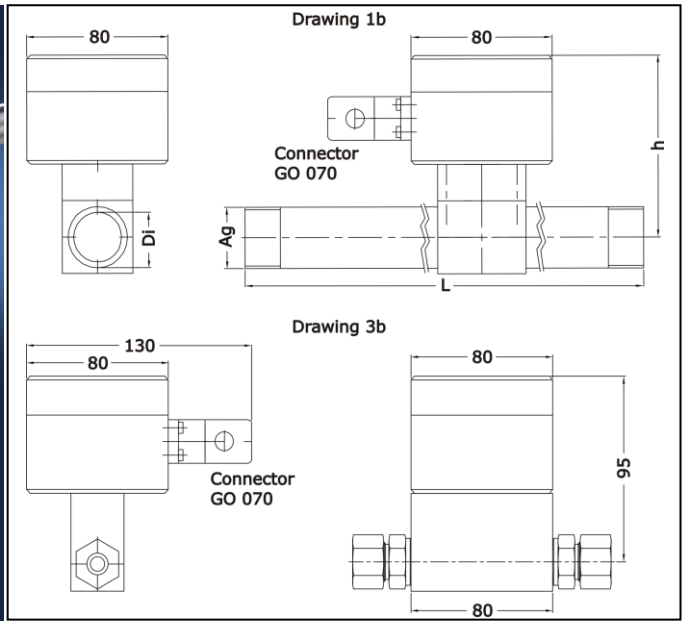
Thermal Flow Sensor TA Di
with integrated transducer

höntzsch
flow measuring technology

Thermal flow sensor TA Di with integrated transducer for measuring mass flow, standard flow rate and air / gas consumption



Sensor TA Di 16…41.8 … ZG1b and TADi 16…41.8 … ZG1b/M-Bus with integrated transducer U10a/U10M
Sensor TA Di 8 … ZG3b and TA Di 8 … ZG3b/M-Bus with integrated transducer U10a/U10M

Range and examples of application

- measuring
  - compressed air and gas consumption of oxygen, nitrogen, argon e.g. in welding technology
  - leakage flows
  - in extract and supply air
  - in air in rough vacuum range at pressures above 200 hPa abs
  - monitoring inerting of nuclear processes

Measured variables

- standard flow rate [m³/h, l/min], mass flow [kg/h], standard velocity [m/s], standard conditions adjustable; default: temperature t_n = +21 °C pressure p_n = 1014 hPa

Design

- measuring tube with transducer integrated in the connection housing
- thin-film sensor element

Advantages

- high turndown Nv (0.2 ... 150 m/s)
- range from 0.04 Nm³/h (0.6 l/min)
- low degree of measurement uncertainty, even with the lowest flow velocities
- direct air/gas mass flow-proportional measurement; additional pressure and temperature measurement unnecessary
- sensor has no moving parts
- stainless steel sensor housing
- wide working temperature and pressure range
- low installation costs
- negligible pressure loss thanks to virtually unrestricted passageway
- high durability and long-term stability
- sterilisable (sensor material-resistance allowing)
- optional: LCD-display, keypad
- configurable and fully-customisable PC software

Sample gases

- clean gases, gas mixtures: air, nitrogen, oxygen, methane, natural gas, argon, hydrogen, butane, propane, carbon dioxide, helium, sulphur hexafluoride, landfill gas ...
- calibration carried out in a wide range of gases and gas mixtures to achieve the best possible measurement uncertainty

Functional principle

- measurement of flow according to the heat transfer method
- measurement is temperature-compensated over the complete range of temperature operating conditions

Particles, humidity in the gas

- particles such as dust and fibres do not affect the measurement as long as they are not abrasive and do not adhere to the sensor
- under standard atmospheric conditions deviations in values as a result of variable air humidity are covered by the measurement uncertainty specifications

Model designation (example)

TA Di	8	G	E	60 m/s	140	p16	ZG3b	/M-Bus
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

