Zertifiziertes QM-System
DIN EN ISO 9001
Zertifikat-Nr. 01017

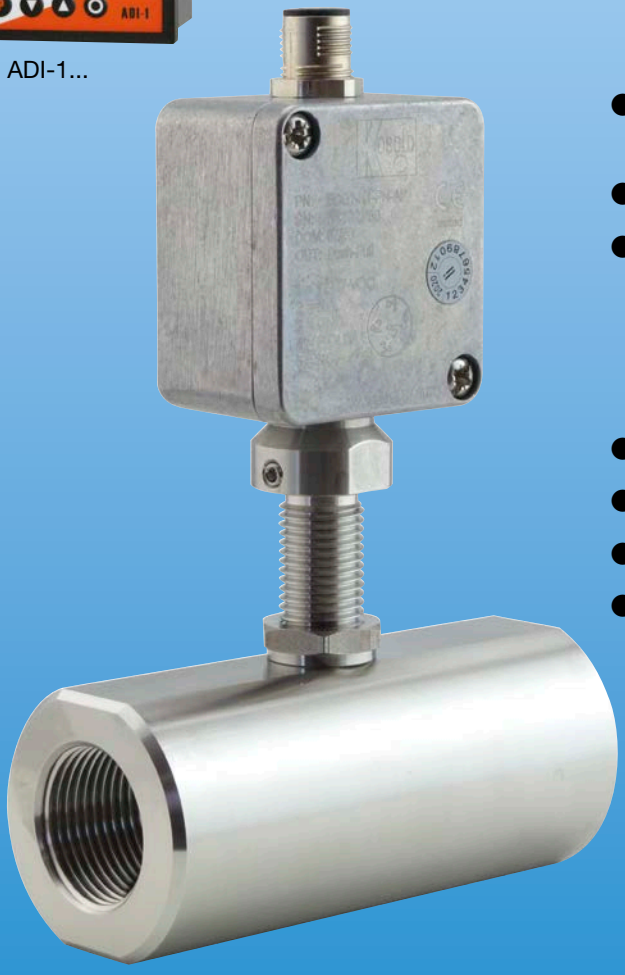
Turbine Flow Meter

for liquids

measuring • monitoring • analysing

TUV

Model: ADI-1...



Model: TUV...

- Measuring ranges:
  0.3 - 1.5 ... 35 - 400 l/min water
- Linearity: ± 1% of reading
- p_{max}: up to 630 bar;
  t_{max}: -40 ... +120 °C
  -40 ... +150 °C (option)
  -60 ... +240 °C (option)
  -60 ... +350 °C (option)
- Viscosity range: 1 - 10 cSt
- Connection: G ¼ ... G 1½ female
- Material: stainless steel
- Output: pulses

S4

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1/01 - 2024

Method of Operation

The TUV model turbines are based on the principle of the Woltmann rotating vane meter. A turbine wheel of negligible mass is concentrically mounted in a pipe and supported by bearings. The liquid flows through the turbine wheel in the axial direction. The medium flow is smoothed by a flow straightener, and reaches the turbine wheel as a quasilaminar flow stream. The speed of the turbine wheel is proportional to the average flow velocity across the pipe cross-section. The rotational speed is thus proportional to the volumetric flow over a wide range.

A pickup with Hall effect (for temperatures up to +150 °C) or inductive pickup (for temperatures -60 ... +350 °C) screwed into the turbine housing senses the speed of the turbine wheel in a non-contacting manner.

The sensor signal is amplified and converted to produce a pulse signal. The pulse count per time unit is proportional to the actual flow rate.

All turbines are calibrated and delivered with their own calibration reports. Variations in viscosities in your application can be taken into consideration during calibration of the most commonly found viscosities.

Areas of Application

Turbine flow meters serve to precisely measure actual flow rates and to meter the flow of liquids of low viscosity.

