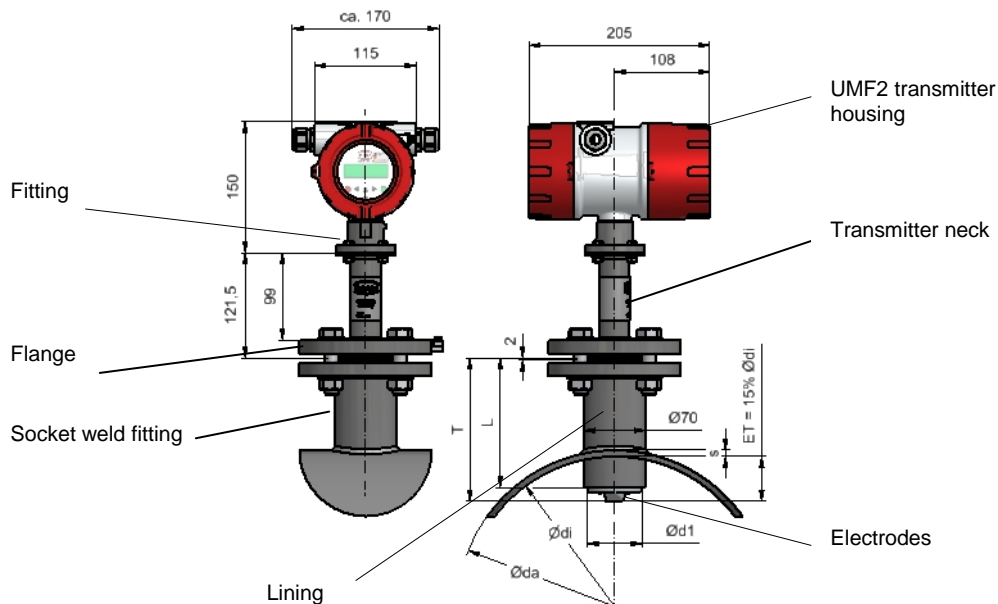
#### 3.2 System design

The magnetic-inductive PIT-UMF2 (B) flow measurement system consists of a sensor (PIT), which picks up an induced measuring signal from the medium flowing through the pipe, and a transmitter (UMF2 (B)), which transforms this signal in standardized output signals (4-20 mA or pulses).

The PIT-\*\*\* sensor can be operated with all transmitters for magnetic-inductive flow meters manufactured by Heinrichs Messtechnik. The sensor is installed in the pipe while the transmitter is mounted directly on the sensor or separately on the outside, depending on the equipment design.

