

**Operating Instructions  
for  
Turbine Wheel Flow Meter**

**Model: TUV**



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## 2. Note

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Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.

The instruction manuals on our website [www.kobold.com](http://www.kobold.com) are always for currently manufactured version of our products. Due to technical changes, the instruction manuals available online may not always correspond to the product version you have purchased. If you need an instruction manual that corresponds to the purchased product version, you can request it from us free of charge by email ([info.de@kobold.com](mailto:info.de@kobold.com)) in PDF format, specifying the relevant invoice number and serial number. If you wish, the operating instructions can also be sent to you by post in paper form against an applicable postage fee.

The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EC-machine guidelines.

**as per PED 2014/68/EU**

In acc. with Article 4 Paragraph (3), "Sound Engineering Practice", of the PED 2014/68/EU no CE mark.

Diagram 8, Pipe, Group 1 dangerous fluids

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## 3. Regulation Use

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Any use of the TUV which exceeds the manufacturer's specification may invalidate its warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.

## 4. Operating Principle

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### 4.1 General

The medium (to be measured) rushes into the turbine flow sensor in axial direction and sets the turbine wheel into rotation. The pick-up grasps the speed of the turbine wheel and generates an output signal which is alternating voltage with a specific frequency (impulses per litre) with reference to the instantaneous rate of flow. Thus, the generated frequency is proportional to the rate of flow of medium at any given point in time. After amplification and signal-conversion, the voltage is made available for pulse evaluation. The K-factor (Calibration factor) of turbine wheel flow sensor is printed as an exact measure of pulse-rate. To ascertain the K-factor, we calibrate our flow sensors ourselves. In doing so, we make allowance for operational viscosities and customer's specifications.

### 4.2 Evaluation

Our Calibration protocol includes the following (and other) data for unit evaluation:

- Max. Measurement-error with respect to the instantaneous value
- Max./min. Frequency with corresponding flow-rates
- K-factors, at different flow rates within the measurement range
- Intermediate K-factor as average value for the complete measuring range. The intermediate factor serves the purpose of evaluation for strongly fluctuating flow-volumes

While this data is made available, you can fine-tune your units. The following equation is used:

$$\text{Lit} Q = \frac{F \times 60}{K}$$

Q= Flow in Litre per Minute

K= K-factor of flow sensor (pulses per Litre)

F= generated pulse frequency in Hz

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## 5. Instrument Inspection

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Instruments are inspected before shipping and sent out in perfect condition. Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

**Scope of delivery:**

The standard delivery includes:

- Turbine Wheel Flow Meter model: TUV

## 6. Mechanical Connection

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### 6.1 Preparation

- Ensure that piping is free of debris before installation of the turbine, as hardened debris or other impurities may clog or jam the turbine wheel.
- For all turbines, we recommend the following filter sizes.

DN (Turbine)	Filter size
3 to 9 mm	100 Micron
9 to 50 mm	300 Micron
50 to 300 mm	500 Micron

### 6.2 Installation

- **The installation should be carried out in straight pipe runs**, preferably in the vertical position. However, the turbine may be mounted in every mounting position with proper calibration. Note that the K-factor could change slightly in the horizontal position, because the calibration of turbines (under DN 50) is carried out in vertical position. If the mounting position of the turbine is to be horizontal, it has to be specified when ordering.

Straight run distances from elbows, T-pieces, valves, pumps, etc. are critical for proper operation. Inlet and outlet pipe straight run distances should be as follows:

Inlet straight run: 10 x DN

Outlet straight run: 5 x DN

- **Pipe Connections**

The diameter of connecting pipe and turbine must be the same. Because of the variations in high-pressure pipe joints, the inner diameter of connecting pipes should be smaller than the nominal diameter of the turbine.

- **Reducing the pipe to connect the meter**

Please use only the cone versions with an angle of 22° to 30° and ensure that the gaskets do not block the free-flow area of cross section of the pipe.

### 6.3 Noise sources

- **Vortices and other flow-disturbances** in immediate vicinity of turbine falsify the results of measurements. Moreover, the turbine may be damaged in the extreme case. You may avoid such impairments by installing separate laminar flow elements (Length 2.5 x DN of turbine) on both ends of turbine.
- **Voltage: Noise Generation and Magnetic field Disturbances** near the turbine can disturb the pick-up. In particular, on the remote version, the pick-up may act as an antenna.
- **Strong Vibrations of Pipelines** may possibly impose microphonic effect on the pick-up. The transmission of vibrations may be restricted through proper mounting of the pick-up, so that there is no metallic contact between pick-up tip and pick-up bore-ends (inside turbine housing). Flexible hose connections should be used at the inlet and outlet.
- **Air inside in the Pipelines** falsifies the results of measurements. The pipelines must always be filled with liquid, because turbine-flow sensor is an indirect volume-measuring unit and thus registers only the total volume flowing through, independent of, whether the liquid is pure or a mixture of liquid and gas.
- **Cavities** (above all, with the measurement of random-flow gases)  
A steady minimal output counter pressure restricts cavity development:

$$\begin{aligned} & 2x \text{ Pressure-loss of turbine /Transducer} \\ & + \text{vaporisation pressure of the liquids} \\ & = \text{minimal output counter pressure} \end{aligned}$$

