# Thermal flow sensor TA Di with integrated measuring transducer

**höntzsch**
flow measuring technology



Sensor TA Di with integrated transducer U10b

## Functional principle
Measurement of flow according to the heat transfer method

## Measured variables
- standard velocity, standard flow rate, mass flow and temperature
- standard conditions adjustable; default:
  temperature $t_n$ = +21 °C
  pressure $p_n$ = 1014 hPa

## Gases
- pure gases, gas mixtures: air, nitrogen, methane, natural gas, propane, butane, argon, carbon dioxide, sulphur hexafluoride, helium, hydrogen, oxygen, landfill gas, ...
- switching between the calibration characteristics of various measurement gases is possible in running operation

## Output variables
- 2 analog outputs 4 … 20 mA (flow and temperature)
- quantity pulse / limit value
- performance data via WiFi
- M-Bus

## Design
Measuring tube with transducer integrated in the connection housing

## Advantages
- high turndown ratio (up to 1 : 1000)
- measuring range from 0.04 Sm³/h (0.6 Sl/min)
- low measuring uncertainty, even at lowest flow velocities
- direct mass flow measurement; additional pressure and temperature measuring is not necessary
- sensor has no moving parts
- stainless steel sensor housing
- higher working temperature and pressure ranges
- low installation costs
- negligible pressure drop thanks to virtually unrestricted passageway
- high durability and long-term stability
- sterilisable (sensor material resistance allowing)
- optional: LCD with keypad, WiFi, M-Bus
- values can be displayed and parameters set simply via the display and keypad or web interface

## Range and examples of application
- measuring
  - compressed air and gas consumption of oxygen, nitrogen, argon e.g. in welding technologies
  - leakage flow
  - outgoing air, burner supply air
  - monitoring inerting of nuclear processes
  - in air in low vacuum range at pressures greater than 200 hPa abs.

## Particles, condensation, humidity in the gas
- charges in the gas caused by particles, dust and fibres do not affect the measurement as long as there is no abrasion and no deposit on the sensor
- deviations in values as a result of variable air humidity in normal atmospheric conditions are covered by the measuring uncertainty specifications

## Model designation (example)

| TA Di | 8 | G | E | 60 m/s | 140 | p16 | ZG3d |
|-------|---|---|---|--------|-----|-----|------|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |

## Basic types

| TypE | Article no. |
|------|-------------|
| TA Di  8   GE   60 m/s  / 140 / p16 ZG3d | B016/510 |
| TA Di  8   GE 120 m/s  / 140 / p16 ZG3d | B016/510-120M/S |
| TA Di  8   GE 150 m/s  / 140 / p16 ZG3d | B016/510-150M/S |
| TA Di 16   GE   60 m/s  / 140 / p16 ZG1d | B016/511 |
| TA Di 16   GE 120 m/s  / 140 / p16 ZG1d | B016/511-120M/S |
| TA Di 16   GE 150 m/s  / 140 / p16 ZG1d | B016/511-150M/S |
| TA Di 21.6 GE   60 m/s  / 140 / p16 ZG1d | B016/512 |
| TA Di 21.6 GE 120 m/s  / 140 / p16 ZG1d | B016/512-120M/S |
| TA Di 21.6 GE 150 m/s  / 140 / p16 ZG1d | B016/512-150M/S |
| TA Di 27.2 GE   60 m/s  / 140 / p16 ZG1d | B016/513 |
| TA Di 27.2 GE 120 m/s  / 140 / p16 ZG1d | B016/513-120M/S |
| TA Di 27.2 GE 150 m/s  / 140 / p16 ZG1d | B016/513-150M/S |
| TA Di 35.9 GE   60 m/s  / 140 / p16 ZG1d | B016/514 |
| TA Di 35.9 GE 120 m/s  / 140 / p16 ZG1d | B016/514-120M/S |
| TA Di 35.9 GE 150 m/s  / 140 / p16 ZG1d | B016/514-150M/S |
| TA Di 41.8 GE   60 m/s  / 140 / p16 ZG1d | B016/515 |
| TA Di 41.8 GE 120 m/s  / 140 / p16 ZG1d | B016/515-120M/S |
| TA Di 41.8 GE 150 m/s  / 140 / p16 ZG1d | B016/515-150M/S |
| TA Di 53.1 GE   60 m/s  / 140 / p16 ZG1d | B016/516 |
| TA Di 53.1 GE 120 m/s  / 140 / p16 ZG1d | B016/516-120M/S |
| TA Di 53.1 GE 150 m/s  / 140 / p16 ZG1d | B016/516-150M/S |