Examples:

- Fuel
- Liquefied gases
- Solvents
- Light heating oil
- Pharmaceutical liquids
- Tap water and demineralised water

Technical Details

Temperature of medium:	-40 ... +120 °C (electronics EHV, option ST) -40 ... +150 °C (electronics EHV, option MT) -60 ... +240 °C (electronics IFV/IF0, option ET) -60 ... +350 °C (electronics IFV/IF0, option HT)
Viscosity range:	1 - 10 mm²/s (calibrated at 1 mm²/s) option: customer-specific calibration at desired viscosity
Linearity:	±1% of reading
Repeatability:	± 0.1%
Response time:	5 ... 50 ms
Recommended filter:	100 µm (to TUV-1205), 300 µm (from TUV-1206)
Sensor:	
Case / interior sections:	stainless steel 1.4404
Turbine wheel:	stainless steel 1.4462
Bearings:	HM

1/01 - 2024

Order Details (Example: **TUV-1200 EHV ST S**)

Model	Connection female thread (dimension »C«)	Measuring range [l/min]	Max. pressure [bar]	Electronics Type	Temperature of medium	Calibration
TUV-1200	**G¼**	0.3 - 1.5	630	**EHV** = Standard pickup Hall Effect with amplifier incl. mating connector **IFV** = Inductive pickup with amplifier and 2 m assembled cable **IF0** [5] = Inductive pickup without amplifier and 2 m assembled cable	For electronics option EHV: **ST** [1] = -40 ... +120 °C **MT** [2] = -40 ... +150 °C For electronics option IFV/IF0: **ET** [3] = -60 ... +240 °C **HT** [4] = -60 ... +350 °C	**S** = Standard (1 mm²/s) **V** = Special (up to 10 mm²/s)
TUV-1201	**G¼**	0.5 - 4	630			
TUV-1202	**G⅜**	0.8 - 6	630			
TUV-1203	**G⅜**	1.2 - 10	630			
TUV-1204	**G⅜**	2 - 20	630			
TUV-1205	**G⅜**	3.3 - 33	630			
TUV-1206	**G⅜**	6 - 60	400			
TUV-1207	**G¾**	8.5 - 85	400			
TUV-1208	**G1**	15 - 150	400			
TUV-1209	**G1 ½**	30 - 360	315			
TUV-1210	**G1 ½**	35 - 400	315			

[1] Pickup standard
[2] Pickup extended
[3] Without cooling fins
[4] Including cooling fins
[5] Attention: Amplifier necessary for signal amplification/evaluation

Digital indicators and transducers see data sheet ADI-1.

K Factor / Frequency

Model	Average K factor* [Imp./l] ≥ 1 cSt	Frequency* [Hz] at FS ≥ 1 cSt
TUV-1200	32 000	1100
TUV-1201	24 000	1170
TUV-1202	17 800	1740
TUV-1203	11 000	2100
TUV-1204	5 200	1800
TUV-1205	1 900	1080
TUV-1206	1 300	1350
TUV-1207	900	1300
TUV-1208	310	925
TUV-1209	155	960
TUV-1210	130	1000

* The tap of the wheel is halved for higher viscosities (>8 mm²/s), K factors and frequencies are thus doubled.
The free cross section »DN« must remain free when a connection adapter is used.

Impulse Amplifier Model EHV

Technical Details

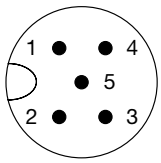
Mounting:	Screw-in M14x1.5 (1-channel)
Power supply:	12 ... 28 V_{DC}, regulated
Current consumption:	< 25 mA
Frequency range:	1 ... 5000 Hz
Output stages:	Push-Pull active
Ambient temperature:	-40 ... +60 °C [-40 ... +140 °F]
Medium temperature:	screw-in M14x1.5 (1-channel) -40 ... +120 °C [-40 ... +248 °F] -40 ... +150 °C [-40 ... +302 °F]
Housing Material:	Aluminium die casting alloy 231
Sensor probe material:	1.4404 [AISI 316L]
Protection Class:	aluminium IP65 with closed electical connection
Weight:	approx. 200 g

Electrical connection

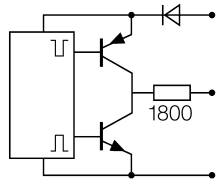
(Short circuit proof, reverse polarity protected)
M12 connector (5-pole, male, A-coded)

Pin

1	$+U_b$ / Loop+ (24 V)
2	n. c.
3	GND / Loop-
4	Digital output
5	n. c.



Push-Pull



	min.	max.	
R_{Last}	10 kΩ		
I_{Last}		15 mA	V_{outlow} = 1800 Ω x I_{Last}
U_{Last}		28 V	$V_{outHigh}$ = +Ub - 0.5 V - (1800 Ω x I_{Last})
$+U_b$	11.5 V	28 V	

1/01 - 2024

Inductive Pickups and Amplifiers Model IFV/IF0

Application

Contactless IF sensors detect the rotational speed of TUV. These are inductive sensors that output a sinusoidal voltage signal in the mV range. The remotely via cable connected amplifier unit amplifies and converts this signal. The spatial and thermal separation of the IF sensor and amplifier unit allows flows to be measured at extreme medium temperatures of -196 °C up to +350 °C [-320.8 °F up to +662 °F].

