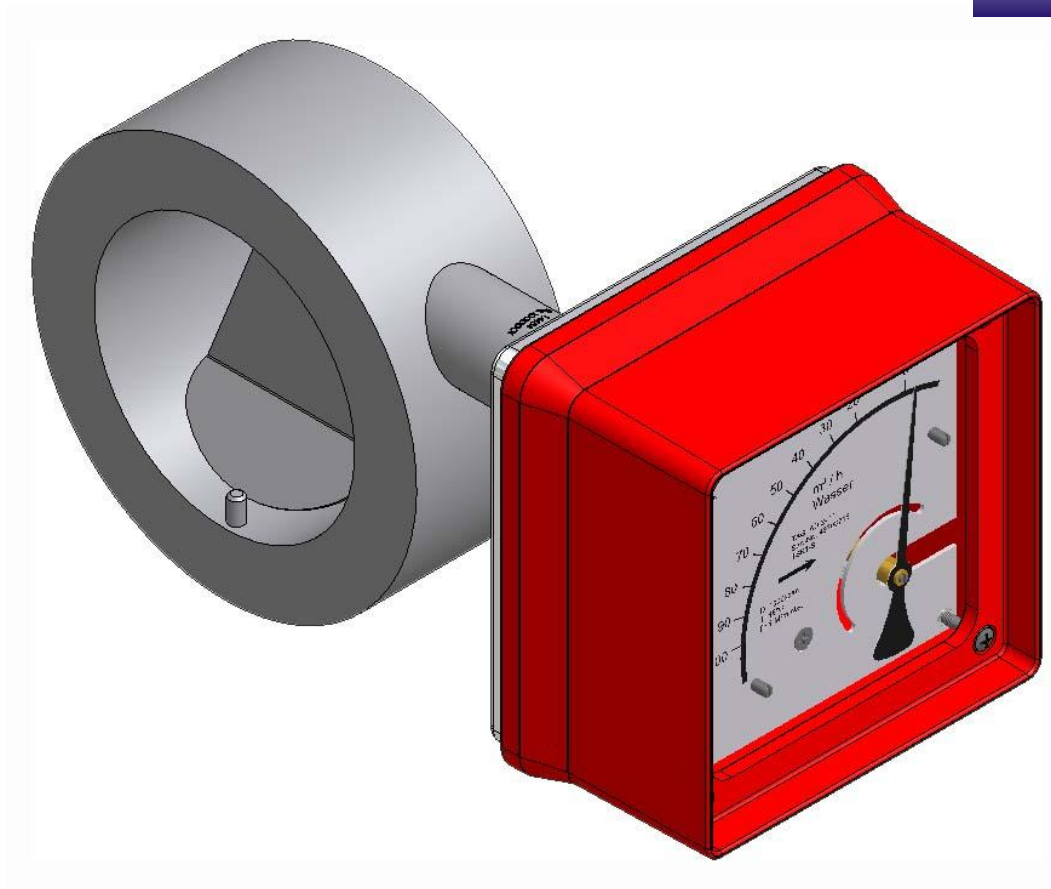
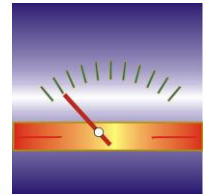


Paddle-Type Flowmeter for Liquids

TSK

Installation and Operating Instructions



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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 TSK Device Description. Read the manual carefully before the device is installed and put into use. It does not include special versions or applications.

All devices are 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 the telephone directory at the end of this manual or on 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 Supplier/manufacturer

Heinrichs Messtechnik GmbH
 Robert-Perthel-Str. 9 · D-50739 Köln
 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

Paddle-type flowmeter in all-metal design

1.3 Product name

TSK1 with subgroups
 TSK1-C (stainless steel)
 TSK1-S (stainless steel)
 TSK1-K (polypropylene/stainless steel)
 TSK1-P (PTFE/Hastelloy C)

1.4 Issue date

20/10/2008

1.5 Version no.

3.0
 File: TSK1_BA_03_eng

2 Applications

The TSK meter is suitable for flow measurement of liquid products in pipes. **The special advantage is that it can be used for all directions of flow.** It shows the current flow rate in volume or mass per unit in time.

Applications: flow measurement, dosing, monitoring, adjusting and control of liquid and gaseous products. The meter's design makes it ideal for processes under difficult and adverse operating conditions.

The devices are available with additional electrical equipment for process monitoring and control.

3 Operational mode and system design

3.1 Measuring principle

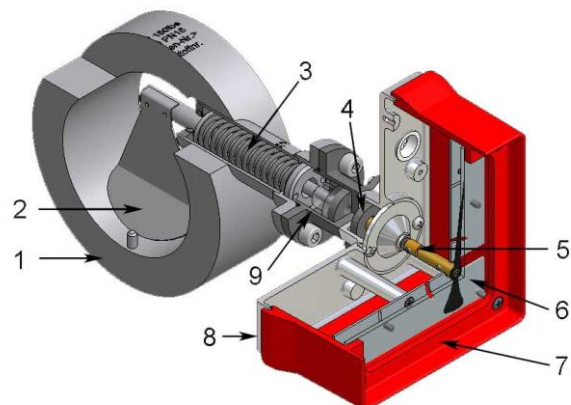
If a medium flows with sufficient velocity through the horizontally or vertically arranged measuring chamber (1) if the TSK fitting, the paddle (2) will swivel around the axle through the force of the medium and the opposing force of the paddle surface plus the spring tension establish equilibrium. The angular position or the position of equilibrium (α) of the paddle (2) in the measuring chamber (1) is the measure for the flow. The encapsulated ring-type permanent magnet (4) at the end of the paddle axis (3) then transmits this position to the scale (6) and the optional electronic evaluators through the magnet tracking indicator (5) system. This happens safely and without packing glands.

The flow rates shown on the scale only apply to the calibrated medium or to a medium with the same physical characteristics.

3.2 System design

The TSK flowmeter mainly consists of the fitting with the measuring chamber, the measuring elements "torsion spring" and "paddle," the magnet tracking indicator system and the indicator unit.

The flowmeter is manufactured as a sandwich-type construction and available for the nominal sizes from DN 50 to DN 400.



- 1 Fitting
- 2 Paddle
- 3 Paddle axis with torsion spring
- 4 Ring-type permanent magnet
- 5 Magnet tracking indicator system
- 6 Scale
- 7 Cover with window
- 8 Base plate of indicator housing
- 9 Coupling chamber

4 Input

4.1 Measured variable

Volume flow

4.2 Measuring range (lower-range and upper-range value)

Measuring range span	15–100%
Smallest measuring range	1.5–10 m ³ /h water
Largest measuring range	185–1300 m ³ /h water
Electrical signal outputs	20–100%

4.3 Measuring range table

Nominal size (DN)	Measuring	Measuring range for water at 1000 kg/m ³		Pressure loss (mbar)
50	A	1,5 – 10	m ³ /h	120
	C	3 – 30	m ³ /h	50
65	B	1,5 – 14	m ³ /h	40
	E	4 – 30	m ³ /h	60
80	D	4 – 24	m ³ /h	40
	H	10 – 60	m ³ /h	60
100	F	6 – 40	m ³ /h	40
	G	8 – 80	m ³ /h	60
125	H	10 - 60	m ³ /h	40
	J	20 - 120	m ³ /h	60
150	I	15 - 100	m ³ /h	35
	L	30 - 200	m ³ /h	55
200	K	25 - 160	m ³ /h	35
	N	50 – 275	m ³ /h	45
	Q	60 - 400	m ³ /h	55
250	O	50 - 300	m ³ /h	30
	R	60 - 500	m ³ /h	40
300	M	80 - 400	m ³ /h	30
	P	100 - 600	m ³ /h	40
350	U	120 - 700	m ³ /h	30
	W	150 - 1000	m ³ /h	40
400	V	150 - 800	m ³ /h	30
	X	200 - 1300	m ³ /h	40

5 Output (electrical equipment, options)

5.1 Binary output

Using the segments of the slot-type initiators or the eccentric discs of the microswitches, any switching point between 20% and 90% of the flow rate can be set.

5.1.1 KEI 1 or KEI 2 limit transducers

1 or 2 limit transducers
 type SJ 3,5 N, make Pepperl+Fuchs
 (special switch possible, e.g. SN version)
 Safety class: PTB Nr. 99 ATEX 2219 X
 PTB Nr. 00 ATEX 2048 X

5.1.2 KEM 1 or KEM 2 limit transducers (special version)

Double-throw microswitches whose switching point is activated by a cam plate.

KEM 1 = 1 Double-throw microswitch
 KEM 2 = 2 Double-throw microswitches

Maximum make-break capacity:

230 VAC 50/60Hz 6 A
 24 VDC 0.5 A
 110 VDC 0.2 A

5.2 Analog output with the ES magneto-electric transmitter

The magneto-electric transmitter is factory-calibrated to the scale values upon shipment. The signal output is supplied exclusively in a two-wire connection at 4-20 mA. The 4-20 mA signal has the HART® protocol.

Additional options: 2 limit values, alternatively 1 limit value and 1 pulse output

The signal output and the limit values can be configured using a HART® modem operating on the following configuration programs: SensorPort from Bopp & Reuther, PDM from Siemens or AMS from Rosemount. Furthermore, a HART® hand-held terminal (with DD software) can also be used. For more information about configuration, please refer to the separate Operating Instructions for the ES.

Safety class: DMT 00 ATEX 075 / II2G EEx ia IIC T6

When installing electrical equipment in hazardous areas, the conditions and provisions specified in the approval documents must be followed.

5.3 ES with PROFIBUS PA output

The ES transmitter is available in the PROFIBUS PA version under the ES-PPA type designation. For operation details, see the separate ES-PPA Operating Instructions.

5.4 Analog output with the KINAX 3W2 angle-of-rotation transmitter

The signal output of the angle-of-rotation transmitter is factory-calibrated to the scale values. The signal output is 4-20 mA in 2-wire connection; or alternatively 0-20 mA in 4- or 3-wire connection. The signal output of 4 mA corresponds to the flow rate scale value of 0 (0 mA for the 0-20 mA version). 5.6 mA corresponds to 10% of the flow rate scale value (2 mA). 20 mA corresponds to 100% of the flow rate scale value.

Use in hazardous areas:

The angle-of-rotation transmitter is a component approved for hazardous areas. When used in hazardous areas, all the values and instructions indicated in the certificate of approval must be observed. Auxiliary power is fed through an approved intrinsically safe circuit of 12-30 V. To prove intrinsic safety, only authorized electrical equipment may be interconnected. Please take note of the maximum permissible ambient temperature of 60°C/75°C for the transmitter and the process temperature.

Safety class:

PTB 97 ATEX 2271 / II 2G EEx ia IIC T6

6 Characteristic values

6.1 Accuracy

6.1.1 Reference conditions

Water 20°C

6.1.2 Measured error

± 2,5 % of URV for local display

Additional inaccuracy for:

ES = ±0.2%

KINAX 3W2 = ±0.5%

6.1.3 Repeatability

±0.8% of URV

6.2 Influence of ambient temperature

- Without electrical equipment and with limit transducer without influence
- With ES transmitter:
±0.5% / 10 K reference temperature 20°C
- With KINAX 3W2 transmitter:
±0.2% / 10 K reference temperature 20°C

6.3 Influence of fluid temperature

Deviations in fluid temperature from the temperature observed during calibration can result in a proportional display fault because of the corresponding change in density. Changes in viscosity cause a non-linear display fault.

7 Conditions of use

The VDI/VDE guidelines 3513, Sheet 3, must be observed. The meter is suitable for Liquids with sufficient flowability that are free of solids, do not bond and do not tend to settle.

For paddle-type devices, viscosity factors must not be considered physically. They do not play any role or play an insignificant role when the flow rates are high.