Basic types

		Article No. (U10a)	Article No. (U10M)
TA Di 8 GE	60 m/s / 140 / p16 ZG3b	B016/505	
TA Di 8 GE	60 m/s / 140 / p16 ZG3b/M-Bus		B016/565
TA Di 8 GE	120 m/s / 140 / p16 ZG3b	B016/505-120M/S	
TA Di 8 GE	120 m/s / 140 / p16 ZG3b/M-Bus		B016/565-120M/S
TA Di 8 GE	150 m/s / 140 / p16 ZG3b	B016/505-150M/S	
TA Di 8 GE	150 m/s / 140 / p16 ZG3b/M-Bus		B016/565-150M/S
TA Di 16 GE	60 m/s / 140 / p16 ZG1b	B016/504	
TA Di 16 GE	60 m/s / 140 / p16 ZG1b/M-Bus		B016/564
TA Di 16 GE	120 m/s / 140 / p16 ZG1b	B016/504-120M/S	
TA Di 16 GE	120 m/s / 140 / p16 ZG1b/M-Bus		B016/564-120M/S
TA Di 16 GE	150 m/s / 140 / p16 ZG1b	B016/504-150M/S	
TA Di 16 GE	150 m/s / 140 / p16 ZG1b/M-Bus		B016/564-150M/S
TA Di 21.6 GE	60 m/s / 140 / p16 ZG1b	B016/500	
TA Di 21.6 GE	60 m/s / 140 / p16 ZG1b/M-Bus		B016/560
TA Di 21.6 GE	120 m/s / 140 / p16 ZG1b	B016/500-120M/S	
TA Di 21.6 GE	120 m/s / 140 / p16 ZG1b/M-Bus		B016/560-120M/S
TA Di 21.6 GE	150 m/s / 140 / p16 ZG1b	B016/500-150M/S	
TA Di 21.6 GE	150 m/s / 140 / p16 ZG1b/M-Bus		B016/560-150M/S
TA Di 27.2 GE	60 m/s / 140 / p16 ZG1b	B016/501	
TA Di 27.2 GE	60 m/s / 140 / p16 ZG1b/M-Bus		B016/561
TA Di 27.2 GE	120 m/s / 140 / p16 ZG1b	B016/501-120M/S	
TA Di 27.2 GE	120 m/s / 140 / p16 ZG1b/M-Bus		B016/561-120M/S
TA Di 27.2 GE	150 m/s / 140 / p16 ZG1b	B016/501-150M/S	
TA Di 27.2 GE	150 m/s / 140 / p16 ZG1b/M-Bus		B016/561-150M/S
TA Di 35.9 GE	60 m/s / 140 / p16 ZG1b	B016/502	
TA Di 35.9 GE	60 m/s / 140 / p16 ZG1b/M-Bus		B016/562
TA Di 35.9 GE	120 m/s / 140 / p16 ZG1b	B016/502-120M/S	
TA Di 35.9 GE	120 m/s / 140 / p16 ZG1b/M-Bus		B016/562-120M/S
TA Di 35.9 GE	150 m/s / 140 / p16 ZG1b	B016/502-150M/S	
TA Di 35.9 GE	150 m/s / 140 / p16 ZG1b/M-Bus		B016/562-150M/S
TA Di 41.8 GE	60 m/s / 140 / p16 ZG1b	B016/503	
TA Di 41.8 GE	60 m/s / 140 / p16 ZG1b/M-Bus		B016/563
TA Di 41.8 GE	120 m/s / 140 / p16 ZG1b	B016/503-120M/S	
TA Di 41.8 GE	120 m/s / 140 / p16 ZG1b/M-Bus		B016/563-120M/S
TA Di 41.8 GE	150 m/s / 140 / p16 ZG1b	B016/503-150M/S	
TA Di 41.8 GE	150 m/s / 140 / p16 ZG1b/M-Bus		B016/563-150M/S

(1) Sensor type / Design

Thermal flow sensor TA Di designed as measuring tube

(2) Dimensions

Measuring tube inside Ø Di [mm]	Installation length L [mm]	Installation height h [mm]	Tube connection on both sides
8.0	80 mm + SRV *	95	via onsite tubes 12 x 2 mm
16.0	480	95	Ag R 1/2" ** Gg RP 1/2"
21.6	650	100	Ag R 3/4" ** Gg RP 3/4"
27.2	820	100	Ag R 1" ** Gg RP 1"
35.9	1080	100	Ag R 1 1/4" ** Gg RP 1 1/4"
41.8	1250	105	Ag R 1 1/2" ** Gg RP 1 1/2"

*** SRV : mechanical joint on both sides**
**** Ag : Whitworth tapered pipe thread according to DIN 2999**
Gg : counter thread