Technical Details Amplifier

Supply voltage U_B:	+7 ... 29 V_{DC}
Quiescent current:	< 4 mA
Frequency range:	7 ... 3000 Hz depending on flow meter
Ambient temperature:	-20 ... +50 °C [-4 ... +122 °F] (Ex T4) -40 ... +80 °C [-40 ... +176 °F] (non Ex)
Medium temperature:	max. +350 °C [+662 °F] depending on IF sensor
Input impedance:	< 100 Ω
Input:	0.5 ... 500 mV
Electrical connection:	two 3-pin terminal blocks for inductive pickup, amplifier, power supply and output signal
Housing:	aluminium, L = 64, B = 58, H = 37 (mm) with 2 cable glands
Weight:	approx. 400 g
Dimensions:	see dimensional drawing (page 6)
Protection:	IP 65 (DIN 40050)

Frequency output

Three-wire active NPN:

High level: $U_{high} > U_B$ - 0.6 V - (2.6 kΩ · I_{out})
Low level: $U_{low} < 0.6$ V + (1.3 kΩ · I_{out})

Three-wire passive NPN/ Open Collector:

High level: $U_{high} > U$ - (1.3 kΩ · I_{out})
Low level: $U_{low} < 0.6$ V + (1.3 kΩ · I_{out})
U, applied to the output, max. 29 V

Three-wire PNP active:

High level: $U_{high} > U$ - 0.6 V - (150 Ω · I_{out})
Low level: U_{low} = closing
$I_{max.}$ = 60 mA,
$P_{max.}$ an Rs = 1 W, Rs = 150 Ω
Current level two-wire
DIN 19234 NAMUR
High level: $I_{high} > 2.2$ mA
Low level: $I_{low} < 1.1$ mA

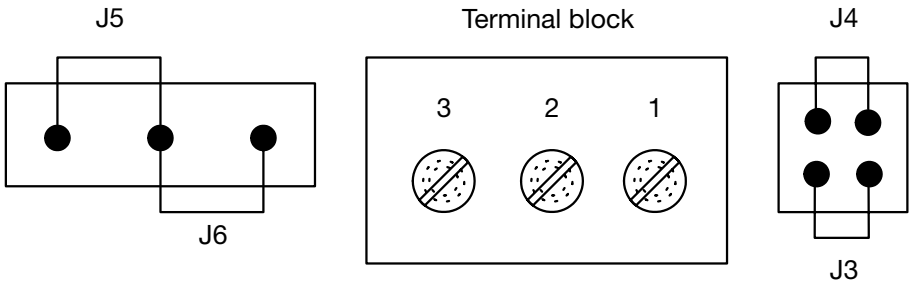
Technical Details – IFV/IF0

Outlet:	Uss 0.5 ... 500 mV
Output resistance:	< 100 Ω
Frequency range:	7 ... 3000 Hz
Medium temperature:	-40 ... +120 °C [-40 ... +248 °F] -60 ... +240 °C [-76 ... +464 °F] -60 ... +350 °C [-76 ... +662 °F]
Connection:	connector type MIL 3-pole
Housing Material:	stainless steel acc. to DIN 1.4104 [AISI 430F]
Dimensions:	see drawing

Setting the Output Mode Electronics Model IFV

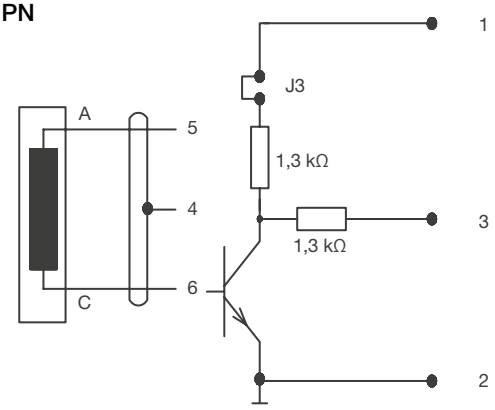
In the electronics model IFV the type of output can be selected freely. By inserting or removing the 2 jumpers, the output mode is defined.

