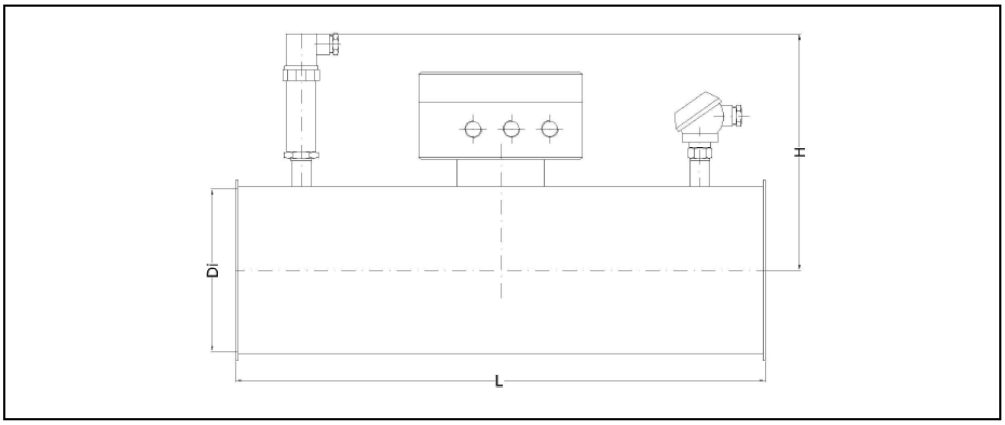
Westenberg
Wind Tunnels
& Measurement Systems

Vortex Measuring Tube VA TP DN Exactflow II - for test bench applications

Vortex flow sensor VA TP DN ExactFlow II for accurate gas mass flow measuring with long-term stability under extreme conditions, also for application in condensation and particle-laden gases



Measurable variable
- gas mass flow m/t
- standard flow rate NV/t
- actual flow rate V/t

Design
- measuring tube

Functional principle
- vortex counting for flow rate combined with absolute pressure and temperature measurement
- ultrasonic measurement of the vortex shedding frequency f


Karman's vortex street

Advantages
- long-term stability even under extreme conditions
- high turndown ratio (1:100)
- low starting value
- no moving parts
- corrosion resistant
- time constant 125 ms
- operates to a large extent irrespective of gas composition
- low pressure loss
- as a rule no gas filter necessary
- easy process parameter adjustment
- calibration characteristic adaptable to user's factory standard

Medium
- primarily single-phase gas mixtures with air, nitrogen, oxygen, methane, natural gas, flare gas, carbon monoxide, argon as dominant component, combustion exhaust gas, bio gas, sewage gas. Other gases on request.

Range and examples of application

- flow measurement of air, waste gas, engine intake air, exhaust emissions, process gas, bio and sewage gas, gas laden with particles, dust and fibres
- filter testing devices
- depending on the density, condensation around the sensor may affect measurements.

Particles, condensation, humidity in the gas

- charges in the gas caused by particles such as dust and fibres do not affect the measurement, as long as the sensor exhibits no abrasion or deposits
- relative gas humidity of less than 100 % does not affect the measurement uncertainty

Model designation / Order code (example)

VA TP	DN80	ExactFlow	G	E	ZG1
1	2	3	4	5	6

Basis-type

VA TP DN 80 ExactFlowII GE ZG1
VA TP DN 100 ExactFlowII GE ZG1
VA TP DN 120 ExactFlowII GE ZG1
VA TP DN 140 ExactFlowII GE ZG1
VA TP DN 150 ExactFlowII GE ZG1
VA TP DN 175 ExactFlowII GE ZG1
VA TP DN 200 ExactFlowII GE ZG1

(1)Design / functional principle

Measuring tube / vortex flow sensor VA40 for measuring actual flow rate in combination with highprecision absolute pressure sensor 0.6 ... 1.2 bar abs.; 0.1 % FSO and PT100 temperature sensor 4- wire, class AA DIN EN 60751

(2) Dimensions

nominal diameter DN [mm]	inside diameter Di [mm]	sensor length [mm]	measurement H [mm]	wall thickness [mm]
80	78	486	219	1
100	99	486	219,5	2
120	119	486	219,5	2
140	136	486	217,5	1
150	149	486	219,5	2
175	174	486	228	2
200	199	486	244,5	2

Tube connection
quick-action tension ring (see Page 6)
smooth tube ends, DIN or ANSI integral flange connection on request

(3) Measurable variables
gas mass flow m/t
standard flow rate NV/t
actual flow rate V/t
working pressure
working temperature

Measuring range

nominal diameter	measuring tube inside diameter [mm]	mass flow* [kg/h]	actual flow rate [m³/h]	average flow velocity [m/s]
DN 80	78	8 ... 820	7 ... 680	0,4 ... 40
DN 100	99	13 ... 1320	12 ... 1100	0,4 ... 40
DN 120	119	19 ... 1920	17 ... 1600	0,4 ... 40
DN 140	136	25 ... 2510	21 ... 2090	0,4 ... 40
DN 150	149	30 ... 3010	26 ... 2510	0,4 ... 40
DN 175	174	41 ... 4100	35 ... 3420	0,4 ... 40
DN 200	199	54 ... 5360	45 ... 4470	0,4 ... 40