Input/output section

to be provided for TA Di 8 on site - tubes 12 x 2 mm, 160 mm (input) / 80 mm (output) laid straight; no additional input/output section necessary for other measuring tubes; length of input section 2/3 of installation length L and output section 1/3 of installation length L

(3) Measuring gases

air, clean gases, gas mixtures with consistent ratio of mixture

(4) Materials in contact with the medium

stainless steel, glass, epoxy resin, Viton®

(5) Measuring ranges* air / nitrogen

Basic type / measuring range	in m³/h	in kg/h	in l/min	in m/s	1 m³/h equates to [m/s]
TA Di 8 ...					
... 60 m/s ...	0.04 ... 11	0.05 ... 13	0.6 ... 181	0.2 ... 60	5.53
... 120 m/s ...	0.04 ... 22	0.05 ... 26	0.6 ... 362	0.2 ... 120	5.53
... 150 m/s ...	0.04 ... 27	0.05 ... 33	0.6 ... 452	0.2 ... 150	5.53
TA Di 16 ...					
... 60 m/s ...	0.15 ... 43	0.18 ... 52	2.4 ... 729	0.2 ... 60	1.38
... 120 m/s ...	0.15 ... 86	0.18 ... 104	2.4 ... 1448	0.2 ... 120	1.38
... 150 m/s ...	0.15 ... 109	0.18 ... 130	2.4 ... 1810	0.2 ... 150	1.38

(5) Measuring ranges* air / nitrogen (cont'd)

Basic type / measuring range	in m³/h	in kg/h	in l/min	in m/s	1 m³/h equates to [m/s]
TA Di 21.6 ...					
... 60 m/s ...	0.27 ... 79	0.32 ... 95	4.4 ... 1319	0.2 ... 60	0.758
... 120 m/s ...	0.27 ... 158	0.32 ... 190	4.4 ... 2638	0.2 ... 120	0.758
... 150 m/s ...	0.27 ... 198	0.32 ... 238	4.4 ... 3298	0.2 ... 150	0.758
TA Di 27.2 ...					
... 60 m/s ...	0.42 ... 125	0.50 ... 151	7.0 ... 2092	0.2 ... 60	0.478
... 120 m/s ...	0.42 ... 250	0.50 ... 300	7.0 ... 4184	0.2 ... 120	0.478
... 150 m/s ...	0.42 ... 314	0.50 ... 377	7.0 ... 5230	0.2 ... 150	0.478
TA Di 35.9 ...					
... 60 m/s ...	0.73 ... 219	0.88 ... 263	12.1 ... 3644	0.2 ... 60	0.274
... 120 m/s ...	0.73 ... 438	0.88 ... 526	12.1 ... 7288	0.2 ... 120	0.274
... 150 m/s ...	0.73 ... 547	0.88 ... 657	12.1 ... 9110	0.2 ... 150	0.274
TA Di 41.8 ...					
... 60 m/s ...	1.0 ... 296	1.2 ... 356	16.5 ... 4949	0.2 ... 60	0.202
... 120 m/s ...	1.0 ... 592	1.2 ... 712	16.5 ... 9880	0.2 ... 120	0.202
... 150 m/s ...	1.0 ... 741	1.2 ... 890	16.5 ... 12350	0.2 ... 150	0.202

* all standard flow rate and standard flow velocity specifications relating to a standard pressure p_N = 1014 hPa and a standard temperature t_P = +21 °C (294.15 K)

Measurement uncertainty / Time constant / Damping

measurement uncertainty for flow rates NV/t at 1014 hPa and +21 °C
less than/equal to 40 m/s : 2 % of actual value + 0.02 m/s
greater than 40 m/s : 2.5 % of actual value

time constant (U10a) : adjustable to 1 s and multiples
damping (U10M) : adjustable to 0.5 s and multiples

Storing a characteristic for use in other gases

based on	Article No.
calibration in air and conversion of the air characteristic for another test gas gas, up to 60 m/s	TA_TRANSFO (on request)
real gas calibration to achieve the best possible measurement uncertainty	(on request)

(6) Permissible temperature

medium	-10 ... +140 °C	
ambient	-25 ... +50 °C	
	-5 ... +50 °C	with option 'LCD'