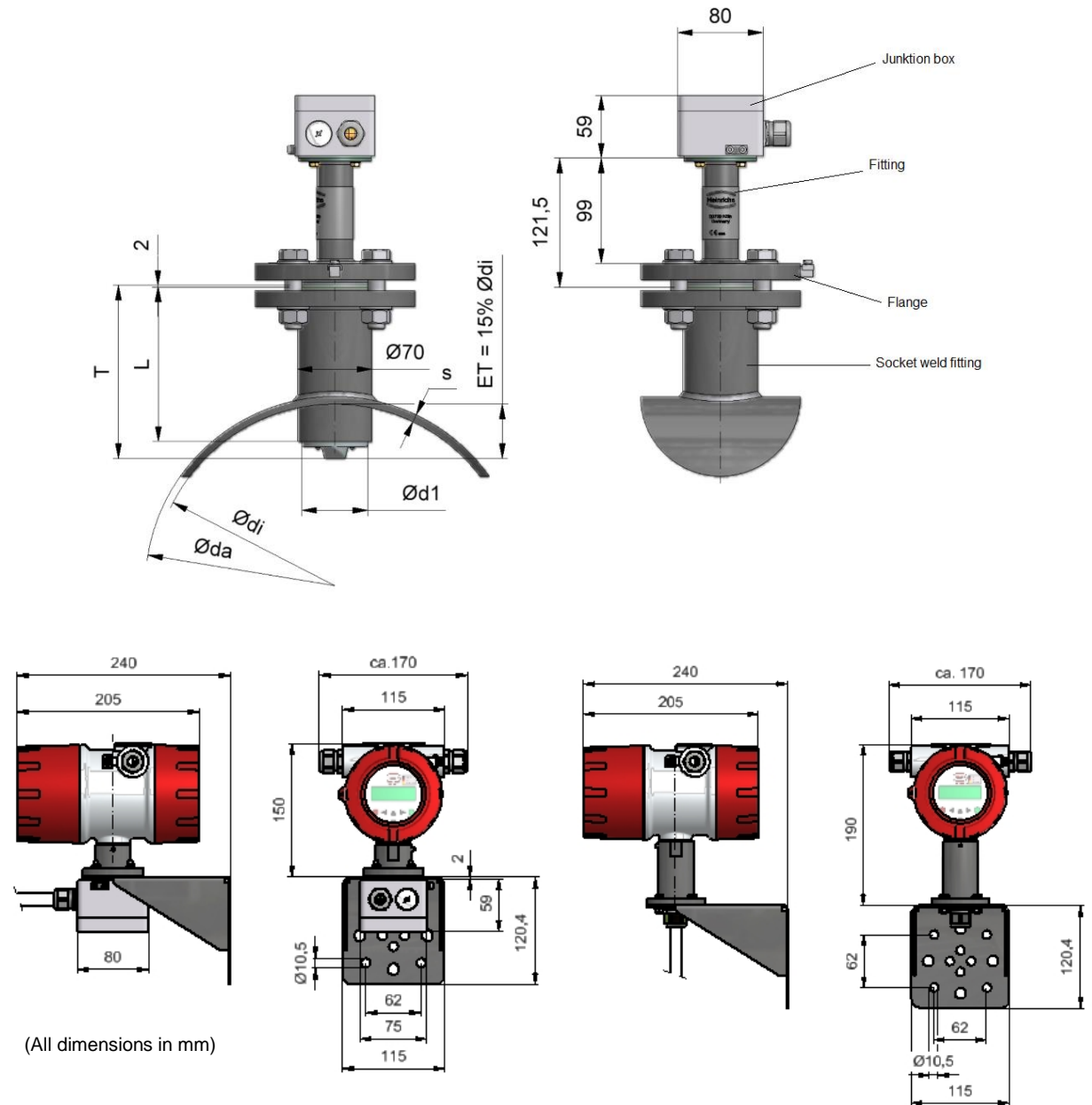
##### 3.2.1 Transmitter mounted on the sensor

This type of construction ensures easy and trouble-free installation



### 3.2.2 Remote installation of the transmitter

Heinrichs Messtechnik recommends this type of installation when there is little space or the medium temperatures are high. The sensor and the transmitter are connected by a field coil and an electrode cable. The electrode cable must be shielded and protected against disturbing interferences.



Remote transmitter with terminal connection box,  
(For cable length longer than 10 m)

Remote transmitter with direct connected cable to transmitter,  
(For cable length of max. 10 m)

### 3.2.3 Sensor versions

- PIT-S**      Wetted parts stainless steel / hastelloy / PTFE,  
                 Transmitter neck connection flange stainless steel
- PIT-A**      Wetted parts PFA / hastelloy,  
                 Transmitter neck connection flange stainless steel
- PIT-U**      Version with retraction device