Output mode	Jumper J3	Jumper J4	Jumper J5	Jumper J6
Two-wire passive DIN 19234 NAMUR	Remove	Insert	Remove	Remove
Three-wire active NPN	Insert	Remove	Remove	Insert
Three-wire active PNP (PLC)	Insert	Remove	Insert	Remove
Three-wire passive NPN/Open Collector	Remove	Remove	Remove	Insert

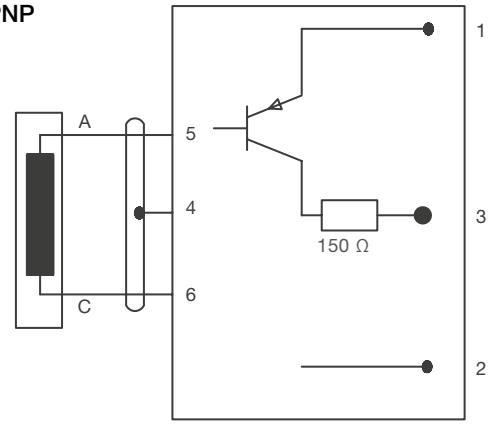


Connections

NPN



PNP

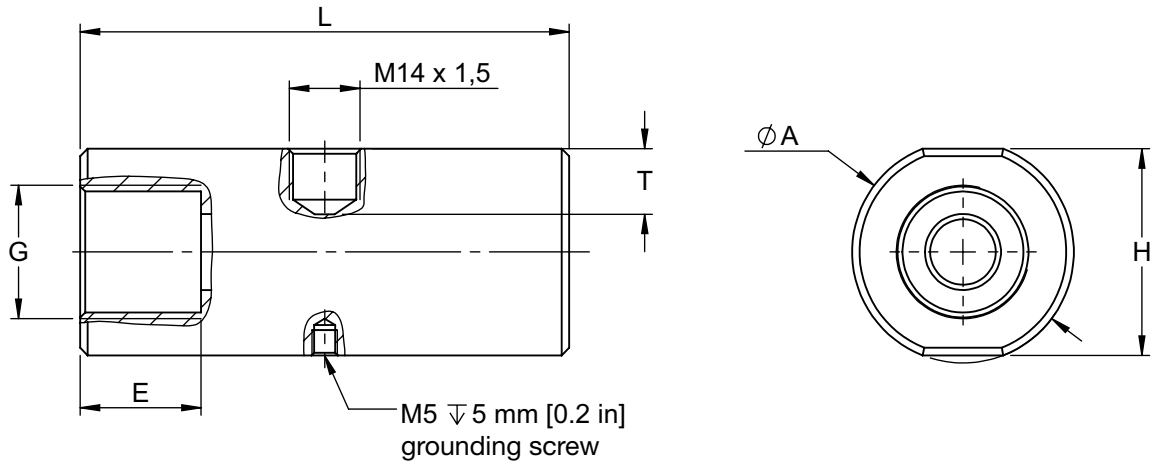


Terminal Assignment

1 = $+U_B$
2 = 0 V / GND
3 = output signal
4 = 0 V / GND / shield
5 = signal IF-coil
6 = signal IF-coil

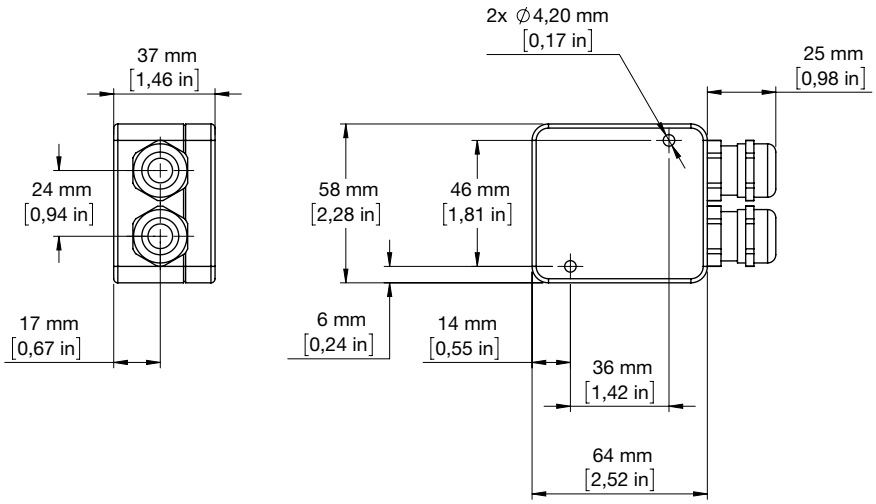
1/01 - 2024

Dimensions [mm]