7.1 Installation conditions

The measuring device can be installed vertically or horizontally (according to the direction of flow indicated in the order). The nominal size of the product line to be connected must correspond to the nominal size of the measuring device. The best installation position is between loose flanges. When installing the device between weld-on flanges, the flange hole pattern has to be turned so that the indicator unit is in a horizontal position if the pipe arrangement is horizontal. The nominal size of the product line to be connected must correspond to the nominal size of the device. Avoid fittings converging on one side directly in front of the device.

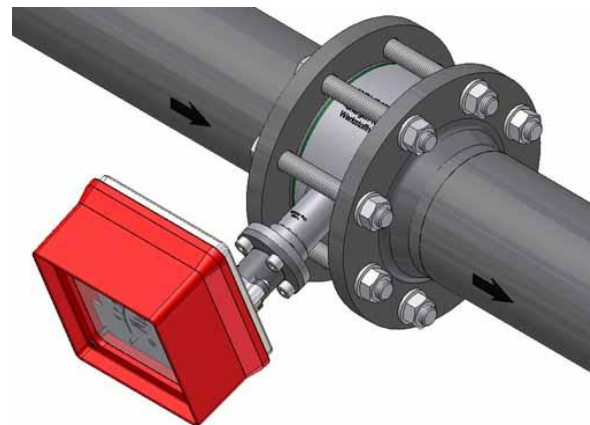
The adequate distance to ferromagnetic parts must be observed. During installation, the standard inlet section must be 5 x D and the standard outlet section 3 x D.

We recommend that the lateral distance between two adjacently mounted devices be **300 mm**. The devices can be mounted close together if vertically offset by one device length. The minimum lateral distance for interfering steel parts should be **200 mm**. In case of doubt, check the interference by moving the device back and forth in the selected distance by about 200 mm and testing whether the pointer position changes.

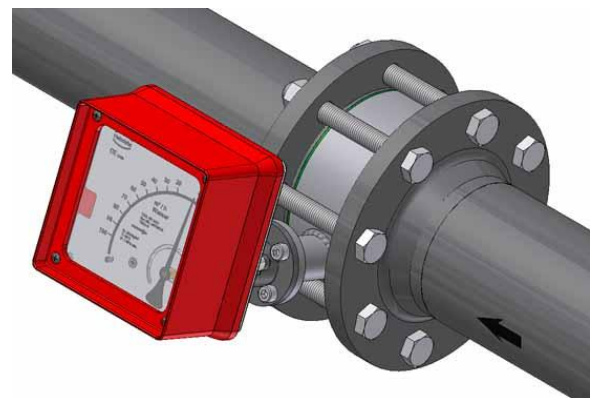
Select the mounting location so as to enable a reliable reading of the scale values. Please take note as well of the space requirement for a possible disassembly of the device.

Installation examples with respect to the directions of flow:

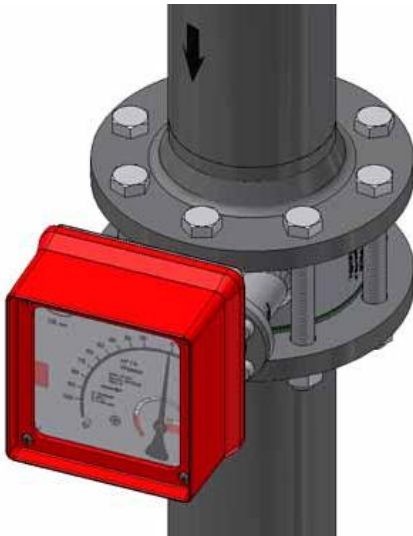
horizontal; from the left to the right



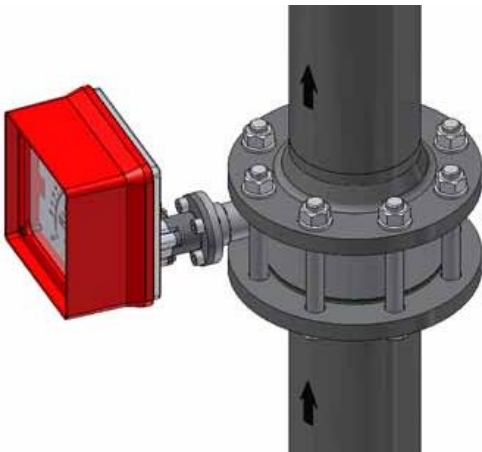
horizontal; from the right to the left



vertical: from the top to the bottom



vertical: from the bottom to the top



Caution:

When mounting the device in the horizontal position, make sure the indicator unit is not pointing upwards. This is to prevent water lodging on the glass window and entering the device under the protective shroud of the housing.

7.1.1 Mounting/start-up

Before installation, check whether the measuring element is free from foreign bodies. The instrument must be mounted perpendicularly or horizontally according the planned and confirmed direction of flow.

The nominal size of the device and that of the pipes must be the same. The pressure stages and, hence, the dimensions of the flanges must coincide. The surface roughness of the flange sealing surface must be suitable for the prescribed gaskets.

Check whether the mounting clearance between the flanges of the pipes corresponds to the assembly dimension of the device plus two gaskets. To achieve stress-free mounting, the flanges of the pipes must be aligned parallel to each other.

If the device is calibrated to more than 1.013 bars absolute pressure, the valve is usually installed behind the flowmeter. At 1.013 bars absolute pressure (free exhaust) install it in front of the device.

Device slowly flush to avoid a surge of gas bubbles.

Basically, avoid activation using solenoid valves.

Use connecting bolts and gaskets in the prescribed dimensions. The gaskets must be suitable for the operating pressure, the temperature and the measured medium. With PTFE- and PP coated devices, use gaskets whose interior and exterior diameter correspond to the sealing strip of the device.

Tighten the flange bolts crosswise so that the process connections are tight. Pay particular attention to the tightening torques of screws, especially with PTFE- and PP-coated devices. The maximum torques are:

Nominal size	Nominal pressure	Tightening torques
DN50 / 2" ANSI	PN 40	45 Nm
DN65	PN40	45 Nm
DN80 / 3" ANSI	PN 40	48 Nm
DN100 / 4" ANSI	PN 16	50 Nm
DN125 / 5" ANSI	PN 16	80 Nm
DN150 / 6" ANSI	PN 16	90 Nm
DN200 / 8" ANSI	PN 10	115 Nm
DN250 / 10" ANSI	PN 10	95 Nm
DN300	PN 10	115 Nm
DN350	PN 10	140 Nm
DN400	PN 10	155 Nm

(following VDI/VDE Guideline 3513)

Please check whether the pipe is adequately stable so that vibration or swinging of the device is out of the question. (Do not use steel mounting parts directly on the device.)

7.1.2 Device settings

The measuring equipment is delivered ready for operation according to your order specifications. **The limit transducers** are set to the desired values. If you have submitted no requirements, the basic setting for

1 contact device: - Minimum contact switching point at 20% of descending flow (damped/closed-circuit principle).

2 contact devices: Minimum contact switching point at 20% of descending flow and maximum contact switching point at 90% of ascending flow

7.1.3 Adjusting the limit transducer

The contacts are adjustable through the contact position indicators located on the scale. Dismantle the indicator cover, unfasten the contact position indicators, set to the desired value and reattach them.

7.1.4 Operation in hazardous areas

7.1.4.1 Without electrical equipment

The basic version of the flow meter is a *non-electrical device* without its own ignition sources and meets DIN EN 13463-1 requirements. It can be used in hazardous areas that require Category 2 equipment.

Marking:  II 2GD c

Reg. Nr.: BVS 03 ATEX H/B 112
Tech. File Ref. 03-02 X

Since the device does not have its own power sources that would result in a temperature increase, the fluid temperature is decisive for the maximum surface temperature.

When used in potentially explosive dust atmospheres, the device must be cleaned regularly in order to avoid deposits exceeding 5 mm.

7.1.4.2 With built-in electrical limit transducers

When the limit transducers are installed, the device becomes an electrical assembly and receives a marking in accordance with DIN EN 50014 from the entire device with the built-in electrical limit transducers.

The electrical and thermal data and the special conditions of the EC Type Examination Certificate of the built-in limit transducers must be observed (see also the diagram in Section 7.3.1).

The influence of the fluid temperature on the built-in limit transducers must be observed. The overtemperature of the maximum fluid temperature based on the maximum ambient temperature must be considered with a factor of **0.25**.

Example for built-in limit transducer:

Max. ambient temperature	$T_{amb} = 40^{\circ}\text{C}$
Max. fluid temperature	$T_m = 120^{\circ}\text{C}$
Factor for brought-in heat	$F = 0.25$
Temperature class	T4

$T_{\bar{u}}$ = Overtemperature
 T_a = Ambient temperature of limit transducer

$$T_{\bar{u}} = T_m - T_{amb} = 120^{\circ}\text{C} - 40^{\circ}\text{C} = 80^{\circ}\text{C}$$

$$T_a = T_{\bar{u}} * F + T_{amb} = 80^{\circ}\text{C} * 0,25 + 40^{\circ}\text{C} = 60^{\circ}\text{C}$$

In accordance with the tables in the PTB 99 ATEX 2219 X EC Type Examination Certificate, the SJ 3,5... N... inductive sensor must be operated in the T5 temperature class with an intrinsically safe circuit that does not exceed the maximum values of the Type 3 circuit.


When using the device in hazardous areas, follow the applicable national installation rules.

Example for calculating the max. fluid temperature based on the max. ambient temperature for the built-in sensor Type ES.


$T_a = 70^{\circ}\text{C}$
 $T_{amb} = 60^{\circ}\text{C}$
 $F = 0.25$

$$T_m = \left(\frac{T_a - T_{amb}}{F} \right) + T_{amb} = \left(\frac{70^{\circ}\text{C} - 60^{\circ}\text{C}}{0,25} \right) + 60^{\circ}\text{C} = 100^{\circ}\text{C}$$


7.1.4.2.1 Marking for the device when the SJ 3,5...N... limit transducer is built in

 PTB 99 ATEX 2219 X
II 2G Eex ia IIC T6-T4

7.1.4.2.2 Marking for the device when the ES magneto-electric transmitter is built in

 DMT 00 ATEX 075
II2G Eex ia IIC T6

7.1.4.2.3 Marking for the device when the KINAX 3W2 angle-of-rotation transmitter is built in

 PTB 97 ATEX 2271
II 2G Eex ia IIC T6

7.1.4.3 Atmospheric conditions

In accordance with EN 1127, a "potentially explosive atmosphere" is defined as a mixture of air and combustible gases, vapour, mist or dust under atmospheric conditions. Such conditions are defined in EN 13463-1, para. 1, with values $T_{atm} = -20^{\circ}\text{C}$ to $+60^{\circ}\text{C}$ and $P_{atm} = 0.8$ to 1.1 bar. Outside this range, safety parameters for most ignition sources are not available.

Usually, paddle-type flow meters operate under operating conditions outside the atmospheric conditions of 0.8 to 1.1 bar. Irrespective of the zone classification – safety parameters of explosion protection – are basically not applicable to the inside of the measuring tube. Therefore operation with combustible products is only allowed if a potentially explosive air mixture is not formed inside the flow meter. Where this condition is not met, the operator will need to assess the ignition hazard in each individual case and give due consideration to existing parameters (e.g. pressure, temperature, process product, materials of construction for the measuring tube).

7.1.4.4 Ground connection

In paddle-type flow meters, it is possible under operating conditions for charge separation to occur in the measuring tube due to the transport of non-conductive fluids and/or when the flow comes into contact with non-conductive internals (e.g. liners, floats).

For that reason, variable-area flow meters must be permanently grounded by the operator by way of the process connections (flanges) in order to discharge electrostatic build-up. The operator is also responsible for extending the ground continuity of the process pipeline.

If grounding cannot be made via the process connections (plastic process connections or undefined connections), the flow meter must be connected to the local ground potential via the flanges. This connection only ensures electrostatic grounding of the device and does not meet the requirements for equipotential bonding.