## 4 Characteristics

### 4.1 Accuracy

$\pm 1.5\%$  of measured value plus  $\pm 0.5\%$  of URV

### 4.2 Conductivity of fluid

$\geq 20\ \mu\text{S}/\text{cm}$

### 4.3 Influence of ambient temperature

Pulse output  $\pm 0,05\%$  pro 10K

Current output  $\pm 0,1\%$  pro 10K

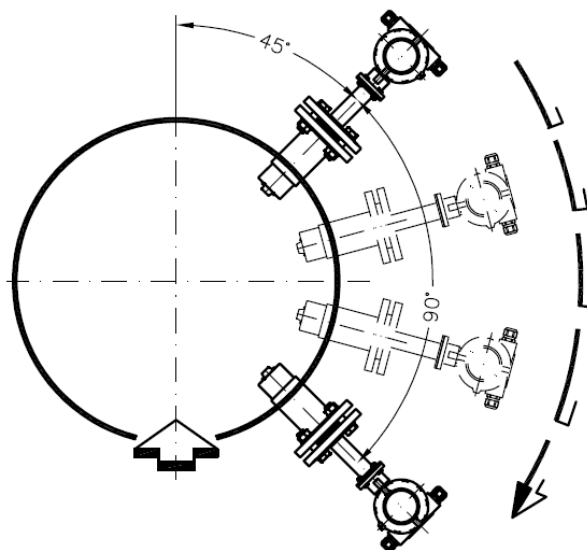
### 4.4 Influence of medium temperature

None

## 5 Conditions of use

### 5.1 Installation conditions

Disturbing elements (e.g. shut-off and control valves) are to be arranged downstream from the sensor. If this is not possible, flow conditioners must be installed so that no vortices can reach the pipe section of the sensor. The mounting location in the pipe system should be selected so that the sensor is continually filled with the medium. This requirement can be met by using drains and check valves.



In order to stay within the indicated accuracy, the installation must be performed according to EN 29104 "Measurement of Fluid Flow in Closed Conduits – Methods of Evaluating the Performance of Magnetic-Inductive Flow meters." Based on this standard, the minimum straight run of pipe ahead of the inlet must be **10 pipe diameters (> 10 x DN)** and 5 pipe diameters following the outlet (**> 5 x DN**) [DN = nominal diameter of pipe].

In order to prevent serious measuring errors when the pipe is partially filled or when there are gas bubbles or sediment deposits, the mounting position described above should be chosen.

The limits for the product and ambient temperature must be met at the mounting location. Corrosive atmospheres must be avoided. Please also take into account the space requirement for a possible removal of the device.

#### 5.1.1 Immersion depth of PIT-\*\*\* in the pipe

In order to suppress the influence of the flow profile as much as possible, the depth of immersion of the sensor head in the pipe must be **15 % of the inside diameter of the pipe**. The socket weld fitting must not cover the top of the sensor head and must be shortened if necessary.

### 5.1.2 Removal and installation under process pressure

For easy removal and installation under pressure, a special retraction device is available. When using this device, the sensor head must not be damaged by closing the valve.

For details, see the Additional Operating Instructions for Removal and Installation the meter under process pressure Additional Operating Instructions PIT-Druck\_BA\_0X\_eng.doc (see also Section 14 "Options").

### 5.1.3 Grounding

For safety reasons and to ensure faultless operation of the magnetic-inductive flow meter, earthing of the flow sensor is important. In accordance with VDE 0100, Part 540, the earthing connections must be connected to the grounding conductor. To avoid false measurement, the ground potential must be identical to the ground potential of the medium.

When using insulated and lined pipes or plastic pipes, the metrological grounding of the medium for PIT-S (SS) is carried out via the wetted part of the sensor head.

All wetted parts of PIT-A (PFA) are coated with PFA. Therefore it is not possible to ground the medium via the housing parts. In this case make sure that the PIT-A sensor will be supplied an earthing. If the sensor does not have an earthing electrode ensure that a suitable earthing disc will be used.

## 5.2 Use in hazardous areas

The flow meters PIT-.../UMF2 (B) are not intended for use in hazardous areas.

## 5.3 Ambient conditions

### 5.3.1 Ambient temperature ranges

-20°C to +60°C, below 0°C the readability of the LCD is limited

### 5.3.2 Storage temperature

-25°C to +60°C

### 5.3.3 Climatic category

- In accordance with IEC 654-1
- Not weather-protected **Class D locations** exposed directly to open-air climate

### 5.3.4 Ingress Protection

PIT standard sensor: IP65, option: IP68

UMF2 (B) standard housing IP68 (NEMA 6P)



**Caution:**

Ingress protection IP68 is only achieved if suitable and tightly screwed down cable glands or conduits are used. If the cable glands are only tightened manually water may leak into the terminal compartment in the housing.



**Danger:**

Particular care must be taken if the window in the housing becomes fogged over or discolored because moisture, water or product might seep through the wire sheath into the terminal compartment in the housing!



**Warning:**

Electromagnetic compatibility is only achieved if the electronics housing is closed. Leaving the enclosure open can lead to electromagnetic disturbances.

### 5.3.5 Shock resistance/vibration resistance

The meter should be protected from extreme shocks and vibrations, which could cause damage.