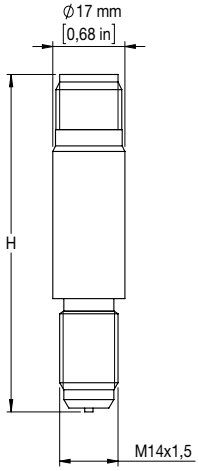


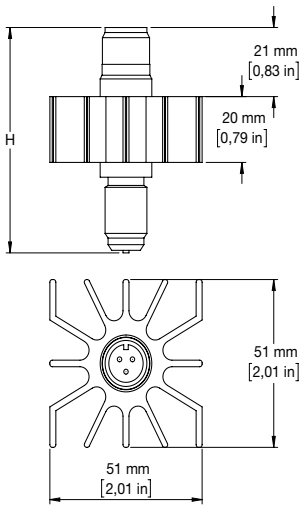
Model	A	E	G	H	L	T
TUV-1200	34 mm [1.34 in]	12,5 mm [0.49 in]	G¼	30 mm [1.18 in]	60 mm [2.36 in]	12 mm [0.47 in]
TUV-1201	34 mm [1.34 in]	12,5 mm [0.49 in]	G¼	30 mm [1.18 in]	60 mm [2.36 in]	12 mm [0.47 in]
TUV-1202	34 mm [1.34 in]	12,5 mm [0.49 in]	G⅜	30 mm [1.18 in]	70 mm [2.76 in]	11 mm [0.43 in]
TUV-1203	34 mm [1.34 in]	12,5 mm [0.49 in]	G⅜	30 mm [1.18 in]	70 mm [2.76 in]	11 mm [0.43 in]
TUV-1204	34 mm [1.34 in]	12,5 mm [0.49 in]	G⅜	30 mm [1.18 in]	74 mm [2.91 in]	10 mm [0.39 in]
TUV-1205	34 mm [1.34 in]	12,5 mm [0.49 in]	G⅜	30 mm [1.18 in]	79 mm [3.11 in]	9 mm [0.35 in]
TUV-1206	34 mm [1.34 in]	12,5 mm [0.49 in]	G⅜	30 mm [1.18 in]	86 mm [3.39 in]	8 mm [0.31 in]
TUV-1207	44 mm [1.73 in]	16,5 mm [0.65 in]	G¾	41 mm [1.61 in]	97 mm [3.82 in]	13 mm [0.51 in]
TUV-1208	49 mm [1.93 in]	18,5 mm [0.73 in]	G1	46 mm [1.81 in]	125 mm [4.92 in]	12 mm [0.47 in]
TUV-1209	64 mm [2.52 in]	22,5 mm [0.89 in]	G1½	60 mm [2.36 in]	161 mm [6.34 in]	15 mm [0.59 in]
TUV-1210	64 mm [2.52 in]	22,5 mm [0.89 in]	G1½	60 mm [2.36 in]	181 mm [7.13 in]	14 mm [0.55 in]

Electronics Model IFV/IF0



Isolated amplifier unit

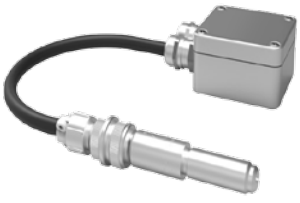




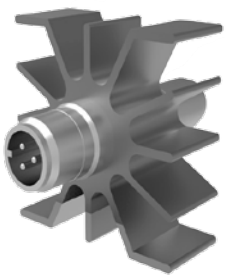
IF0ET and **IF0HT**
Isolated pulse amplifiers

Model	H
IFxxT	86 mm [3.38 in]

Amplifier
for electronics IFV



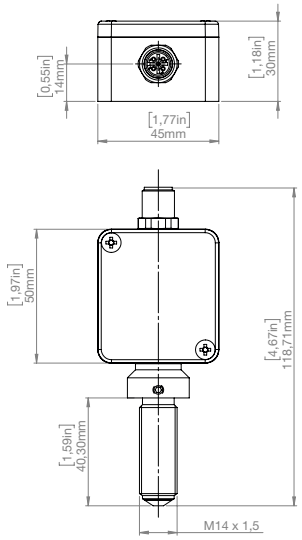
Electronic "IFV"



Electronic IFV/IF0 with coolings fin (option "HT" +350 °C)

1/01 - 2024

Electronics Model EHVST



Electronics Model EHVMT