7.2 Ambient conditions

7.2.1 Ambient temperature ranges

Without electrical accessories: -40°C to $+80^{\circ}\text{C}$
With limit transducer: -40°C to $+65^{\circ}\text{C}$
With KINAX signal output: -40°C to $+60^{\circ}\text{C}$
With ES signal output: -40°C to $+70^{\circ}\text{C}$

For the hazardous area version, take note of the maximum ambient temperatures depending on the temperature class as specified in the Type Examination Certificate.

7.2.2 Storage temperature

The storage temperatures are identical to the ambient temperature ranges.

7.2.3 Climatic category

Weather-protected and/or unheated locations, class C according to IEC 654 Part 1

7.2.4 Degree of protection

IP 65

7.2.5 Shock resistance/vibration resistance

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

7.2.6 Electromagnetic compatibility

EN 61000-6-2:1999 Immunity industrial environment
 EN 50081-1 Emitted interference residential environment
 EN 55011:1998+A1:1999 Group 1, Class B

NAMUR recommendation NE 21

7.3 Fluid conditions

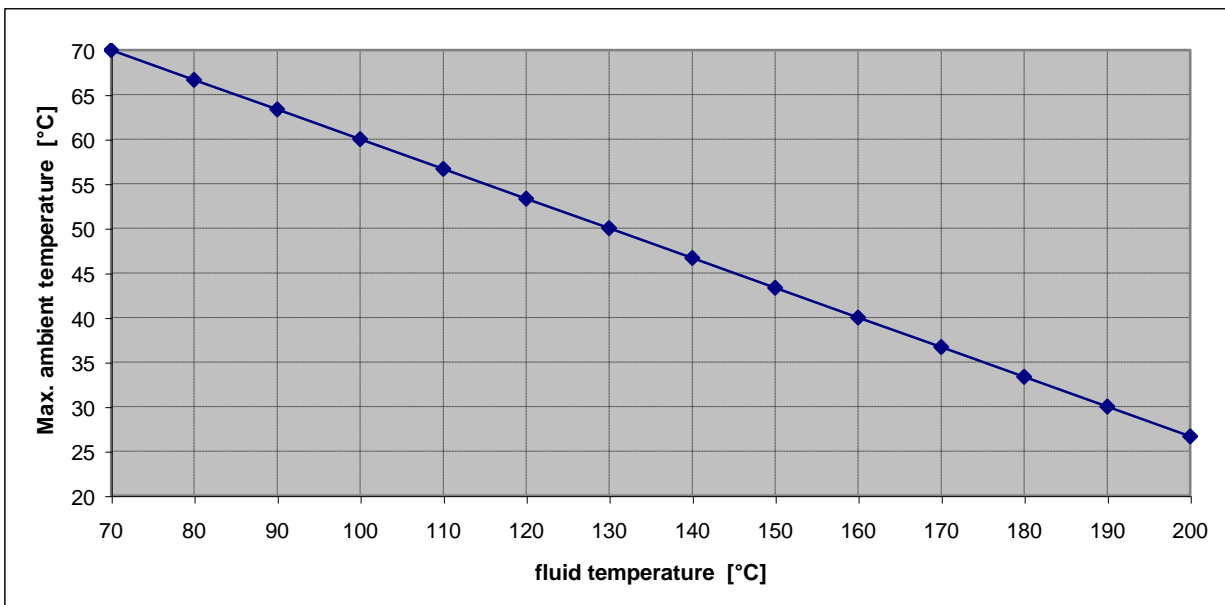
7.3.1 Fluid temperature ranges

Type	Fluid temperature
TSK1-C/S	-40°C to 200°C
TSK1-K	0°C to 80°C
TSK1-P	-20°C to 125°C

A pulled-forward indicator unit is necessary if the fluid temperature falls below -40°C or rises above 200°C.

The effect of the fluid temperature on the indicator unit and its built-in components must be considered

7.3.2 Diagram: Max. ambient temperature based on the fluid temperature for the built-in sensor Type ES



7.3.3 Fluid pressure limit

TSK1-C
 DN 80 PN 40
 DN 100/125/150/200 PN 16
 DN 250 and above PN 10

TSK1-S
 DN 50/80 PN 40
 DN 100/125/150/200 PN 16
 DN 250 and above PN 10

TSK1-K / TSK1-P
 DN 50/100 PN 16
 DN 125/150/200 PN10
 DN 250 and above PN 6

7.3.5 Physical state

Liquid

7.3.6 Density

Liquids: up to 2.0 kg/l

7.3.7 Pressure loss

Pressure loss: Depends on the device size and the measuring range (see Measuring range table).

7.3.4 Inlet and outlet sections

The standard inlet section must be 5 x D and the standard outlet section 3 x D. For an extremely non-linear flow profile (e.g. shut-off/control valves or tee inlet units are located in front of the meter), we recommend doubling the inlet section or using flow straighteners.

8 Construction details

The measuring device consists of a sandwich-type fitting (mounting length 64 mm), which can be installed between flanges. The fitting contains the paddle with the resetting spring. The paddle is mounted on an axis that has a permanent magnet at the end. The torsion caused by the paddle will be transmitted by the axis magnet to the counter magnet system and operate the indicator unit.

8.1 Weight

DN	Approx. weight type TSK1-C/S kg
50	4.5
65	5,5
80	6.5
100	7.5
125	9.5
150	10.5
200	14
250	19
300	25
350	34
400	45

8.2 Sealing surface

The sealing surface can be supplied with groove or ring joint

8.3 Materials

TSK1-C
Fitting: steel
Paddle/axis/spring: stainless steel
Indicator unit: aluminum and safety glass window

TSK1-S
Fitting: stainless steel
Paddle/axis/spring: stainless steel
Indicator unit: aluminum and safety glass window

TSK1-K
Fitting: PP
Paddle/axis/spring: stainless steel; option: Hastelloy
Indicator unit: aluminum and safety glass window

TSK1-P
Fitting: PTFE,
Paddle/axis/spring: Hastelloy; option: titanium
Indicator unit: aluminum and safety glass window

8.4 Dimension table for TSK1-C and TSK1-S

The corresponding dimension drawings can be found on the following pages.

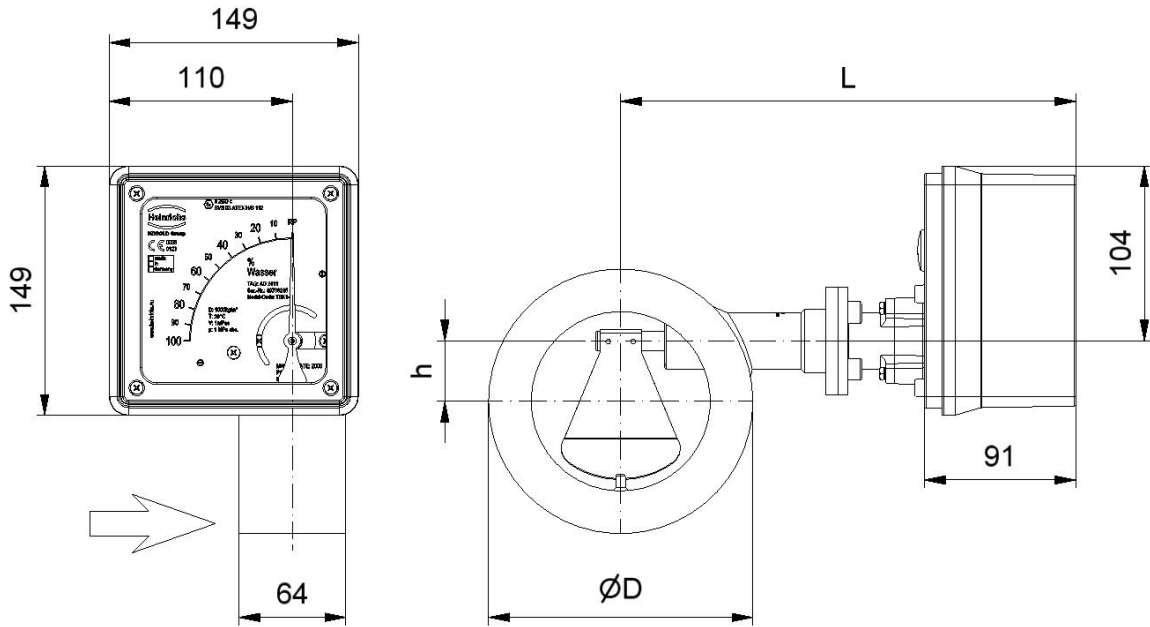
For nominal size		Nominal pressure		L [mm]		D [mm]		h [mm]
DN	ANSI	PN	lbs	Aluminum indicator unit	Stainless steel indicator unit	For DIN flange	For ANSI flange	
50*	2"	40	300	272	261	102	92,1	17
65	2 1/2"	40	300	272	261	122	102	21 ASME=17)
80	3"	40	300	272	261	138	127	31
100	4"	16	150	272	261	158	158	36
125	5"	16	150	352	341	186	186	45
150	6"	16	150	352	341	212	212	53
200	8"	16	150	352	341	268	268	80
250	10"	16	150	352	341	320	320	90
300	12"	10	150	372	361	370	381	100
350	14"	10	150	442	431	430	413	100
400	16"	10	150	452	441	482	470	130
500	20	10	150	492	481	585	585	130

*TSK1-C starting at DN 80.