## 7. Electrical Connection

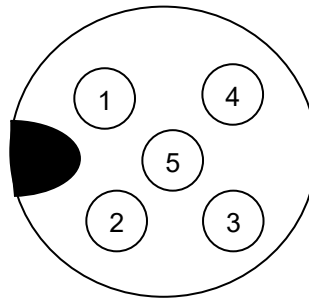
### 7.1 Installation of Pick-up and Amplifier

- Screw-in the pick-up gently.
- Loosen the pick-up about a ¼ turn.
- Counter-nut should be tightened securely.  
By this procedure, a metallic contact between the pick-up tip and pick-up bore-end in the turbine housing is ruled out.
- Please use only shielded cable, preferably, a mesh-screen or braided type.

## 7.2 Wiring of Standard Pick-up

5-pin plug M12

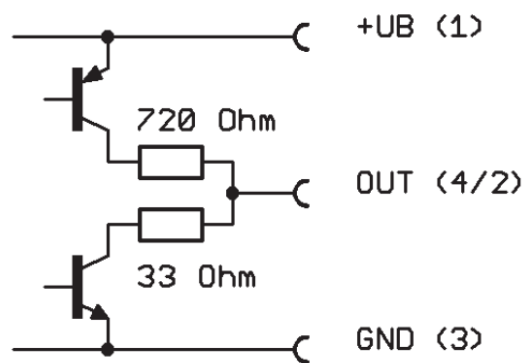
- 1 = +UB
- 2 = n.c.
- 3 = 0 V
- 4 = Signal Push-Pull
- 5 = n.c.



## 7.3 Pulse Output

Output (short-circuit proof)

Push Pull



## 7.4 High Temperature Pick up

see special data sheets



## 8. Commissioning

To avoid pressure shock, the flow medium should be introduced slowly into the unit.



**Warning! Pressure shocks from solenoid valves, ball valves or similar may lead to breakage of the instrument (water hammer). In the operating condition, it must be checked that the instrument housing is continuously filled with the flow medium.**

**Attention! Large air bubbles in the measuring chamber may lead to measurement errors as well as destruction of the bearings.**

## 9. Technical Information

Max. Temperature:	-60..+125 °C (standard) Option: +350 °C
Viscosity range:	1-30 mm <sup>2</sup> /s (calibrated on viscosity)
Linearity:	±1% of reading
Repeatability:	approx. 0.1%
Response Time:	5...50 ms
Filter size:	100 µm (up to TUV-1205), 300 µm (from TUV-1206)
Material:	
Housing/Inner parts:	st. steel 1.4404
Wheel:	st. steel 1.4460
Bearings:	HM
Auxiliary Supply:	10...30 V <sub>DC</sub>
Output:	Push-pull
Voltage amplitude:	U <sub>max</sub> 30 V
Electrical Connection:	5 pin M12

## 10. Order Codes

Order example: **TUV-1200**

Model	Connection female thread (dimension „C“)	Measuring range (L/min)	Average K factor* Imp./L		Max. pressure	Frequency* (Hz) at FS	
			≥ 1 cSt	> 8 cSt		≥ 1 cSt	> 8 cSt
<b>TUV-1200</b>	G ¼	0,3 bis 1,5	32000	32500	630 bar	1100	-
<b>TUV-1201</b>	G ¼	0,5 bis 4	24000	19500	630 bar	1170	-
<b>TUV-1202</b>	G ⅜	0,8 bis 6	17800	17800	630 bar	1740	-
<b>TUV-1203</b>	G ⅜	1,2 bis 10	11000	11000	630 bar	2100	-
<b>TUV-1204</b>	G ⅜	2 bis 20	5200	5200	630 bar	1800	-
<b>TUV-1205</b>	G ⅜	3,3 bis 33	1900	4200	630 bar	1080	2200
<b>TUV-1206</b>	G ⅜	6 bis 60	1300	2730	400 bar	1350	2700
<b>TUV-1207</b>	G ¾	8,5 bis 85	900	1900	400 bar	1300	2600
<b>TUV-1208</b>	G 1	15 bis 150	310	650	400 bar	925	2000
<b>TUV-1209</b>	G 1 ½	30 bis 360	155	320	315 bar	960	2000
<b>TUV-1210</b>	G 1 ½	35 bis 400	130	270	315 bar	1060	1800

\* The tap of the wheel is halved for higher viscosities (>8 mm<sup>2</sup>/s), K factors and frequencies are thus doubled.