## (1) Sensor type / design

Thermal flow sensor TA Di designed as measuring tube

## (2) Dimensions

| measuring tube inside diameter Ø Di [mm] | installation length L [mm] | installation height h [mm] | tube connection on both sides |
|------|------|------|------|
| 8.0 | 80 mm + SRV * | 104 | via on-site tubes 12 x 2 mm |
| 16.0 | 480 | 110 | Ag R 1/2" ** Gg RP 1/2" |
| 21.6 | 650 | 110 | Ag R 3/4" ** Gg RP 3/4" |
| 27.2 | 820 | 110 | Ag R 1" ** Gg RP 1" |
| 35.9 | 1080 | 110 | Ag R 1 1/4" ** Gg RP 1 1/4" |
| 41.8 | 1250 | 110 | Ag R 1 1/2" ** Gg RP 1 1/2" |
| 53.1 | 1600 | 116 | Ag R 2" ** Gg RP 2" |

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

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## 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 constant ratio of mixture

## (4) Materials in contact with the medium

stainless steel 1.4571, 1.4305, 1.4404, glass, epoxy resin, silicone (silicone-free on request), FKM

## (5) Measuring ranges* air/nitrogen

| basic types / measuring range | in Sm³/h | | in kg/h | | in Sl/min | | in Sm/s | | 1 Sm³/h equates to [Sm/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 |
| | | | | | | | | | |
| **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 |
| | | | | | | | | | |
| **TA Di 53.1 ...** | | | | | | | | | |
| ... 60 m/s ... | 1.6 ... | 478 | 1.9 ... | 574 | 31.7 ... | 9567 | 0.2 ... 60 | | 0.125 |
| ... 120 m/s ... | 1.6 ... | 957 | 1.9 ... | 1150 | 31.7 ... | 19167 | 0.2 ... 120 | | 0.125 |
| ... 150 m/s ... | 1.6 ... | 1196 | 1.9 ... | 1438 | 31.7 ... | 23967 | 0.2 ... 150 | | 0.125 |

\* 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 / damping

measurement uncertainty for flow velocities Sv with 1014 hPa and +21 °C in air and gases, as far as calibration performed in real gas

less than / equal to 40 m/s: 2 % v. M. + 0.02 m/s
greater than 40 m/s      : 2.5 % v. M.
damping              : adjustable to 0.5 s and multiples

## Measurable gases

| Medium | Calibration | Medium | Calibration |
|---|---|---|---|
| air | calibration in the medium | carbon dioxide ($CO_2$) | transformed characteristics |
| nitrogen ($N_2$) | transformed characteristics | landfill gas (40 % $CH_4$) | transformed characteristics |
| argon (Ar) | transformed characteristics | helium (He) | transformed characteristics |
| methane ($CH_4$) | transformed characteristics | hydrogen ($H_2$) | transformed characteristics |
| propane ($C_3H_8$) | transformed characteristics | oxygen ($O_2$) | transformed characteristics |
| butane ($C_4H_{10}$) | transformed characteristics | custom 1,2 | customised calibrations |

Calibration always performed in air, in addition, characteristics transformation for the listed media.

The media stored for the realisation of the smallest measurement uncertainties are generally also calibrated in real gas.

On request, additional calibration data for up to two further calibrations can be stored in other media or as special calibrations.