## 5.4 Medium temperature and pressure

### 5.4.1 Direct mounted transmitter

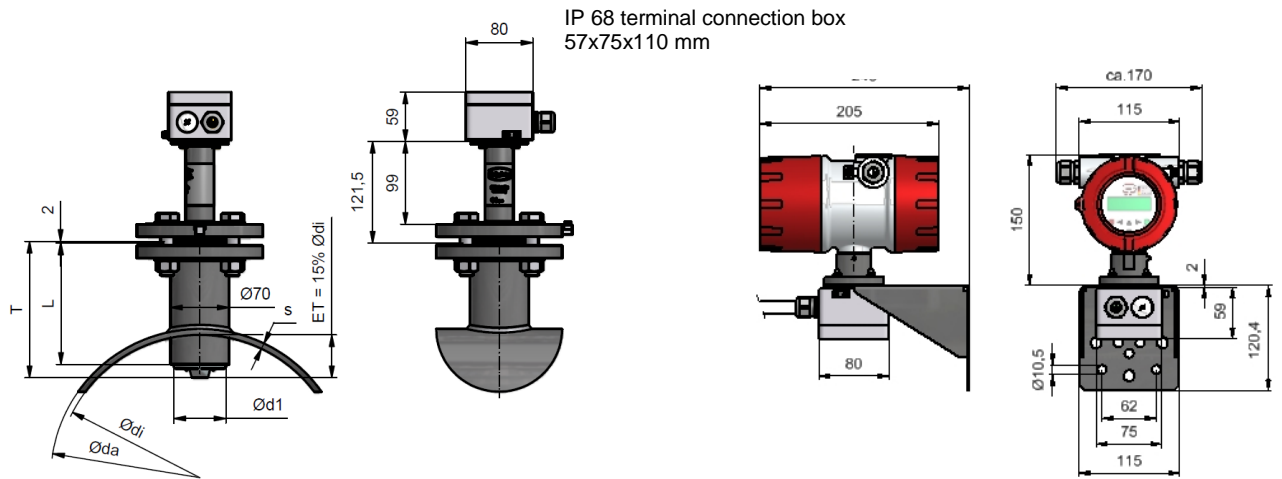
Version	Medium temperature	Pressure
PIT-S (SS / PTFE)	-20°C to 80°C	16 bar
PIT-A (PFA)	-20°C to 80°C	40 bar

### 5.4.2 Remote mounted transmitter

Version	Medium temperature	Pressure
PIT-S (SS / PTFE)	-40°C to 100°C	16 bar
PIT-A (PFA) standard	-40°C to 140°C	40 bar

## 6 Dimensions/weight

### 6.1 PIT-UMF2 (B) dimensional drawing for remote transmitter



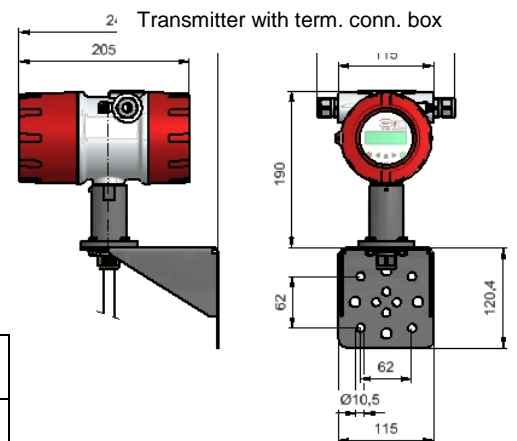
IP 68 terminal connection box  
57x75x110 mm

(All dimensions in mm)

Weight: 3.6 kg

DN: Nominal Diameter  
 T: Length of sensor  
 Ød1: Diameter of sensor  
 L: Length of socket weld fitting  
 ET: Immersion depth in % of pipe diameter