The free cross section “DN” must remain free when a connection adapter is used.

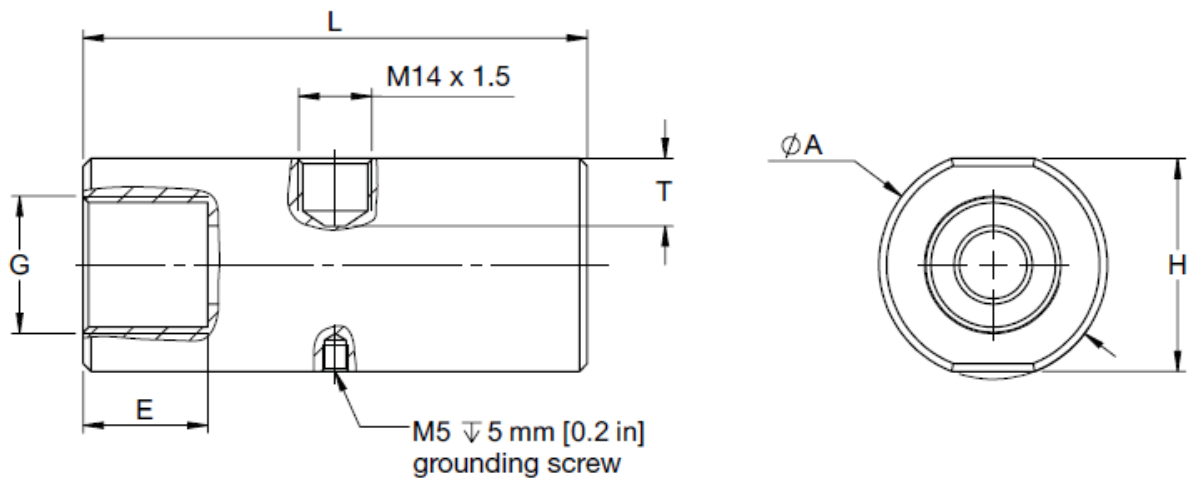
## 11. Maintenance

Turbine wheel flow meters (standard version) are generally maintenance-free devices, provided the instructions are followed as detailed in this manual. We recommend a calibration check-up after 8000 service-hours.

The following spare parts are available:

- **Pick-up**
- **Amplifier**
- **1 Turbine wheel with axle**  
The turbine wheel is supported axially between two flow straighteners. The ends of the turbine’s axle rest in two bearings located in the flow straighteners and against thrust bearings, which absorb the axial push.
- **2 rectifiers with axial counter bearing**  
The rectifiers are fixed with the help of supporting clamps between a distance-ring (Ermeto- turbines) or an inflow cone (flange-turbines) and a support in the housing pipe.

## 12. Dimensions



Model	DN	L	SW
TUV-1200	4	60	30
TUV-1201	4	70	30
TUV-1202	5	70	30
TUV-1203	5	74	30
TUV-1204	7	79	30
TUV-1205	9	79	30

Model	DN	L	AF
TUV-1206	11	86	30
TUV-1207	13	97	41
TUV-1208	19	125	46
TUV-1209	28	161	60
TUV-1210	30	181	60

## 13. EU Declaration of Conformance

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We, KOBOLD Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product:

### **Turbine Wheel Flow Meter Model: TUV**

to which this declaration relates is in conformity with the standards noted below:

**EN 61000-6-2:2005** Electromagnetic compatibility (EMC) - Part 6-2:  
Generic standards - Immunity for industrial environments

**EN 61000-6-4:2007+A1** Electromagnetic compatibility (EMC) - Part 6-4:  
Generic standards - Emission standard for industrial environments

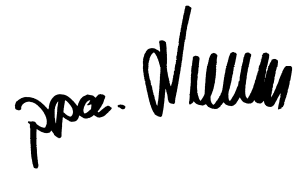
**EN 61010-1:2015** Safety requirements for electrical equipment for  
measurement, control, and laboratory use - Part 1: General requirements

Also, the following EC guidelines are fulfilled:

<b>2014/30/EU</b>	<b>EMC Directive</b>
<b>2011/65/EU</b>	<b>RoHS (category 9)</b>
<b>2015/863/EU</b>	<b>Delegated Directive (RoHS III)</b>



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