## (6) Permissible temperature

| | |
|---|---|
| medium | -10 ... +140 °C |
| ambient | -25 ...  +60 °C<br>-20 ...  +60 °C      with option 'LCD' |

## (7) Pressure resistance

max. 16 bar / 1.6 MPa above atmospheric

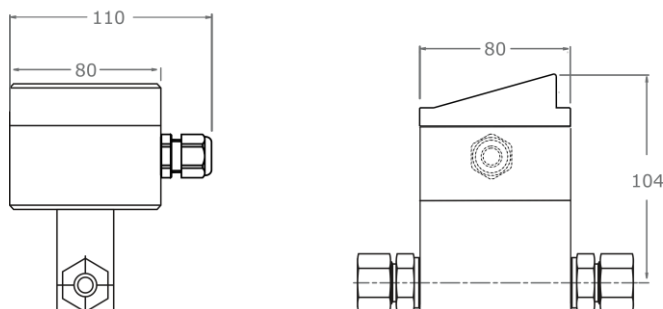greater than 16 bar / 1.6 MPa on request

## (8) Design

| | |
|---|---|
| TA Di 8 | measuring tube with connection housing and integrated transducer U10b, according to Drawing 3d |
| TA Di 16 ... 53.1 | measuring tube with connection housing and integrated transducer U10b, according to Drawing 1d |

Drawing 1d



Drawing 3d

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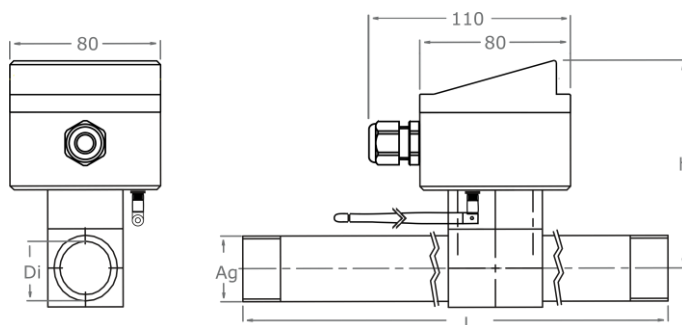
## Ingress protection / fitting position

| | |
|---|---|
| sensor IP68, IEC 529 and EN 60 529 | |
| any installation position with atmospheric pressure, with pressures above atmospheric direction of flow not from above | |

## Connection housing AS80

| | |
|---|---|
| measurements | 80 / 80 / 71 (60) mm (L / W / H) |
| connection | Cable gland for cables with an outside diameter 5 … 9 mm, terminal clamps for strands with cross section 0.2 … 1.5 mm². Comply with the standards and regulations applicable to the cable routing. |
| protection class | IP65, IEC 529 and EN 60 529 |
| Material | powder-coated aluminium |

## Measuring transducer design U10b, integrated in the sensor connection housing

| | |
|---|---|
| analog output 1 flow or temperature | 4 … 20 mA (linear), update every 500 ms burden max. 500 Ohm |
| analog output 2 * flow or temperature | 4 … 20 mA (linear), update every 500 ms burden max. 500 Ohm |
| measured variable flow | Sm/s, Sft/min, Scfm, Sl/s, Sl/min, Sl/h, Sm³/s, Sm³/min, Sm³/h and kg/h counter in Sm³ |
| measured variable temperature | °C, °F |
| pulse output | for quantity measurement or as a limit value, open drain, max. 32 V, 20 mA, pulse duration 0.5 s, max. pulse frequency 1 Hz per volume unit SV, internal current limiting, thermal circuit breaker |
| power supply | 24 V DC ± 10 % |
| power consumption | less than 3 W |
| housing | AS80 |
| EMC | EN 61 000-6-2 and EN 61 000-6-4 |
| setting parameter | physical variables, initial and final value of the analog outputs, time constants, profile factor, pipe inside diameter, quantity pulse, limit value, working pressure, standard density, WiFi settings and more parameters can be changed via display and keypad or web interface |
| * Analog output 2 is not applicable, if sensor is designed with M-Bus option. | |