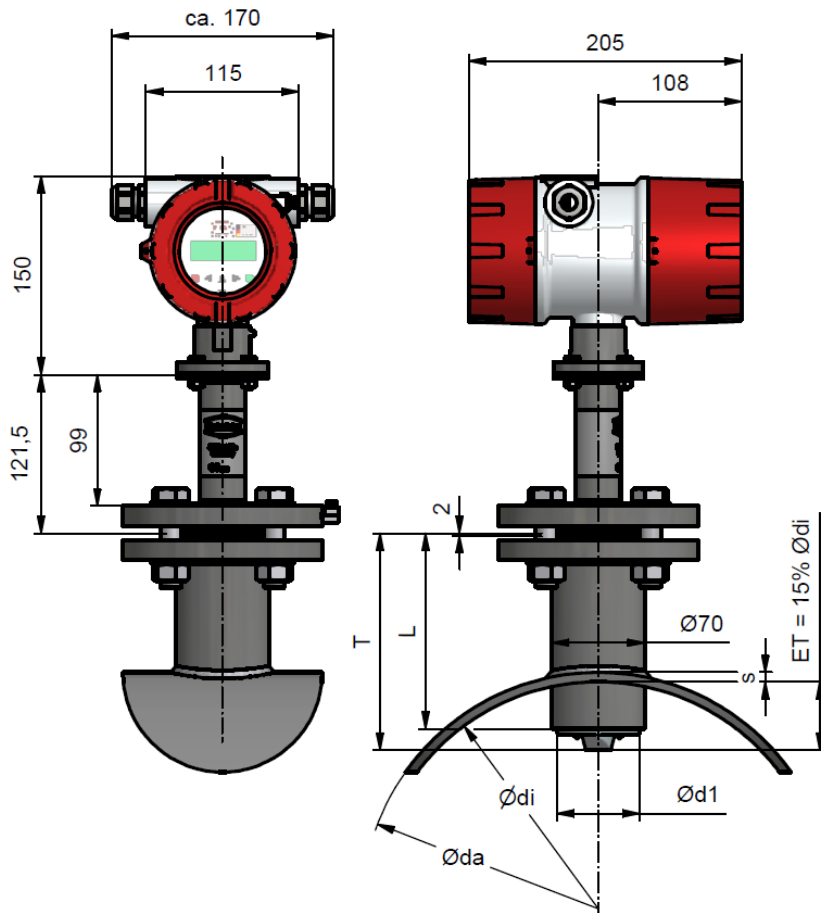
Version	DN	T	Ød1	L
PIT-A (PFA)	150-600	163mm	62mm	145mm
PIT-S (SS / PTFE)	150-600	163mm	60,3mm	145mm
PIT-S (SS / PTFE)	700-1200	263mm	60,3mm	170mm
PIT-S (SS / PTFE)	1400-2000	363mm	60,3mm	170mm



Transmitter with directly connected cable (up to 10 m)



**6.2 PIT-\*\* dimensional drawing with direct mounted transmitter UMF2 (B)**



(All dimensions in mm)

Weight: 5.5 kg

DN: Nominal Diameter  
 T: Length of sensor  
 Ød1: Diameter of sensor  
 L: Length of socket weld fitting  
 ET: Immersion depth in % of pipe diameter

Version	DN	T	Ød1	L
PIT-A (PFA)	150-600	163mm	62mm	145mm
PIT-S (SS / PTFE)	150-600	163mm	60,3mm	145mm
PIT-S (SS / PTFE)	700-1200	263mm	60,3mm	170mm
PIT-S (SS / PTFE)	1400-2000	363mm	60,3mm	170mm

## 7 Power supply / electrical connection

See name plate or Operating Instructions of the corresponding transmitter.

## 8 CE-Mark

The measuring system complies with the legal requirements of the following EU Directives: Low Voltage Directive 2006/95/EC, Electromagnetic Compatibility Directive 2004/108/EC

Heinrichs Messtechnik confirms compliance with the directives by attaching the CE mark to the device.

## 9 Standards and directives, certificates and approvals

Certified to DIN-EN-ISO 9001:2008

Production in accordance with AD2000 guidelines

TÜV approval for welding requirements in accordance with EN 3834-2

### General standards and directives

EN 61010 – Safety requirements for electrical measuring, control and laboratory devices

EN 60529:2010 – Degrees of protection through housing (IP code)

### EMC Directive 2004/108/EC

EN 61000-6-2:2005 immunity for industrial environments

EN 61000-6-3:2007+A1:2011 emissions residential environments

EN 55011:2009+A1:2010 group 1, class B (emitted interference)

## 10 Safety information

### 10.1 Intended use

The PIT-UMF2 (B) flow meter may be used only for flow measurements of fluids whose conductivity exceeds 20 $\mu$ S/cm. The manufacturer shall not be liable for damages that may result from unintended or inappropriate use.