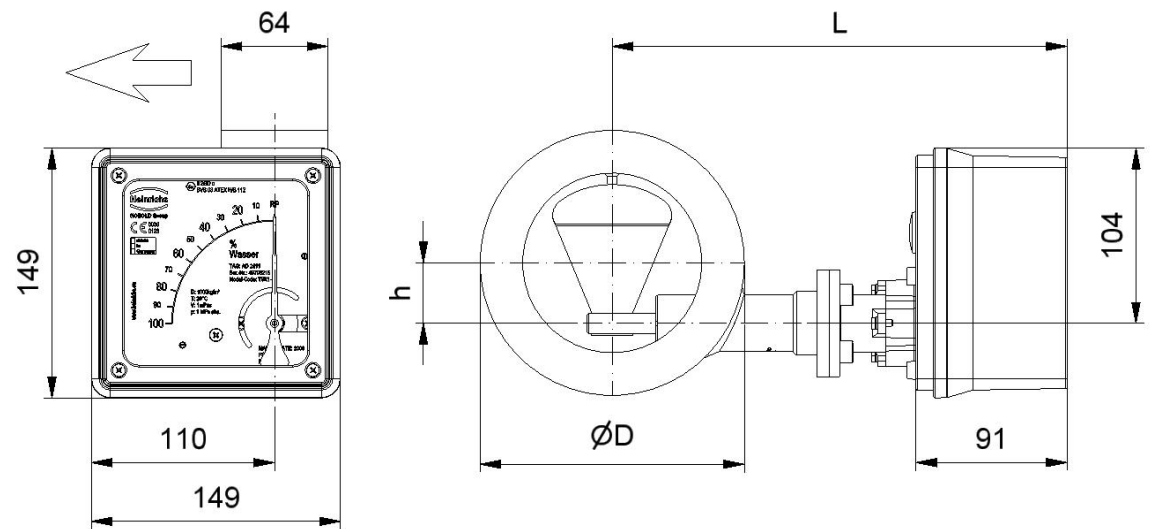
8.5 Dimension drawings

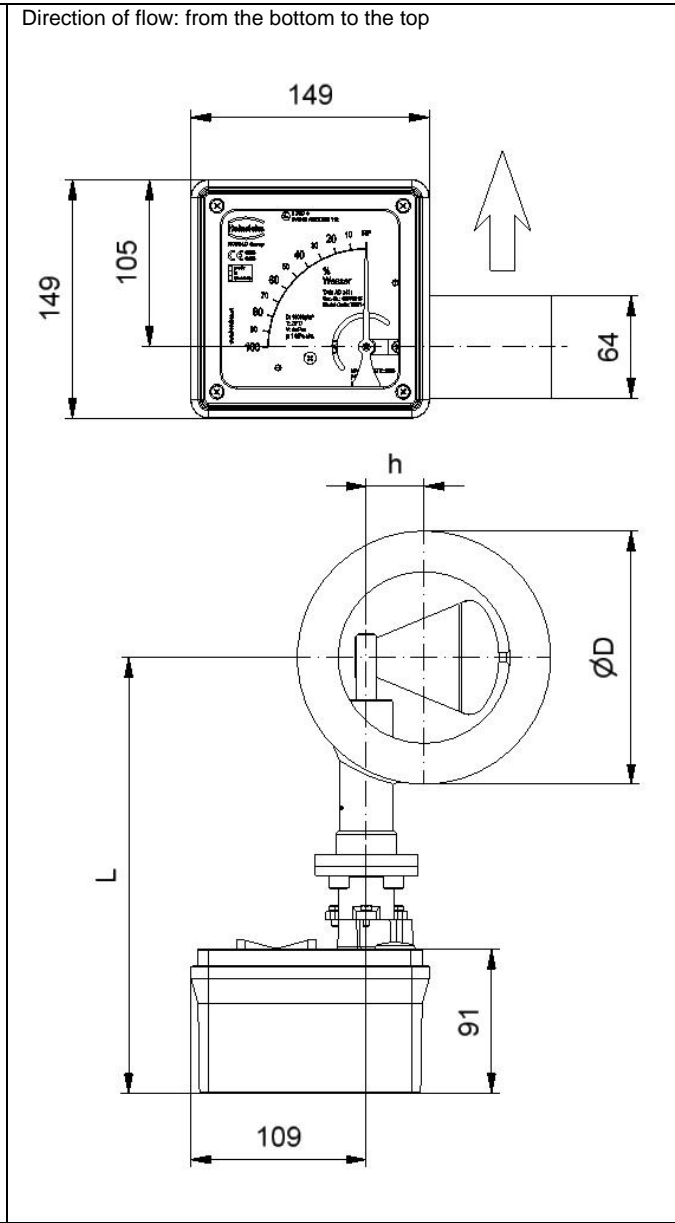
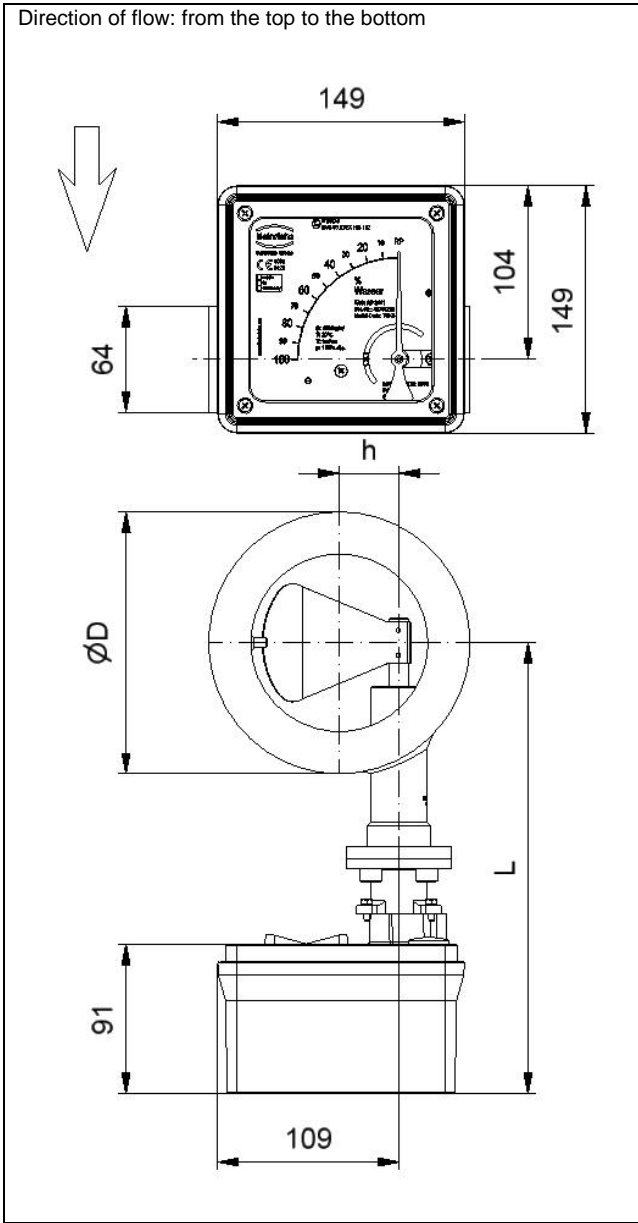
8.5.1 Aluminum indicator unit

