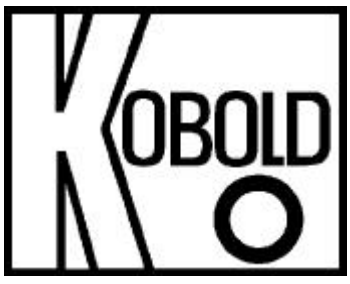
Operating Instructions

for

Turbine Wheel Flow Meter

Model: TUV



1. Instructions

Please read this Service Manual carefully before unpacking and commissioning the unit. The unit may only be used, maintained and installed by qualified personnel, familiar with the Operating instructions and the applicate Heath and Safety requirements.

2. Contents

3. Certificate of Compliance

We, M/s KOBOLD-Messring GmbH, Hofheim-Ts. Germany, declare under our sole responsibility, that this Product:

Turbine Wheel Flow Meter: TUV-...

which relates to this certificate, conforms to the standards listed below:

EN 50081-2 7/93
EN 50082-2 3/95
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EN 292-1, EN 292-2, EN

(Signed) K.

Date: 07.11.00

Manufactured and Marketed by:

Kobold Messring GmbH Tel.: 06192-299-0
Nordring 22-24 Fax: 06192-23398
D-65719 Hofheim

4. Warranty

The extent of warranty is subject to our delivery conditions.Repair / restoration work during the guaranty-period requires our consent and instructions, and may only be carried out by the firm itself, or by a duly appointed distributor.

5. Usage

A trouble-free operation of KOBOLD turbine wheel flow meters can only be guaranteed when all the points in this service manual are given due consideration. Damages resulting from non-consideration of these instructions cannot be covered under warranty.

6. Unit Operation

6.1 General

The medium (to be measured) rushes into the turbine flow sensor in axial direcion 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 refrence 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 by ourselves. In doing so, we make allowance for opertional viscosities and customer's specifications.

6.2 Evaluation

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

- Max. Measurement-error w.r.t. the instantaneous value
- Max./min. Frequency with corresponding flow-rates
- K-factors, at different flow rates within the measurement range
- Intermediate K-faktor 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:

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

Q= Flow in Litre per Minute
K= K-factor of flow sensor (pulses per Litre)
F= generated pulse frequency in Hz

7. Check-up

The instrument are inspected before dispatch and sent out in perfect condition. Should damage to the instrument be visible, we recommend close inspection of the delivery package. In case of damage, please immediately inform the forwarder as he is liable for any damage in transit.

Scope of Delivery
All the parts, which fall in the category of standard scope, are assembled to form the complete unit. The units which require plug-connection, are supplied with plug connection and plug.

8. Mechanical Connection

8.1 Preparation

- Ensure cleaning of pipes before installation of the turbine. Especially, hard-stuck impurities are not to be allowed to turn into the meter.
- 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

8.2 Installation

- **The installation should be carried out in straight pipes,** possibly in vertical position. The turbine works in every mounting position. However, 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 has to be horizontal it has to be specified when ordering.

Distances from ellbows, T-pieces, valves, pumps, etc. pay attention to inlet and outlet pipe straight-distances...

inlet straight 10 x DN
outlet straight 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.

8.3 Noise sources

- **Verticies and other flow-disturbances** in immediate vicinity of turbine falsify the results of measurements. Moreover, the turbine may get 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** in the vicinity of turbine can disturb the pick-up. In particular, on the separated 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 the proper mounting of the pick-up, that there is no metallic contact between pick-up tip and pick-up bore-ends (inside turbine housing) occure. 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:

  2x Pressure-loss of turbine /Transducer
  + damping pressure of the liquids
  = minimal output counter pressure

9. Electrical Connection

9.1 Assembly of pick-up and amplifier

- Screw tight the pick up by hand and without forcing.
- Pick-up locks itself after 1/4 turn.
- Counter-nut should be tightened well.

Finally, the metallic contact between pick-up top and pick-up bore-ends is disconnected.