(7) Maximum working pressure

max. 16 bar / 1.6 MPa overpressure

greater than 16 bar / 1.6 MPa on request

(8) Design	
TA Di 8	measuring tube with connection housing and integrated transducer U10a/U10M, according to Drawing 3b
TA Di 16 ... 41.8	measuring tube with connection housing and integrated transducer U10a/U10M, according to Drawing 1b

(9) Bus system	
/M-Bus	M-Bus according to EN13757-2 and EN13757-3

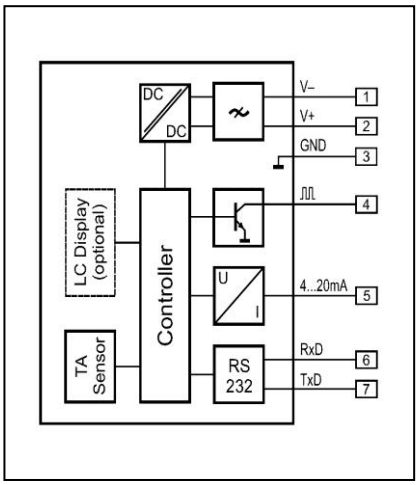
Degree of protection sensor / Installation position
IP68, IEC 529 and EN 60 529
position unrestricted under atmospheric pressure, at overpressure no intake flow from above

Connection housing AS80	
measurements	80 / 80 / 60 mm (L / W / H)
connection	GO 070 with terminal screws
terminal connections	see Page 6 (U10a) and Page 7 (U10M)
degree of protection	IP65, IEC 529 and EN 60 529
material	aluminium, coated

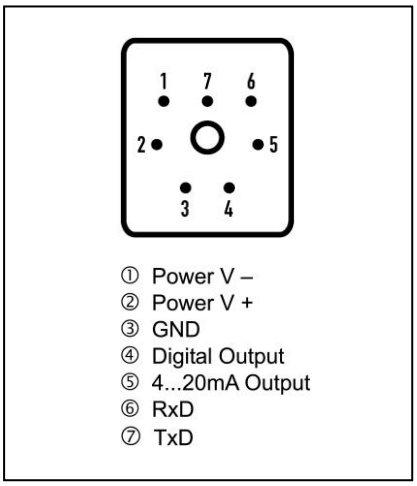
Transducer U10a (4 ... 20 mA) integrated in sensor connection housing	
analog output flow	4 ... 20 mA (linear), output every second resistance max. 400 Ohm
pulse output	for quantity measurement open collector / max. 30 V, 20 mA / duration 0.1 s max. pulse frequency 1 Hz per volume unit NV
PC interface	RS232
	output signal electrically isolated from power supply
connection	GO 070 FA M surface-mounted connector with flange mounted on connection housing, GO 070 WF cable socket with PG 11 cable gland with screw contacts, for cables with outside diameter 4 ... 10 mm and wire cross section 0.14 ... 0.5 mm²
power supply	24 V DC +/- 5 %
power input	< 5 W power cables electrically isolated from connection cables
housing	AS80
EMC	EN 61 000-6-2 and EN 61 000-6-4
setting parameter	analog output, time constant, profile factor, tube inside diameter, quantity pulse working pressure, standard conditions, standard density
setting parameter with PC software UCOM and adapter (see Accessories) alterable	

Options (U10a only)		
	Description	**Article No.**
LCD display with quantity counter	illuminated, inbuilt, 2 x 16 digit, 3 mm high working temperature range -5 ... +50 °C, row 1 - instantaneous value (volume flow) row 2 - quantity counter (volume)	A010/007

Optional LCD in housing cover



Wiring diagram U10a



Pin assignment GO 070

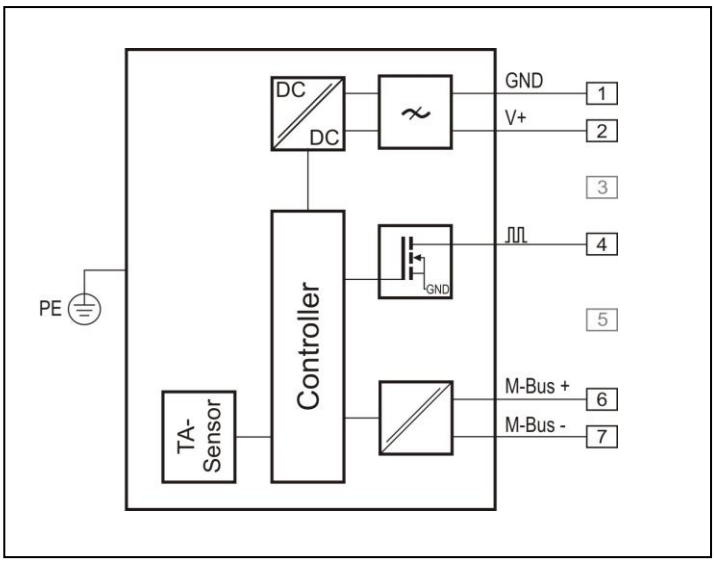
Options (U10a only, cont'd)