Flow measurement from left to the right



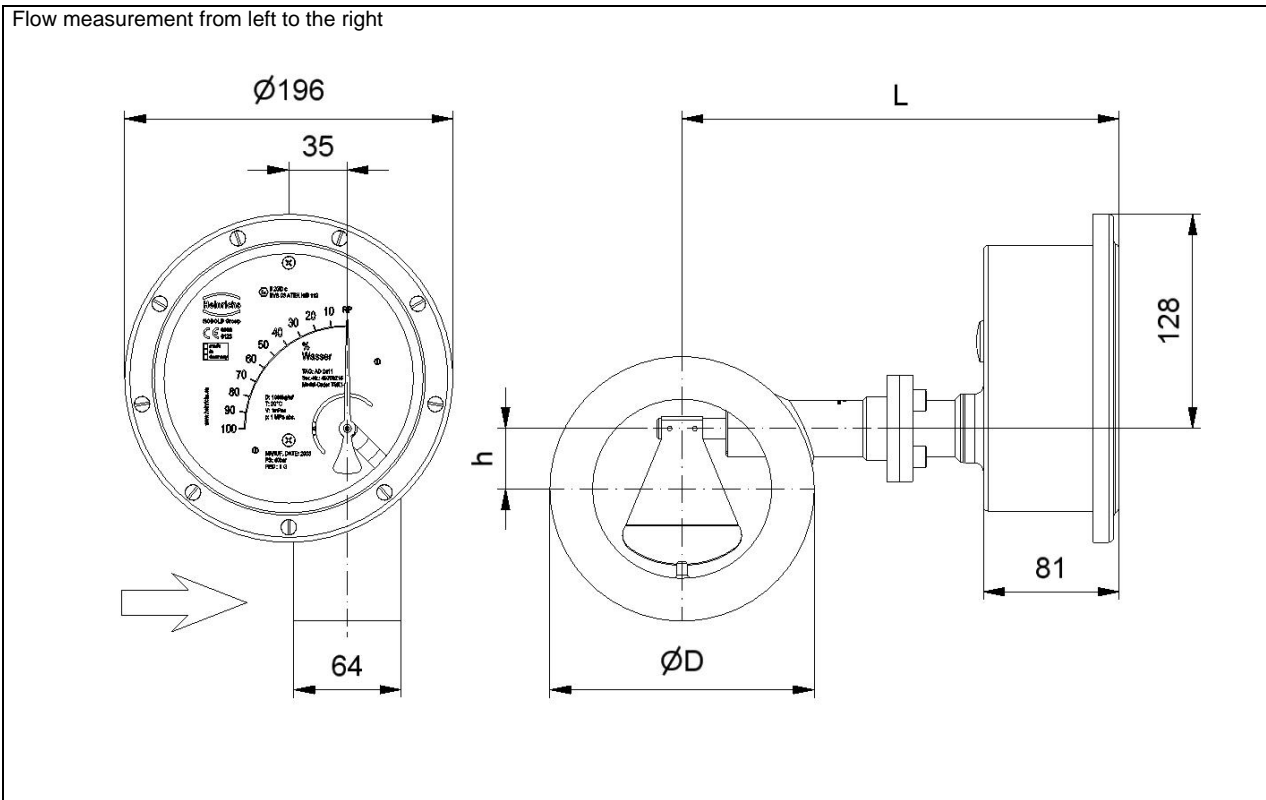
Flow measurement from right to the left



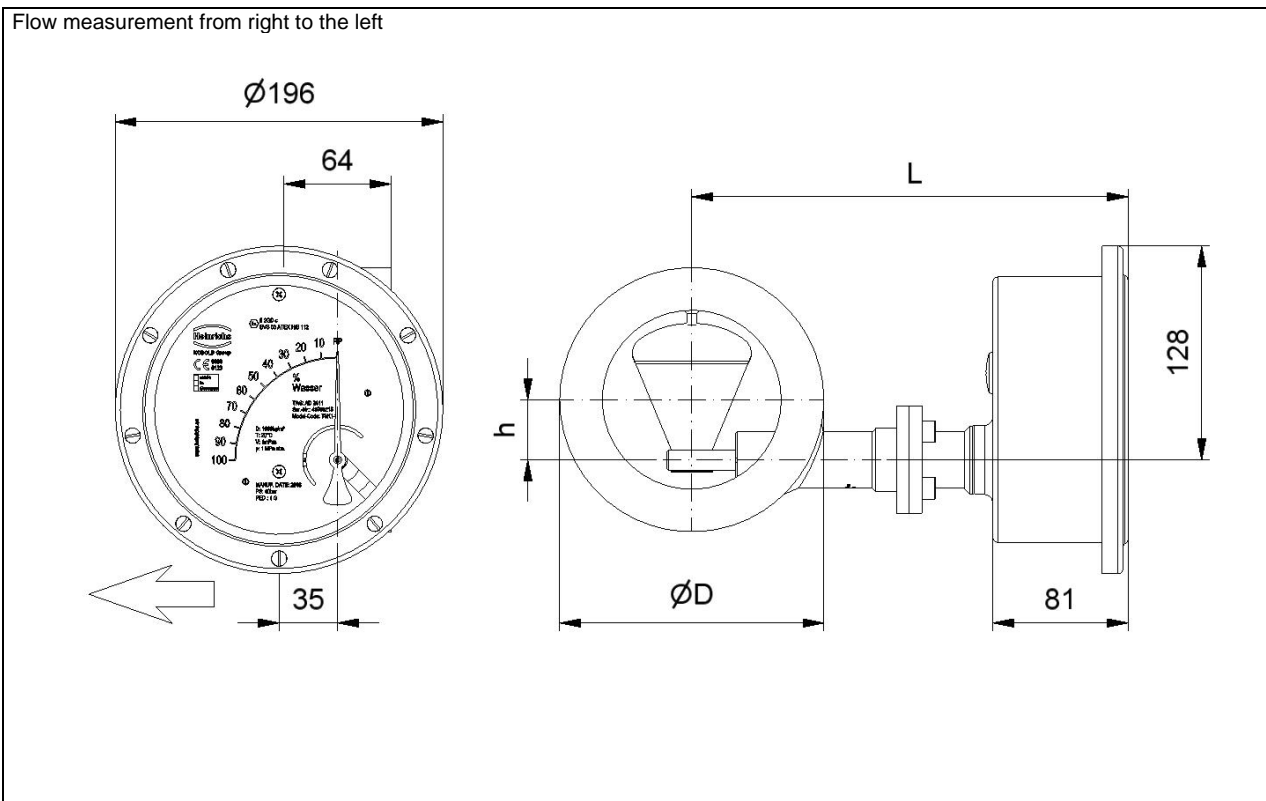


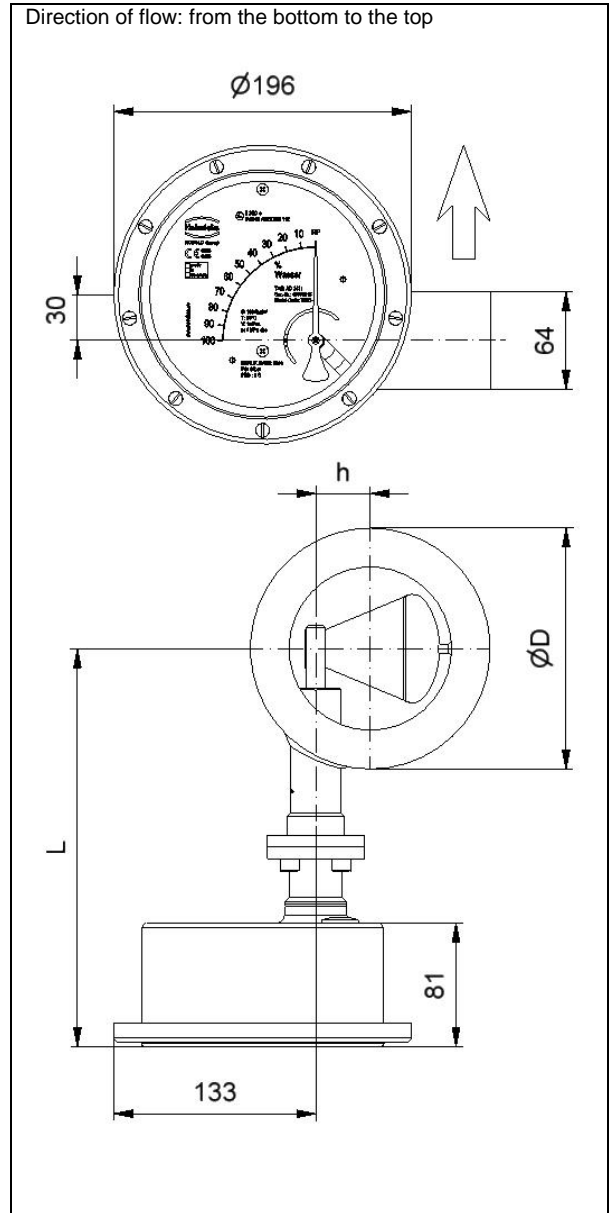
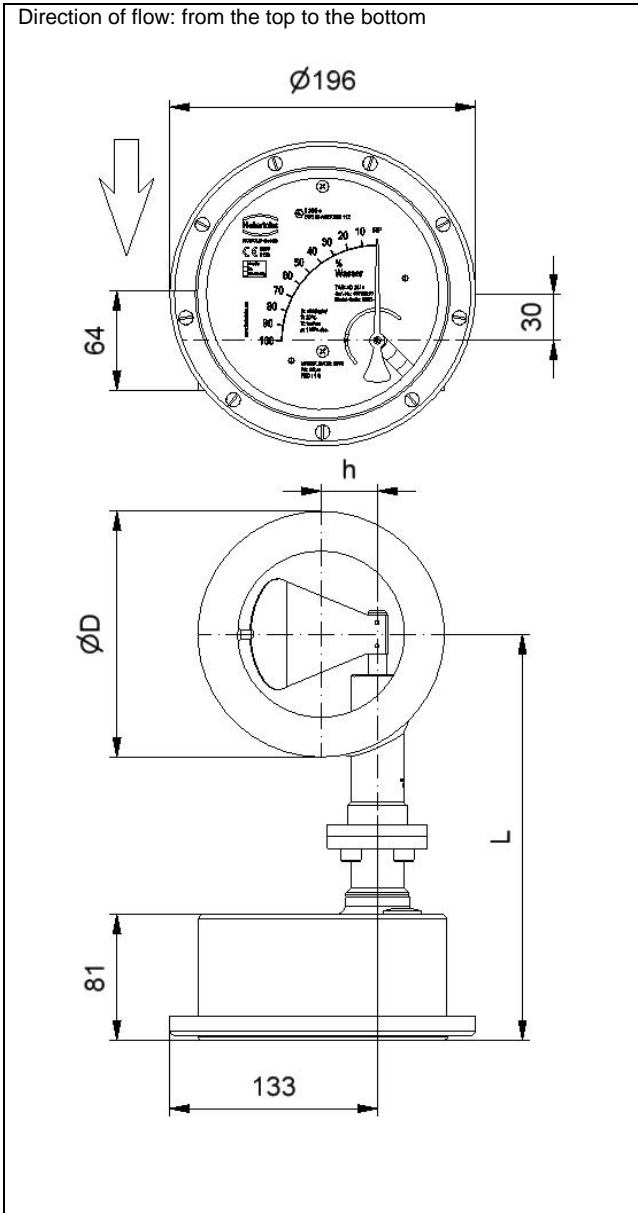
8.5.2 Stainless steel indicator unit

Flow measurement from left to the right



Flow measurement from right to the left



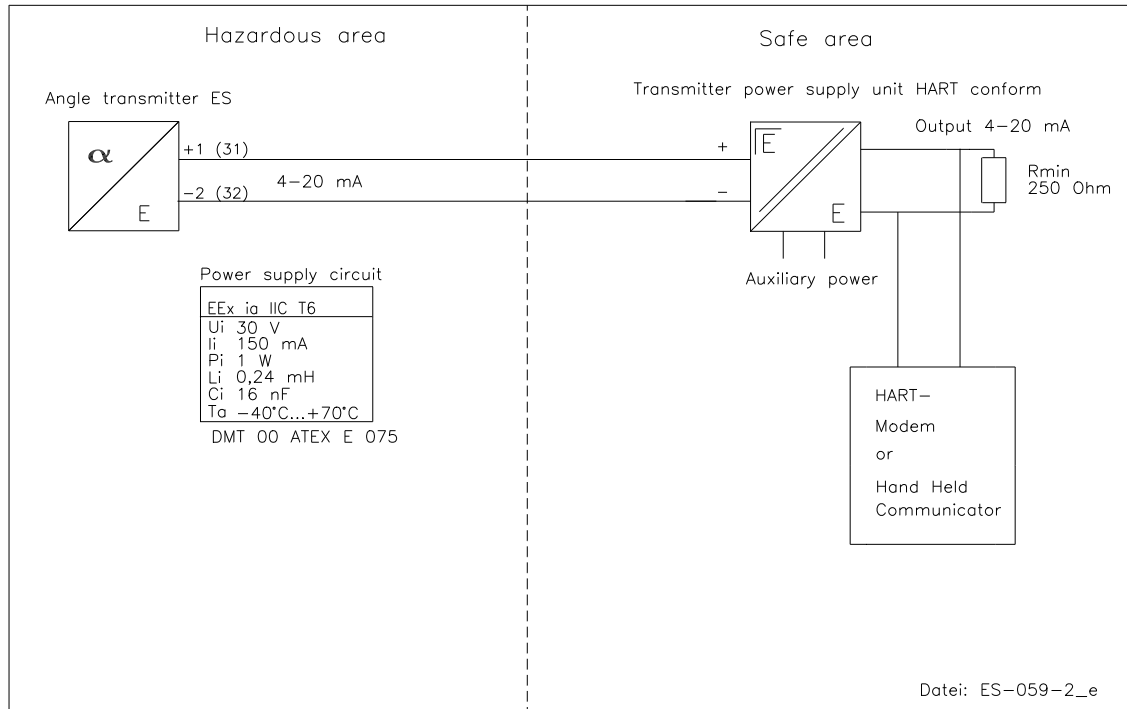


9 Electrical connection

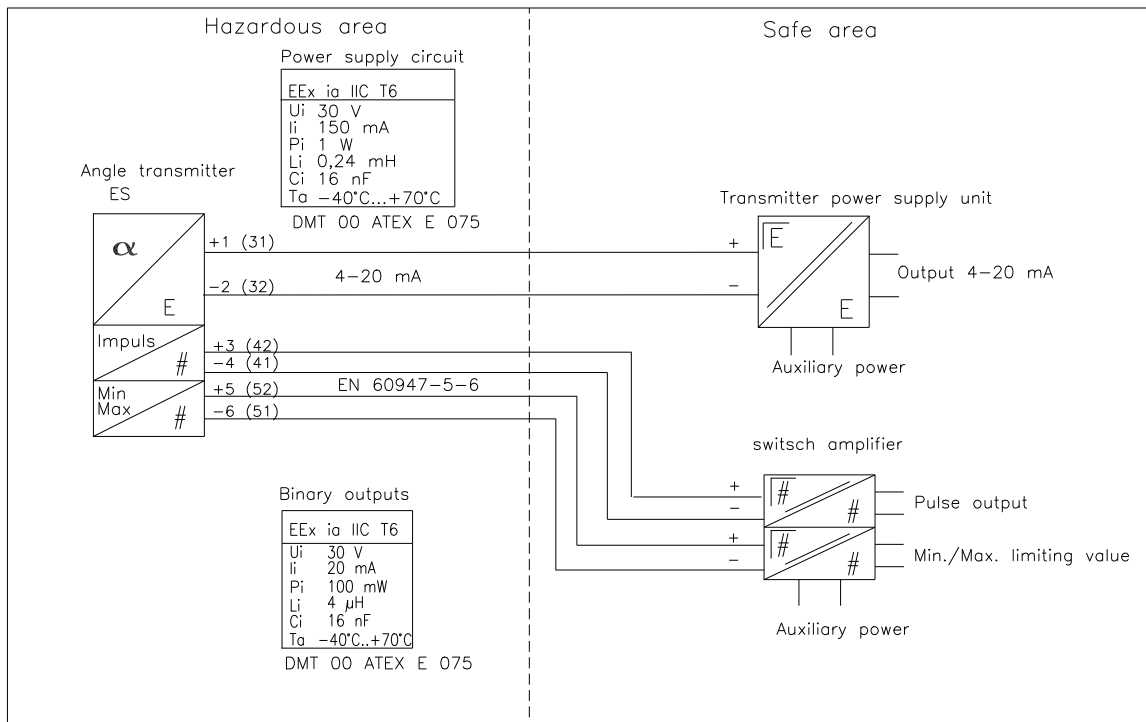
Wiring

To connect the auxiliary power, remove the indicator cover, insert the connector cable into the cable gland and attach it to the terminals according to the terminal diagram. Tighten the cable gland securely, remount the indicator cover and close it tightly.