## Options

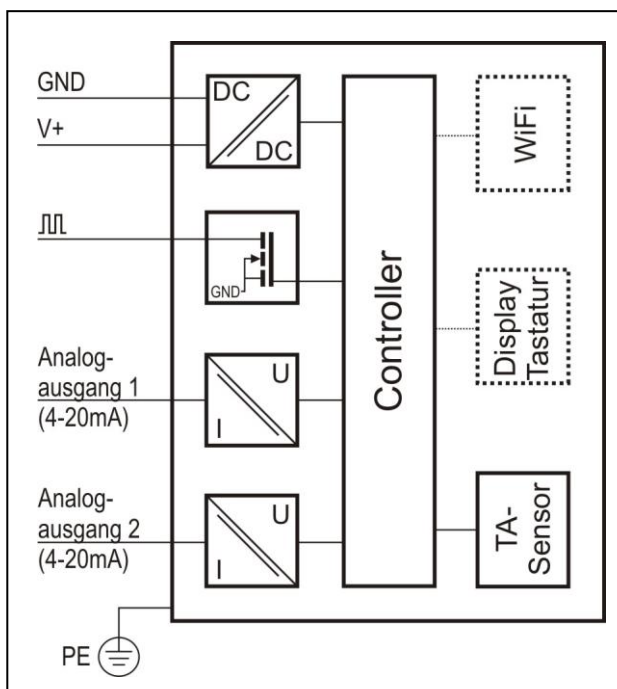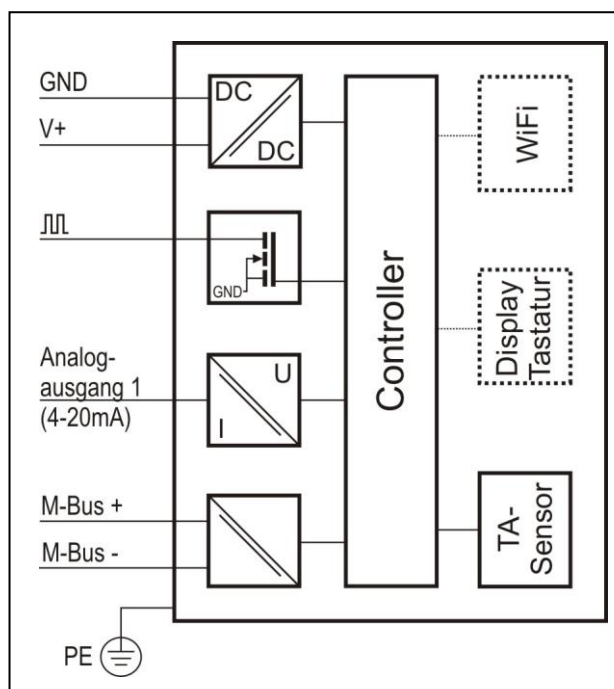| | Description | Article no. |
|---|---|---|
| local LCD with keypad and quantity counter | illuminated, in housing cover, multi-row, graphic-capable, temperature range -20 ... +60 °C, display options:<br>- instantaneous value (volume flow and temperature)<br>- volume<br>- graphical overview of the instantaneous values of the last 10 seconds<br>- status information | A010/530 |
| separate housing cover with local LCD, keypad and quantity counter | see above | A010/531 |
| WiFi module | compatible with the WLAN standards IEEE 802.11b/g/n (2.4 GHz), rotatable and pivotable round antenna. Permits parameter setting and display of the measured value course via web interface. Use as local hotspot or integration in the existing WLAN possible. | WIFI |
| ATEX type of protection category 3G and 3D (zone 2 and 22) | Ex ec IIC T4 Gc X *<br>Ex tc IIIC T135 °C Dc X *<br>* option display and keypad not possible | TAEX2E |



Display and keypad (optional)



WiFi (optional)

Wiring diagram U10b, standard

Wiring diagram U10b with M-Bus option

| M-Bus option | | |
|---|---|---|
| | **Description** | **Article no.** |
| M-Bus option | M-Bus according to EN13757-2 and EN13757-3, measurable variables: SNl/s, Sl/min, Sl/h, Sm³/s, Sm³/min, Sm³/h and kg/h, as well as quantity counter in Sm³ readable, bus address (0) and baud rate (2400) preset and alterable via M-Bus, galvanically isolated, Bus Load: 2 Unit Loads (3mA) | M-BUS OPTION |
| | Setting parameter: physical variables, baud rate, bus address, damping, profile factor, tube inside diameter, standard basis, standard density, working pressure, quantity pulse, limit value | |
| ATEX type of protection category 3G and 3D (zone 2 and 22) | CE <Ex> II 3 G Ex ec IIC T4 Gc X* CE <Ex> II 3 D Ex tc IIIC T135°C Dc X* * option display and keypad not possible | TAEX2EM |

| Accessories | | |
|---|---|---|
| | **Description** | **Article no.** |
| calibration certificate Sv | min. 6 standard calibration values | KLB |

Subject to alteration