When dealing with an aggressive medium, clarify the material durability of all wetted parts.

### 10.2 Installation, start-up and operating personnel

Only trained specialists authorized by the system operator may carry out the installation, electrical installations, start-up maintenance and operation. They must read and understand the operating manual and follow its instructions. Basically, the national conditions and provisions must be followed.

## 11 Packaging, storage and transport

Carefully unpack the device to avoid damaging it.

Storage and installation must be done in a clean and dry room so that contamination – especially of the interior of the fitting – is avoided. The ambient temperature ranges must be observed.

With the help of the delivery note enclosed in the packaging, check whether all technically relevant data coincide with your requirements.

When transporting the device to a remote mounting location, we recommend that you reuse the factory-issued packaging and the transport protection.

## 12 Maintenance

The device requires no maintenance if used according to its intended purpose. Cleaning might be necessary due to deposits and dirt on the electrodes or the sensor head.

### 13 Returning devices for repair and service

**Note:** In accordance with the applicable German waste disposal legislation, the owner/client is responsible for the disposal of special waste and hazardous materials. Consequently, all devices sent to us for repair must be free of any hazardous materials. This also applies to possible hollow spaces and fissures in the devices.

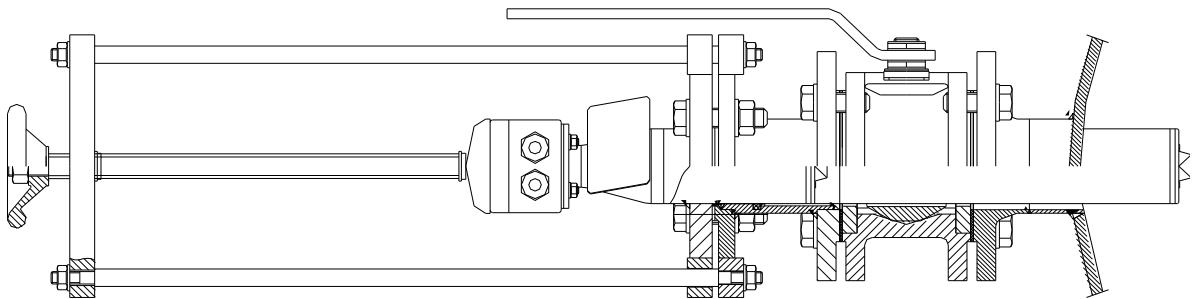
If repair is necessary, confirm the above-mentioned item in writing (**please use the form in the Appendix**). If hazardous materials remain in or on the device after it has been returned, Heinrichs Messtechnik shall be authorized to remove them at the client's expense without further inquiry.

### 14 Options

#### 14.1 Removal and installation under process pressure

In some cases it might be necessary to remove and reinstall the PIT sensor head for cleaning when the pipe is under process pressure. A special retraction device can be used for this purpose.

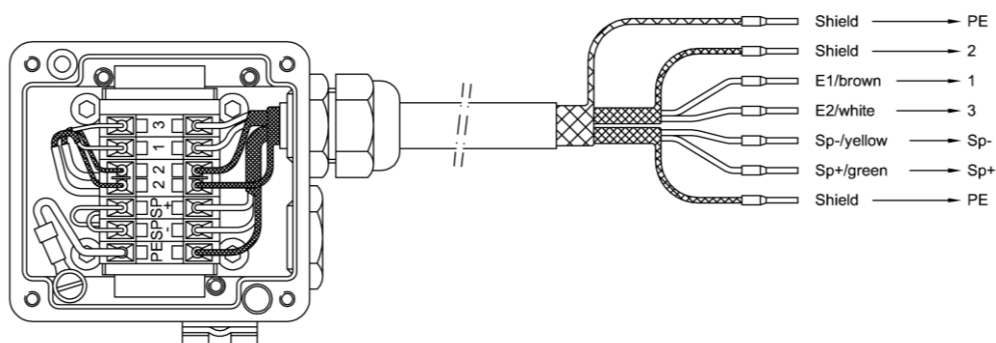
When using this device, it is important to ensure that the sensor head will not be damaged by closing the valve. For a detailed description of this process, see the Additional Operating Instructions (PIT-Druck\_BA\_03\_eng) for removal and installation the meter under process pressure (Section 5.1.2).