	Description	Article No.
ATEX protection Ex nA IIC T4 Gc X Ex tc IIIC T135°C Dc X	 Category 3G (Zone 2) Category 3D (Zone 22)	TAEX2

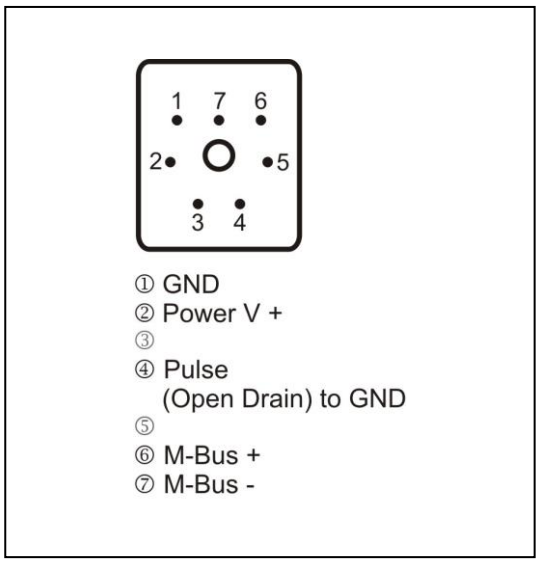
Transducer U10M (M-Bus) integrated in sensor connection housing

pulse output	for quantity measurement, open drain to GND (Pin4) / max. 32 V, 20 mA / duration 0.5 s, max. pulse frequency 1 Hz per volume unit NV internal current limiting / thermal circuit breaker
connection	GO 070 FA M surface-mounted connector with flange mounted on connection housing, GO 070 WF cable socket with PG 11 cable gland with screw contacts, for cables with outside diameter 4 ... 10 mm and wire cross section 0.14 ... 0.5 mm²
bus system	M-Bus according to EN13757-2 and EN13757-3, measurable variables in Nl/s, Nl/min, Nl/h, Nm³/s, Nm³/min, Nm³/h and kg/h, also quantity counter in m³ selectable, bus address (0) and baud rate (2400) preset and alterable via M-Bus, galvanically isolated
power supply	24 V DC +/- 10 %
power input	< 2 W, power cables electrically isolated from connection cables
housing	AS80
EMC	EN 61 000-6-2 and EN 61 000-6-4
setting parameter	physical variables, baud rate, bus address, damping, profile factor, tube inside diameter, standard conditions, standard density, working pressure, quantity pulse, limit value
setting parameter with PC software UCOM (see Accessories) alterable	

Note:
- After each startup the first communication determines the protocol to be used via the M-Bus. Switching between M-Bus protocol and access via UCOM is done with a new startup.
- Configuration of single devices in the bus is possible via UCOM software.
- Communication parameter for using UCOM software:
  2400 baud / even parity / 8 data bits / 1 stop bit / no flow control



Wiring diagram U10M



Pin assignment GO 070

Options (U10M only)

	Description	Article No.
local LCD with keypad and quantity counter	illuminated, in housing cover, multi rows, grafical, temperature range -5 ... +50 °C, display options: – instantaneous value (volume flow and temperature) – volume - grafical overview of the instantaneous values of the last 10 seconds	A010/530

Accessories

	Description	Article No.
PC software UCOM	for configuring the transducer via RS232 (U10a) or M-Bus (U10M)	A010/052
programming adapter G0 070 / RS232	for UCOM software, PC connection Sub-D 9-pin, plug to mains supply 230VAC/24VDC	A010/004
USB / RS232 interface converter	connects PC with USB interface and Höntzsch programming adapter with RS232 interface, PC connection: USB plug type A programming adapter: Sub-D 9-pin	A010/100
calibration certificate Nv	6 standard calibration values (minimum)	KLB

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