9.2 Connecting Pick-up, Amplifier, Electronics

Please use a shielded cable, preferably, a mesh-screen type.

9.3 Cable-lengths

separated version:
2.5 m maximum cable-length for the connection between pick-up and amplifier.

9.4 Wiring and usage instructions

Standard Amplifier
Medium temperature
-20°C...+120°C/150°C

Terminal 1.....UB +7 to 29 V/DC
Termina 2.....0 V/Ground
Termina 3.....NPN/PNP output active/passive

High temperature Pick-up
see seperate data sheets

10. Commissioning

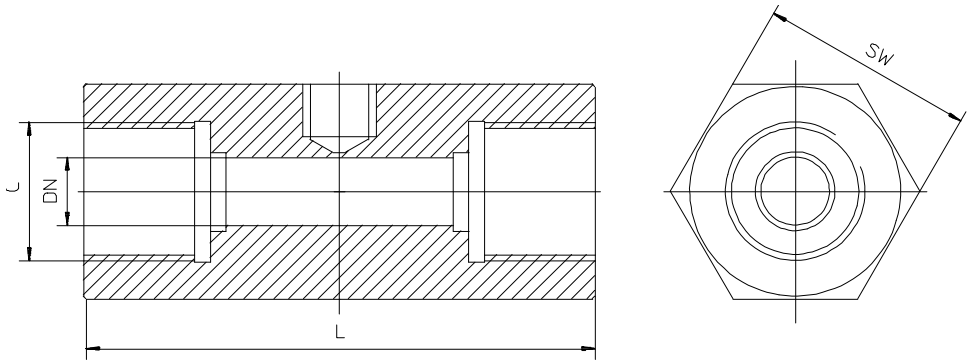
To avoid pressure shock, the flow-medium should run slowly into the unit.

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 continiously 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.

11. Dimensions

Model	DN	L	C	SW
TUV 1201	4	57	G 1/4	30
TUV 1202	5	70	G 3/8	30
TUV 1203	5	70	G 3/8	30
TUV 1204	7	74	G 3/8	30
TUV 1205	9	79	G 3/8	30
TUV 1206	11	86	G 3/8	30
TUV 1207	13	97	G 3/4	41
TUV 1208	19	125	G 1	46
TUV 1209	28	161	G 1½	60
TUV 1210	30	181	G 1½	60



12. Technical Data

Max. Temperature:	-20..+120°C (Standard) Option: -220°C and +350°C
Viscosity range:	1-30 mm²/s (calibrated on viscosity)
Linearity:	±1% of average value.
Repeatability:	approx. 0.05% to 0.1%
Response Time:	5...50 ms
Filter size:	100 µm (upto TUV-1205), 300 µm (from TUV-1206 onwards)
Material:	Housing/Inner parts: St. Steel 1.4305 wheel: St. Steel 1.4122 Bearings: HM
Auxiliary Supply:	7...29 VDC
Output:	NPN/OC passive, Open Collector
Voltage amplitude:	U_{max} 30 V U_{High} >U- (I_{out} [mA] x 1.3 kΩ) U_{LOW}< 0.6 V+(I_{out} [mA] x 1.3 kΩ)
Electr. Connection:	5 pin Amphenol plug

13. Maintenance

Turbine wheel flow meters (standard version) are basically maintenance-free devices, provided instructions are followed, as detailed in this manual.
We recommend a calibration check-up after around 8.000 service-hours.

Following spare-parts are available:

- **Pick-up**

- **Amplifier**

- **1 Turbine wheel with axel** The turbine wheel is supported axially between two flow-straightners. The ends of wheel-axel rest in two bearing holes of flow traightners on the counter bearings, which absorb the axial push.

- **2 rectifier with axial counter bearing**

  The rectifier are fixed with the help of supporting clamps between a distance-ring (Ercmto- turbines) or an inflow cone (flange-turbines) and a support in the housing pipe.