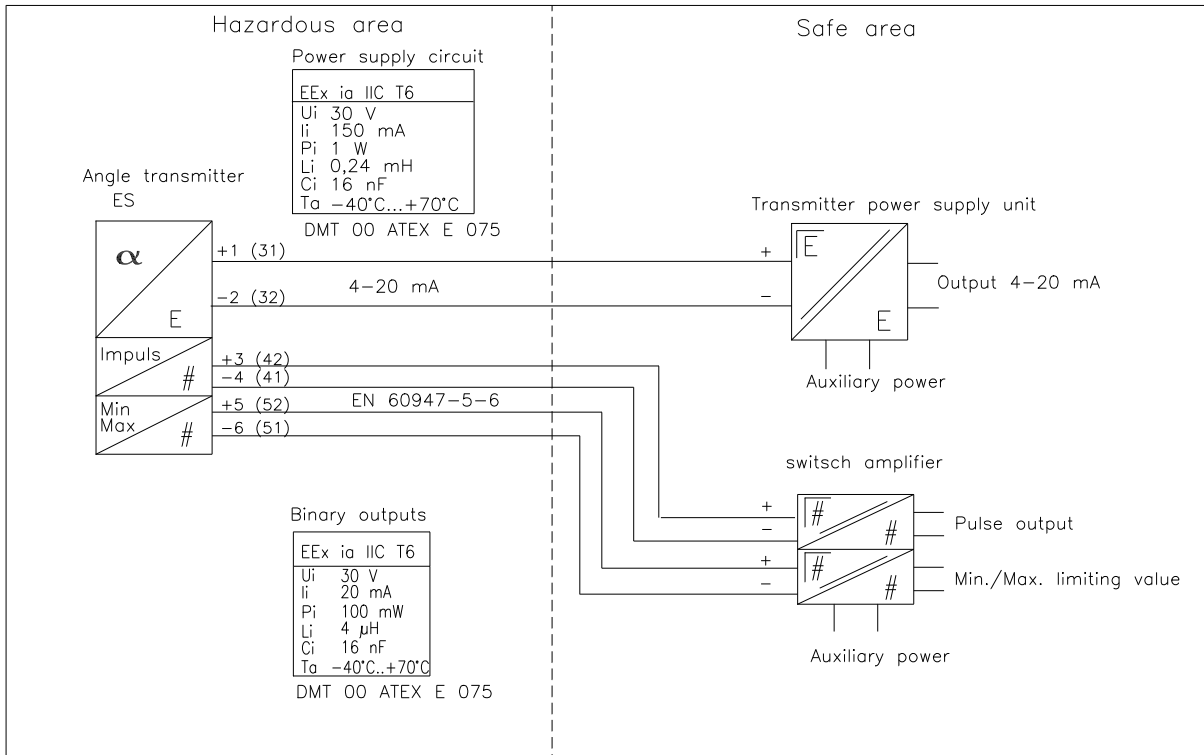
9.1 Wiring diagram for ES transmitter



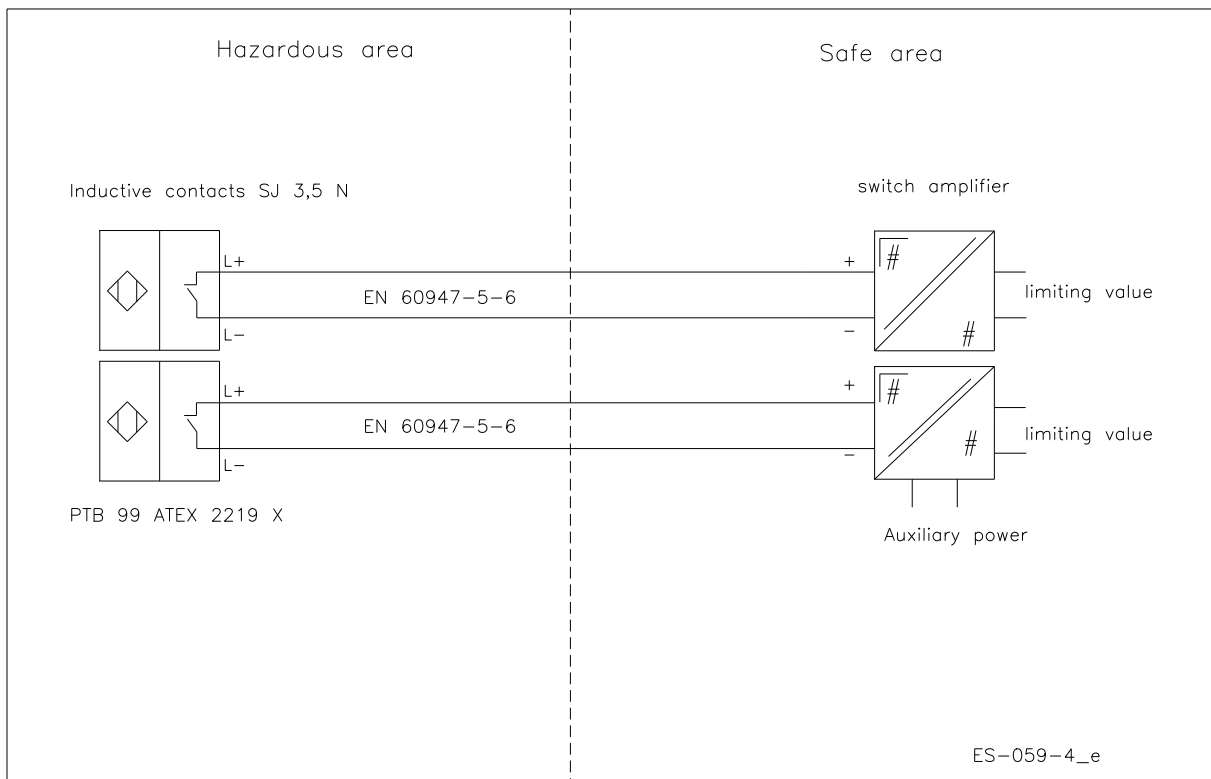
9.2 Wiring diagram for ES transmitter with 4-20 mA output and 2 limit transducers



9.3 Wiring diagram for ES transmitter with 4- 20 mA output, pulse output and limit transducer

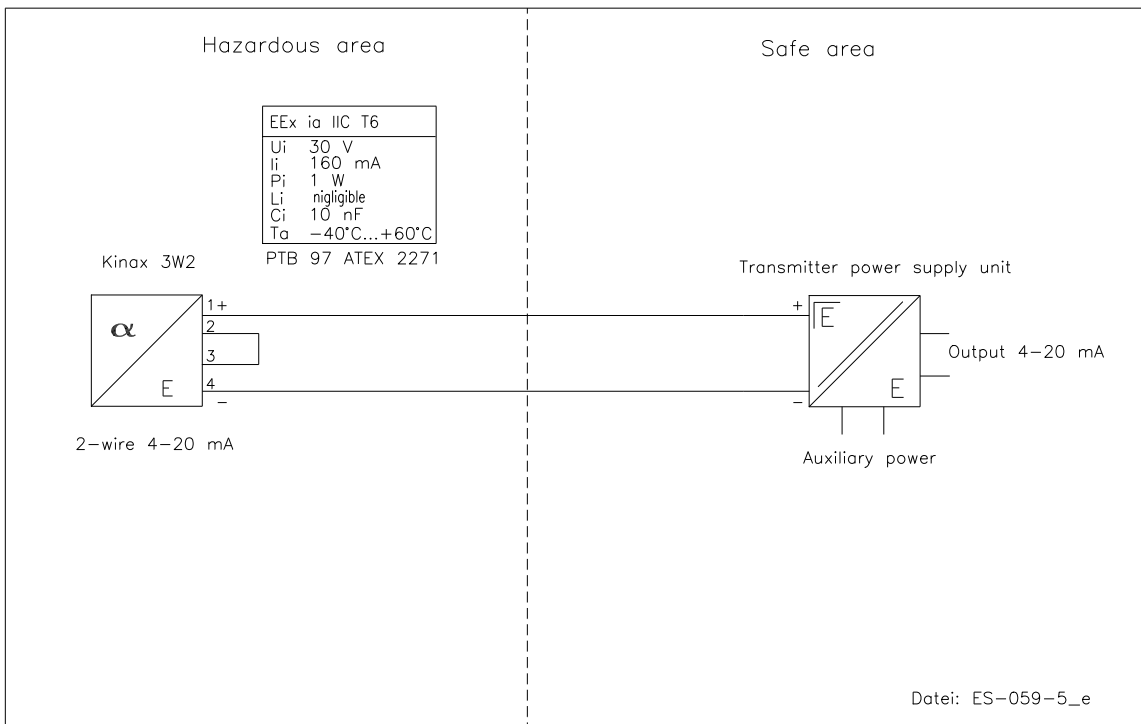


9.4 Wiring diagram for inductive limit transducers

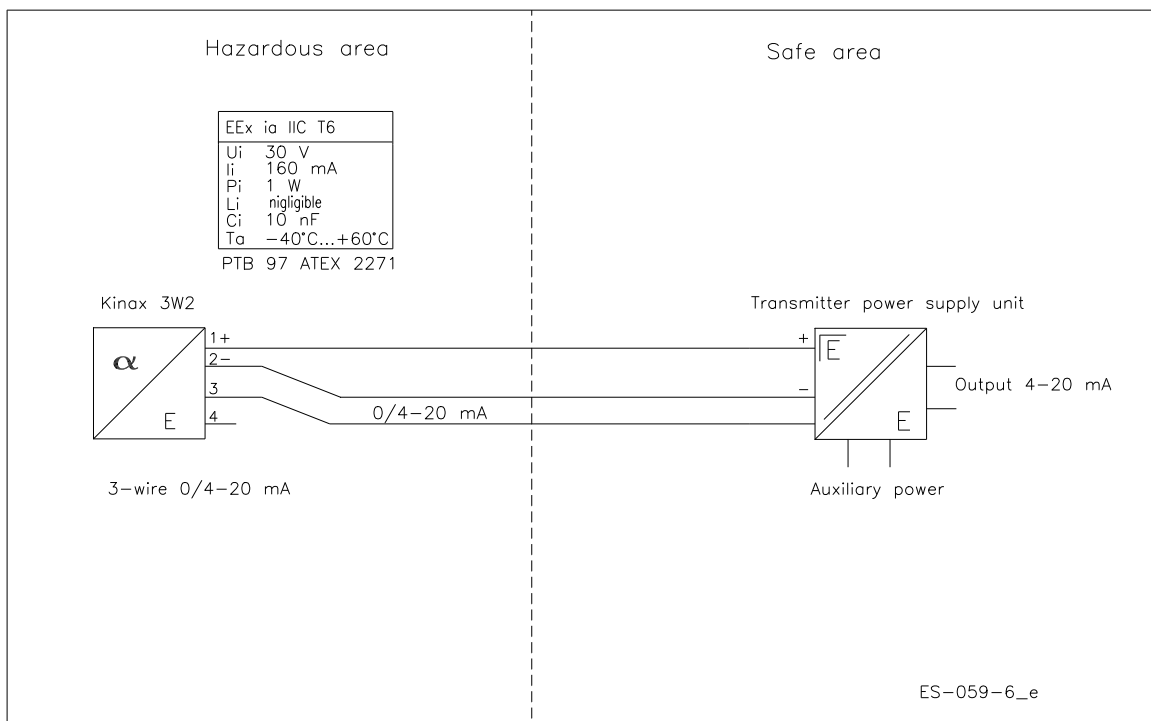


ES-059-4_e

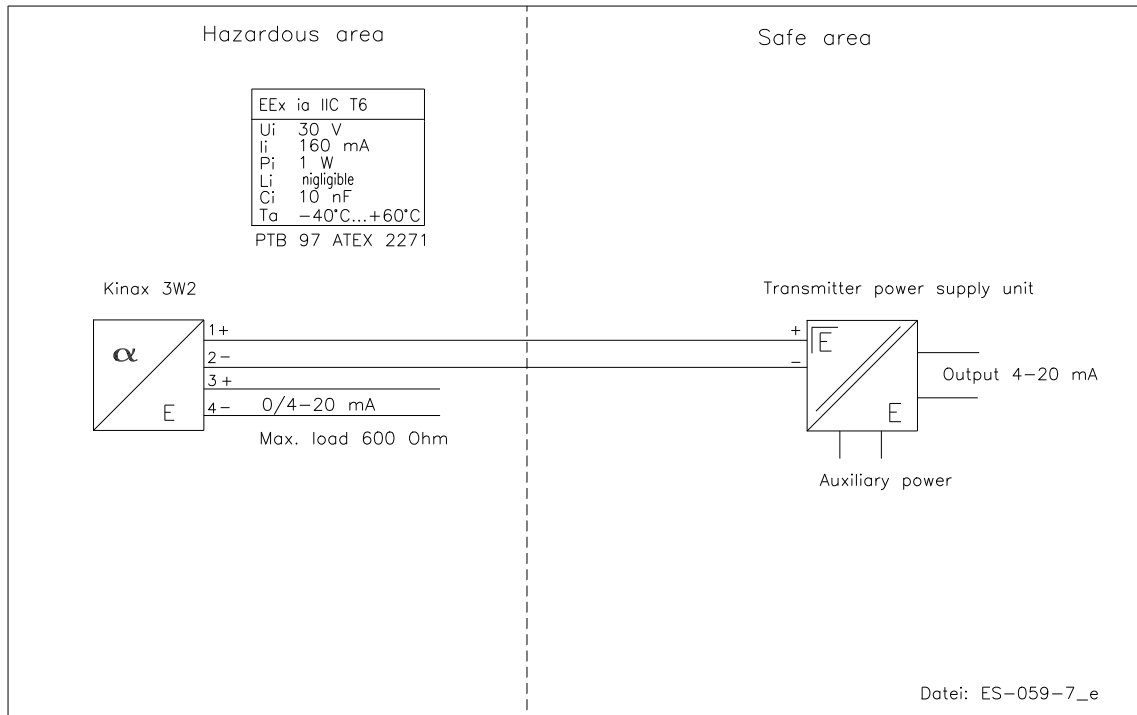
9.5 Wiring diagram for KINAX 3W2 transmitter with 4-20 mA output, 2 wires