#### 14.2 PIT (Sensor) Ingress protection IP68

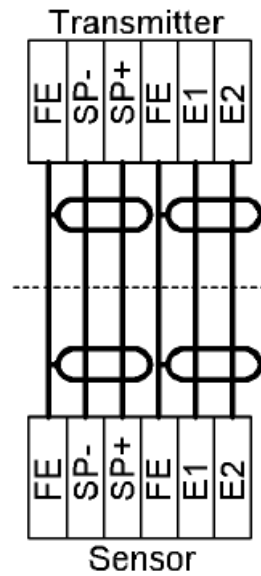
A special version of PIT is available with the IP 68 degree of protection. This version is equipped with a special terminal box, special cable glands and a special cable. The length of the cable must be specified when placing the order. The terminal box does not need to be opened during the installation. If this should be necessary, the cover must be remounted carefully. This is the only way to ensure the IP 68 degree of protection.

- The standard immersion depth is **5 m**. (Material of term. connection box Aluminum)
- Longer immersion depth up to **25 m** with filling of the term. Connection box with special sealing Compound „GHB1” and with factory connected cable at the sensor terminal connection box. (Option)  
Material of term. connection box: Aluminum
- IP 68 version - seawater resistant: material of term. connection box : PE glass fiber reinforced, black 57x75x110 mm (Option)



### 14.2.1 Wiring diagram for remote installation

The outer shield has to be connected to the metalized cable glands at both ends. The inner shields are connected to each other and are plugged into the terminal with the label "Schirm / shield".



**Caution:**

Do not connect or disconnect the field coil cable before the primary power of the meter has been disconnected!

For more details on wiring see Instruction Manual UMF2 (B)(b)\_BA\_01\_eng.pdf

## 15 Decontamination certificate for device cleaning

Company: .....

City: .....

Department: .....

Name: .....

Tel. No.: .....

This flow meter

Type PIT- .....

was operated using the measured medium.....

Since this measured medium is dangerous in water/poisonous/corrosive/flammable,

we have

- checked that all hollow spaces of the device are free of these materials\*
- neutralized and flushed all hollow spaces of the device\*

\*cross out what is not applicable.

We hereby confirm that in resending the device no danger to persons or the environment is posed by the residual measured substance.

Date: .....

Signature: .....

Stamp



## Konformitätserklärung Declaration of conformity

Heinrichs Messtechnik GmbH, Robert-Perthel-Straße 9, 50739 Köln

erklärt in alleiniger Verantwortung, dass das Produkt  
declares in sole responsibility that the product

magnetisch induktiver Messumformer in Kombination mit Sensor der Baureihe  
electromagnetic flowmeter transmitter in combination with electromagnetic flow meter sensor

Typ / type **PIT& UMF2(b)**

mit den Vorschriften folgender Europäischer Richtlinien übereinstimmt:  
conforms with the regulations of the European Directives:

EMV-Richtlinie 2004/108/EG, EMC Directive 2004/108/EC  
Niederspannungsrichtlinie 2006/95/EG, Low Voltage Directive 2006/95/EC

EN 61000-6-2:2005	Störfestigkeit Industriebereich / immunity industrial environment
EN 61000-6-3:2007+A1:2011	Störaussendung Wohnbereich / emission residential, commercial
EN 55011:2009+A1:2010	Funkstörungen / Radio-frequency disturbance characteristics

EN 61010-1:2010      Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- Laborgeräte /  
Safety requirements for electrical measuring, control and laboratory devices

### Name und Anschrift der benannten Stellen der QS-Überwachung, Name and address of the Notified Bodies

DEKRA EXAM GmbH  
Carl-Beyling-Haus  
Dinnendahlstraße 9  
D-44809 Bochum  
Identifikationsnummer RL 94/9/EG: 0158

Köln, 16.03.2016

Frank Schramm  
(Geschäftsführung / General Management)