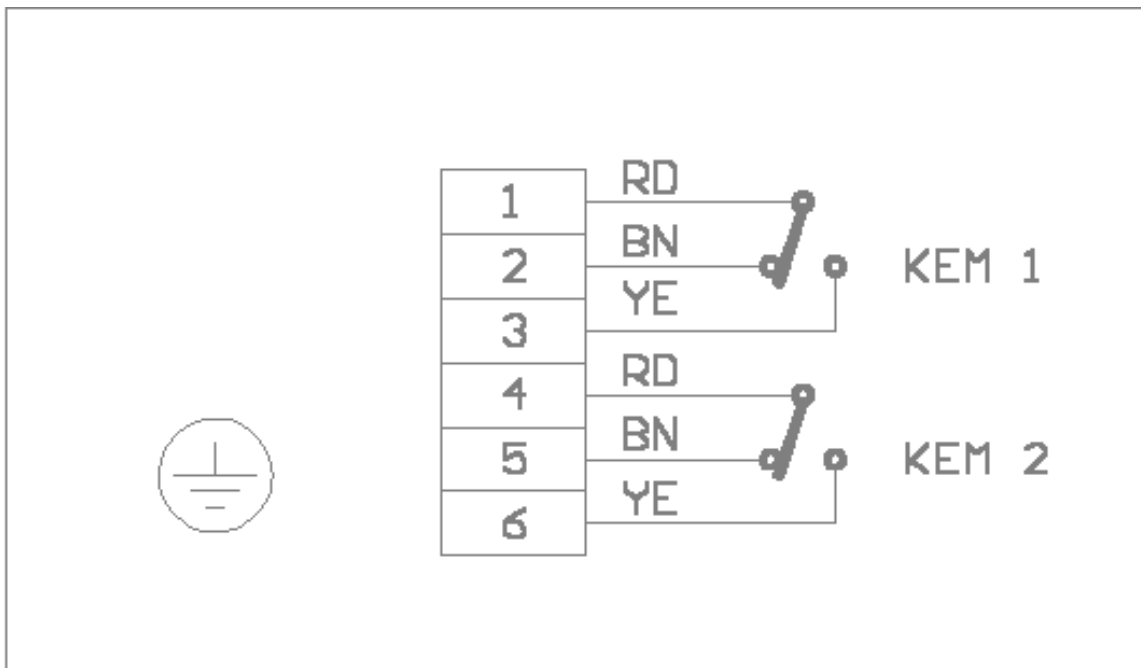
9.6 Wiring diagram for KINAX 3W2 transmitter with 4-20 mA output, 3 wires



9.7 Wiring diagram for KINAX 3W2 transmitter with 4-20 mA output, 4 wires



9.8 Wiring diagram for KEM 1 and KEM 2 double-throw microswitches



10 Indicator unit

- Customized product scale
- ES transmitter with freely programmable user interface
- Parameters may be changed based on the ES Operating Instructions.

11 Auxiliary power

see Electrical connection

12 CE mark

The measuring system meets the statutory requirements of the following EU directives: Directive 94/9/EC (Equipment and Protective Systems for Use in Potentially Explosive Atmospheres), the Electromagnetic Compatibility (EMC) Directive 89/336/EEC and the Pressure Equipment Directive 97/23/EC.

13 Order information

Please include the following information in your order: product data, specific weight, temperature, pressure, viscosity, material design, connection size, measuring range, direction of flow, desired accessories, required approvals and material certificates. **See Device selection by model code.**

13.1 Available accessories

- Stainless steel indicator unit, glass window IP 66
- Indicator unit for high or low temperatures pulled forward by 100 mm
- 1 or 2 inductive limit transducers
- KINAX or ES electric transmitter
- PROFIBUS PA

14 Standards and directives, certificates and approvals

- Certified to DIN-EN 9001
- Production in accordance with AD guidelines and HPO approval (TRB200/TRD201)
- TÜV approval for welding requirements in accordance with DIN-EN 729-2
- Measuring range rated and converted to other products according to VDE/VDI guidelines 3513
- Directive 94/9/EC (Equipment and Protective Systems for Use in Potentially Explosive Atmospheres)
- EN 50014:1997+A1-A2 - General requirements
- EN 50020:1994 - Intrinsic safety "i"
- Directive 89/336/EEC (EMC Directive)
- EN 61000-6-2:1999 – Immunity industrial environment
- EN 50 081-1 – Emitted interference residential environment
- EN 55011:1998+A1:1999 – Group 1, Class B
- NAMUR recommendation NE 21
- EN 60529 – Degrees of protection through housing (IP code)
- EN 61010 – Safety requirements for electrical measuring, control and laboratory devices
- EN 60947-5-6:2000 – Switchgear and controlgear
- Directive 97/23/EC (Pressure Equipment Directive)

15 Safety instructions

15.1 Intended use

The TSK paddle-type flowmeter may be used only for flow measurements of fluid media. The manufacturer shall not be liable for damages that may result from improper or unintended use. When dealing with an aggressive medium, clarify the material durability of all wetted parts. When using the device in hazardous areas, follow the applicable national installation rules.

15.2 Installation, start-up and operating personnel

Only trained specialists authorized by the system operator may carry out the installation, electrical installations, startup, maintenance and operation. They must read and understand the operating manual and follow its instructions.

The required mounting, electrical installation, startup and maintenance work may only be carried out by expert and authorized persons designated by the plant operator.

Basically, follow the conditions and provisions applicable in your country.

16 Packaging, mounting and shipment

Carefully unpack the device to avoid damaging it.

The operability of the paddle can be tested by pressing it in the direction of flow. The pointer position of the indicator mechanism must follow the direction of movement. The resetting spring resets the pointer back to zero after the magnet carriers are released.

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

Storage and installation must be done in a clean and dry room so that contamination – especially of the interior of the fitting – is avoided. Follow the limit values for ambient temperature. When transporting the device to a remote mounting location, we recommend that you reuse the factory-issued packaging and the transport protection.

17 Maintenance

The device requires no maintenance if used according to its intended purpose and is largely insensitive to dirt. However, if cleaning is necessary take note of the following aspects:

- Before removing a device, make sure that the pipeline is free from the product, is pressureless and has cooled down.
- Fittings with the insides coated may be carefully cleaned after removal with a brush and the appropriate cleansing agent. Carefully clean the measuring body from possible coating. Attention: do not use the measuring ring/cone and the measuring body with hard objects (see Removing/installing the measuring body).
- The switching points of the limit transducers are adjustable. To do this, remove the indicator cover, unfasten the contact point indicator located on the scale and readjust it. After the adjustment, reattach the bolts of the contact point indicator. Reinstall and tighten the indicator cover.
- The calibration of the KINAX signal output is firmly set and not adjustable. Do not adjust the potentiometer of the transmitter.
- The parameterization of the ES is possible and is done via HART®. Please refer to the separate Operating Instructions for the ES.

18 Trouble shooting

- **Indicator window clouds over:** Water in the indicator unit.
- **Indicator cover is not tight enough:** Adjust the cover seal, tighten the cover.
- **Window is opaque:** Corrosive atmosphere, ventilate.
- **Window ices over due to cold and damp atmosphere:** The device can be equipped at the factory with an air/nitrogen flush.
- **Window ices over due to very cold medium and damp atmosphere:** The device can be equipped at the factory with a pulled-forward indicator unit.
- **Device shows incorrect values:** Compare process data, density, viscosity, temperature and pressure with the values on the scale. If they deviate, convert the scale values using the VDE/VDI 3513 standard; for the signal output 2 option, carry out reparameterization.
- **Pointer does not react in spite of varying flow:** The pointer may have gotten stuck; remove the cover and move the pointer; if the pointer can be moved easily, the measuring body cannot move. If the pointer is unable to move further, send the device to the head office for servicing.
- **Electrical equipment are not functioning:** Check the auxiliary power. Are suitable power supply equipment connected, have the terminals been selected correctly, has the parameterization carried out correctly?

19 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.

20 Replacement parts

The following parts can be ordered as replacement parts:

- 1) Indicator cover with window/gasket/screws
- 2) Scale with standard scaling
- 3) Pointer
- 4) Limit value indicator
- 5) Pointer stop
- 6) Limit value initiator

21 Decontamination certificate for device cleaning

Company:

City:

Department:

Name:

Tel. No.:

This paddle-type flowmeter

type TSK-.....

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.



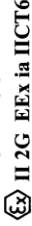
We hereby confirm that in resending the device no danger to persons or the environment is posed by the residual measured substance.

Date:

Signature:

Stamp:

22 EC Type Examination Certificates

<p style="text-align: center;"></p> <p style="text-align: center;">Appendix to</p> <p style="text-align: center;">EC-Type Examination Certificate</p> <p style="text-align: center;">DMT 00 ATEX E 075</p> <p>(13) _____</p> <p>(14) _____</p> <p>(15) <u>15.1. Subject and type</u> Electronic transmitter type ES or ES-PPA</p> <p><u>15.2. Description</u> The electronic transmitter serves for the recording of the position or angular position of a magnet at rotameters. The completely encapsulated electronic device of the transmitter is mounted in a light alloy housing together with corresponding terminals for the connection of the intrinsically safe circuits. The transmitter is provided to be installed in a housing with a min. degree of protection IP 20.</p> <p><u>15.3. Parameters</u></p> <table border="0"> <tr> <td>15.3.1 type ES</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>15.3.1.1 Input circuit (terminals 1 and 2)</td> <td>Ui</td> <td>DC</td> <td>30</td> <td>V</td> <td></td> </tr> <tr> <td>voltage</td> <td>Ii</td> <td></td> <td>150</td> <td>mA</td> <td></td> </tr> <tr> <td>current</td> <td>Pi</td> <td></td> <td>1</td> <td>W</td> <td></td> </tr> <tr> <td>power</td> <td>Li</td> <td></td> <td>0,24</td> <td>mH</td> <td></td> </tr> <tr> <td>effective internal inductance</td> <td>Ci</td> <td></td> <td>16</td> <td>nF</td> <td></td> </tr> <tr> <td>effective internal capacitance</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table> <p>15.3.1.2 Binary outputs 1 and 2; potentially free optocoupler circuits (terminals 3 - 4 and 5 - 6), each</p> <table border="0"> <tr> <td>voltage</td> <td>Ui</td> <td>DC</td> <td>30</td> <td>V</td> </tr> <tr> <td>current</td> <td>Ii</td> <td></td> <td>20</td> <td>mA</td> </tr> <tr> <td>power</td> <td>Pi</td> <td></td> <td>100</td> <td>mW</td> </tr> <tr> <td>effective internal inductance</td> <td>Li</td> <td></td> <td>4</td> <td>µH</td> </tr> <tr> <td>effective internal capacitance</td> <td>Ci</td> <td></td> <td>16</td> <td>nF</td> </tr> </table> <p>15.3.2 type ES-PPA Input circuit (terminals 7 and 8) for connection with a circuit in accordance with FISCO model (PTB report no. PTBW-53)</p> <table border="0"> <tr> <td>voltage</td> <td>Ui</td> <td>DC</td> <td>25</td> <td>V</td> </tr> <tr> <td>current</td> <td>Ii</td> <td></td> <td>280</td> <td>mA</td> </tr> <tr> <td>power</td> <td>Pi</td> <td></td> <td>2</td> <td>W</td> </tr> <tr> <td>effective internal inductance</td> <td>Li</td> <td></td> <td>negligible</td> <td></td> </tr> <tr> <td>effective internal capacitance</td> <td>Ci</td> <td></td> <td>negligible</td> <td></td> </tr> </table> <p>15.3.3 ambient temperature range</p> <p style="text-align: right;">Ta - 40 °C up to + 70 °C</p>	15.3.1 type ES						15.3.1.1 Input circuit (terminals 1 and 2)	Ui	DC	30	V		voltage	Ii		150	mA		current	Pi		1	W		power	Li		0,24	mH		effective internal inductance	Ci		16	nF		effective internal capacitance						voltage	Ui	DC	30	V	current	Ii		20	mA	power	Pi		100	mW	effective internal inductance	Li		4	µH	effective internal capacitance	Ci		16	nF	voltage	Ui	DC	25	V	current	Ii		280	mA	power	Pi		2	W	effective internal inductance	Li		negligible		effective internal capacitance	Ci		negligible		<p style="text-align: center;"></p> <p style="text-align: center;">Translation</p> <p style="text-align: center;">EC-Type Examination Certificate</p> <p style="text-align: center;">- Directive 94/9/EC - Equipment and protective systems intended for use in potentially explosive atmospheres</p> <p style="text-align: center;">DMT 00 ATEX E 075</p> <p>(3) Equipment: Electronic transmitter type ES or ES-PPA</p> <p>(5) Manufacturer: Bopp & Reuther Heinrichs Messtechnik Josef Heinrichs GmbH & Co. Messtechnik KG</p> <p>(6) Address: D 50933 Köln</p> <p>(7) The design and construction of this equipment and any acceptable variation thereto are specified in the schedule to this type examination certificate.</p> <p>(8) The certification body of Deutsche Montan Technologie GmbH, notified body no. 0158 in accordance with Article 9 of the Directive 94/9/EC of the European Parliament and the Council of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive. The examination and test results are recorded in the test and assessment report BVS PP 00.2071 EG.</p> <p>(9) The Essential Health and Safety Requirements are assured by compliance with: EN 50014:1997+A1-A2 General requirements EN 50020:1994 Intrinsic safety 'i'</p> <p>(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.</p> <p>(11) This EC-Type Examination Certificate relates only to the design and construction of the specified equipment. Further requirements of Directive 94/9/EC apply to the manufacture and placing on the market of this equipment.</p> <p>(12) The marking of the equipment shall include the following: </p> <p style="text-align: right;">Deutsche Montan Technologie GmbH Essen, dated 31. Oktober 2000</p> <p>Signed: Jockers _____ DMT-Certification body</p> <p>Signed: Dill _____ Head of special services unit</p>
15.3.1 type ES																																																																																													
15.3.1.1 Input circuit (terminals 1 and 2)	Ui	DC	30	V																																																																																									
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current	Pi		1	W																																																																																									
power	Li		0,24	mH																																																																																									
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page 2 of 3 to DMT 00 ATEX E 075
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page 1 of 3 to DMT 00 ATEX E 075
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(1) EC-TYPE-EXAMINATION CERTIFICATE
 (Translation)



- (2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - Directive 94/9/EC
- (3) EC-type-examination Certificate Number:

PTB 97 ATEX 2271

- (4) Equipment: Transmitter for angular position KINAX 3W2 type 706-...
 ... resp. KINAX WTT07 type 707-...
 resp. KINAX WTT06 type 706-...
- (5) Manufacturer: Camille Bauer AG
- (6) Address: Aargauerstrasse 7, CH-5610 Wohlen
- (7) This equipment and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

(9) The examination and test results are recorded in the confidential report PTB Ex 97-27381.
 Compliance with the Essential Health and Safety Requirements has been assured by compliance with:
EN 50014:1997
EN 50020:1994

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-type-examination Certificate relates only to the design and construction of the specified equipment in accordance with Directive 94/9/EC. Further requirements of this Directive apply to the manufacture and supply of this equipment.

(12) The marking of the equipment shall include the following:



Zertifizierungsstelle Explosionsschutz
 By order

Dr.-Ing. U. Johannsmeyer
 Regierungsdirektor

Braunschweig, 21.01.1998

Sheet 1/3

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.

Physikalisch-Technische Bundesanstalt • Bundesallee 100 • D-38116 Braunschweig



(16) Test and assessment report
 BVS PP 00.2071 EG as of 31. Oktober 2000

(17) Special conditions for safe use
 None

We confirm the correctness of the translation from the German original.
 In the case of arbitration only the German wording shall be valid and binding.

45307 Essen, dated 31.10.2000
 BVS-SchulKn A 20000463

Deutsche Montan Technologie GmbH

[Signature]
 DMT-Certification body

[Signature]

Head of special services unit



(13) **SCHEDULE**
 (14) **EC-TYPE-EXAMINATION CERTIFICATE No. PTB 97 ATEX 2271**

(15) **Description of equipment**

The angular position transmitter KINAX 3W2 of type 706-... KINAX WT 707 of type WT 707-... and KINAX WT 706 of type WT 706-... convert the angular position of a shaft contactlessly to a proportional electrical output signal.
 A variation of the shaft position effects a variation of a capacitance, which is converted to a proportional current alteration by the downstream electronics.
 The ranges of the ambient temperature dependent on the temperature class are shown in the following table.

Minimum ambient temperature	Maximum ambient temperature	Temperature class
-40 °C	60 °C	T 6
-40 °C	75 °C	T 5

Electrical data

Supply- and measuring output.....type of protection Intrinsic Safety EEx ia IIC for connection to a certified intrinsically safe circuit (terminals 1, 2, 3)

Maximum values: $U_i = 30 \text{ V}$
 $I_i = 160 \text{ mA}$
 $P_i = 1 \text{ W}$

Effective internal capacitance: $C_i \leq 10 \text{ nF}$
 The effective internal inductance is negligibly small.

The transmitter for angular position KINAX 3W2 of type 706-... must be mounted into a housing which meets the requirement of a degree of protection IP 20 according to IEC 529.

Since the angular position transmitters KINAX WT 707 of type WT 707-... and KINAX WT 706 of type WT 706-... meet the requirements of a degree of protection IP 20 according to IEC 529 mounting of these variants into an additional housing is not necessary.

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.



SCHEDULE TO EC-TYPE-EXAMINATION CERTIFICATE PTB 97 ATEX 2271

(16) Report PTB Ex 97-27381

(17) Special conditions for safe use
 not applicable

(18) Essential health and safety requirements
 met by standards

Braunschweig, 21.01.1998

Zertifizierungsstelle Explosionsschutz
 By order



Dr.-Ing. U. Johannsmeyer
 Regierungsdirektor

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.



Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin



EC-TYPE-EXAMINATION CERTIFICATE
(Translation)



(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - Directive 94/9/EC
(3) EC-type-examination Certificate Number:
PTB 99 ATEX 2219 X

(4) Equipment: Slot-type initiators types SJ... and SC...
(5) Manufacturer: Pepperl + Fuchs GmbH
(6) Address: D-68307 Mannheim

(7) This equipment and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.
(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential report PTB Ex 99-29175.
(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:
EN 50014:1997
EN 50020:1994

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.
(11) This EC-type-examination Certificate relates only to the design and construction of the specified equipment in accordance with Directive 94/9/EC. Further requirements of this Directive apply to the manufacture and supply of this equipment.
(12) The marking of the equipment shall include the following:

Ex II 2 G EEx ia IIC T6

Braunschweig, December 22, 1999

Zertifizierungsstelle Explosionsschutz

By order:



U. Johannsmeyer
Dr.-Ing. U. Johannsmeyer
Regierungsdirektor

sheet 1/3

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.

Physikalisch-Technische Bundesanstalt • Bundesallee 100 • D-38116 Braunschweig



Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin

SCHEDULE

(13) **EC-TYPE-EXAMINATION CERTIFICATE PTB 99 ATEX 2219 X**

(15) **Description of equipment**

The slot-type initiators of types SJ... and SC... are used to convert displacements into electrical signals.

The slot-type initiators may be operated with intrinsically safe circuits certified for categories and explosion groups [EEx ia] IIC or IIB resp. [EEx ib] IIC or IIB. The category as well as the explosion group of the intrinsically safe slot-type initiators depends on the connected supplying intrinsically safe circuit.

Electrical data

Evaluation and supply circuit.....

..... type of protection Intrinsic Safety EEx ia IIC/IIB resp. EEx ib IIC/IIB

only for connection to certified intrinsically safe circuits

Maximum values:

type 1	type 2	type 3	type 4
$U_i = 16 V$	$U_i = 16 V$	$U_i = 16 V$	$U_i = 16 V$
$I_i = 25 mA$	$I_i = 25 mA$	$I_i = 52 mA$	$I_i = 76 mA$
$P_i = 34 mW$	$P_i = 64 mW$	$P_i = 169 mW$	$P_i = 242 mW$

The assignment of the type of the connected circuit to the maximum permissible ambient temperature and the temperature class as well as the effective internal reactances for the individual types of slot-type initiators are shown in the table:

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Physikalisch-Technische Bundesanstalt



Braunschweig und Berlin

SCHEDULE TO EC-TYPE-EXAMINATION CERTIFICATE PTB 99 ATEX 2219 X

types	C _i [nF]	L _i [μH]	type 1			type 2			type 3			type 4		
			maximum permissible ambient temperature in °C for application in temperature class											
			T6	T5	T4-T1	T6	T5	T4-T1	T6	T5	T4-T1	T6	T5	T4-T1
SC2-N0...	150	150	72	87	100	65	80	100	40	55	75	23	38	54
SC3,5-N0-Y...	150	150	72	87	100	65	80	100	40	55	75	23	38	54
SC3,5...-N0...	150	150	73	88	100	66	81	100	45	60	89	30	45	74
SJ1,8-N-Y...	30	100	73	88	100	67	82	100	45	60	78	30	45	57
SJ2,2-N...	30	100	73	88	100	67	82	100	45	60	78	30	45	57
SJ2-N...	30	100	73	88	100	67	82	100	45	60	78	30	45	57
SJ3,5...-N...	50	250	73	88	100	66	81	100	45	60	89	30	45	74
SJ3,5-H...	50	250	73	88	100	66	81	100	45	60	89	30	45	74
SJ5...-N...	50	250	73	88	100	66	81	100	45	60	89	30	45	74
SJ5-K...	50	550	72	87	100	66	81	100	42	57	82	26	41	63
SJ10-N...	50	1000	72	87	100	66	81	100	42	57	82	26	41	63
SJ15-N...	150	1200	72	87	100	66	81	100	42	57	82	26	41	63
SJ30-N...	150	1250	72	87	100	66	81	100	42	57	82	26	41	63

(16) Test report PTB Ex 99-29175

(17) Special conditions for safe use

- For the application within a temperature range of -60°C to -20 °C the slot-type initiators of types SJ... and SC... must be protected against damage due to impact by mounting into an additional housing.
- The connection facilities of the slot-type initiators of types SJ... and SC... shall be installed as such that at least a degree of protection of IP20 according to IEC-publication 60529:1989 is met.
- The assignment of the type of the connected circuit to the maximum permissible ambient temperature and the temperature class as well as the effective internal reactances for the individual types of slot-type initiators is shown in the table given under item (15) of this EC-type-examination certificate..
- Inadmissible electrostatic charge of the plastic housing of the slot-type initiators of type SJ30-N..., has to be avoided (warning label on the device).

(18) Essential health and safety requirements

Met by the standards mentioned above

Zertifizierungsstelle Explosionsschutz
By order:

Dr.-Ing. U. Johannsmeyer
Regierungsdirektor



Braunschweig, August 10, 1999

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