The standard flow rate measuring range NV/t results from the measuring range of the actual flow rate BV/t as well as working pressure p_B, temperature t_B, standard pressure p_N and temperature t_N from the equation $NV/t = BV/t * p_B * T_N / (p_N * T_B)$. Pressure as absolute and temperature in Kelvin.
* mass flow exemplarily for = t_B +21 °C and p_B = 1013 hPa equal to a standard density of 1.2 kg/m³

measurement uncertainty	< 1 % of measured value + 0.1 % of terminal value (with +20 °C / 1000 hPa)
repeatability	± 0.15 % of measured value
input/output sections	in order to achieve as great a measurement accuracy as possible, an input section of 20 x Di in conjunction with a flow rectifier (Gl-R) (see Accessories) is recommended. The output section should be no shorter than 10 x Di. The input/output sections can be reduced and operation without flow rectifier is also possible. However, this leads in both cases to increased measurement uncertainties, which are dependent on the path of the pipeline, disturbances and the actual operating flow velocity. With selected suction conditions, such as a suction filter, the input sections can be shortened to 10 x Di.

(4) Medium

design	Gases
... G ...	primarily single-phase mixtures with air, nitrogen, oxygen, methane, natural gas, flare gas, ammonia, argon, carbon monoxide, steam ... as dominant component, combustion exhaust gas, bio gas, sewage gas

(5) Materials in contact with the medium

design	material
... E ...	stainless steel 1.4571, 1.4404, 1.4301, ceramics, VITON_seals

Max. working pressure
up to 1.2 bar / 120 kPa overpressure,
higher working pressure requirements in conjunction with integral flange connection and other pipelines on request

Working temperature range

Of the medium	-20 ... +80 °C (up to +240 °C on request)
permissible ambient	-20 ... +80 °C

(6) Design
measuring tube with connection housing

Transducer and connection housing

dimensions	150 / 100 / 80 mm (L / W / H)
connection	'push in' PCB terminals; core connection possible without tools; separate strands by applying pressure with a pen or screwdriver; for wire cross-section 0.14 ... 1.5 mm²; bush for shielded cables with external diameter 5 ... 10 mm, contacting of the copper overall shielding by the metallic screwed cable glands
terminal connections	
type of protection	IP65, IEC 529 and EN 60 529

Electromagnetic Compatibility (EMC)
according to EN 61 000-6-2 / IEC77

Mounting attitude
any to ensure that the sensor remains operative in horizontal pipeline duct even with moderate condensation, installation should be carried out with the connection housing pointing sideward

Transducer VTP-VA-AS102 in the connection housing

Eingang Vortex-Frequenz	Auflösung : 0,125 Hz
Eingang t: Pt100	Auflösung : 0,1 K
Eingang p: 4-20 mA	Auflösung : 1 hPa Zeitkonstante : 0,125 s
2 Analogausgänge	4 ... 20 mA, Bürde max. 500 Ohm 16 Bit Auflösung (1/65000)
Analogausgang A1 'hohe Genauigkeit'	Gasmassestrom proportional Aktualisierungszeit 0,125 s Zeitkonstante 4 sec, bei Frequenzsprung >25% 2 sec Messunsicherheit : 1 % v. M. + 0,1 % v. E.
Analogausgang A2 'kurze Zeitkonstante'	Gasmassestrom proportional Zeitkonstante 0,125 s, optional 0,065 s Messunsicherheit : 2,5 % v. M. + 0,1 % v. E.
	Die Ausgangssignale sind galvanisch von der Versorgung getrennt. Optional können die beiden Analogausgänge mit zusätzlichen Trennverstärkern galvanisch untereinander und von den Eingängen getrennt werden.
Versorgung	24 V DC, optional 12 V DC
Leistungsaufnahme	kleiner 5 W

Accessories (optional)

	Description
LCD display in housing cover	line 1: 'standard flow rate' or 'mass flow' line 2: 'temperature and pressure' or 'error code'; 2 x 16 digit, character height 5.5 mm working temp. range -20 ... +50 °C
PC software UCOM VTP	for configuration of transducers UVA TP via RS232 interface, PC connector cable RJ22 / sub-D 9-pin (seperat)
PC connector cable RJ22 / sub-D 9-pin	for configuration of transducers UVA TP in LDG16 or AS102 housing via RS232 interface in conjunction with UCOM software; transducer connection: RJ22, PC connection: sub-D, 9-pin

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
calibration certificate m/t / f	6 calibration values
DKD calibration certificate m/t / f	

Accessories (continued)

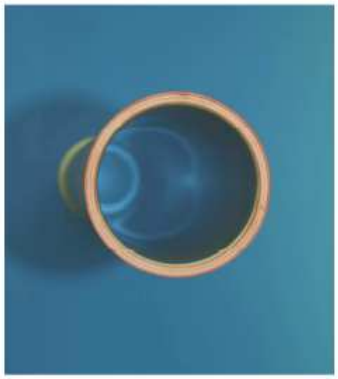
Tubes for input/output section for quick action tension ring connection

	Installation length [mm]
RS DN 80 -486	486
RS DN 80 -984	984
RS DN 100 -486	486
RS DN 100 -984	984
RS DN 120 -486	486
RS DN 120 -984	984
RS DN 140 -486	486
RS DN 140 -984	984
RS DN 140 -1984	1984
RS DN 150 -486	486
RS DN 150 -984	984
RS DN 150 -1984	1984
RS DN 175 -486	486
RS DN 175 -984	984
RS DN 175 -1984	1984
RS DN 200 -486	486
RS DN 200 -984	984
RS DN 200 -1984	1984

Flow rectifier (3-stage) with tube section for quick action tension ring connection

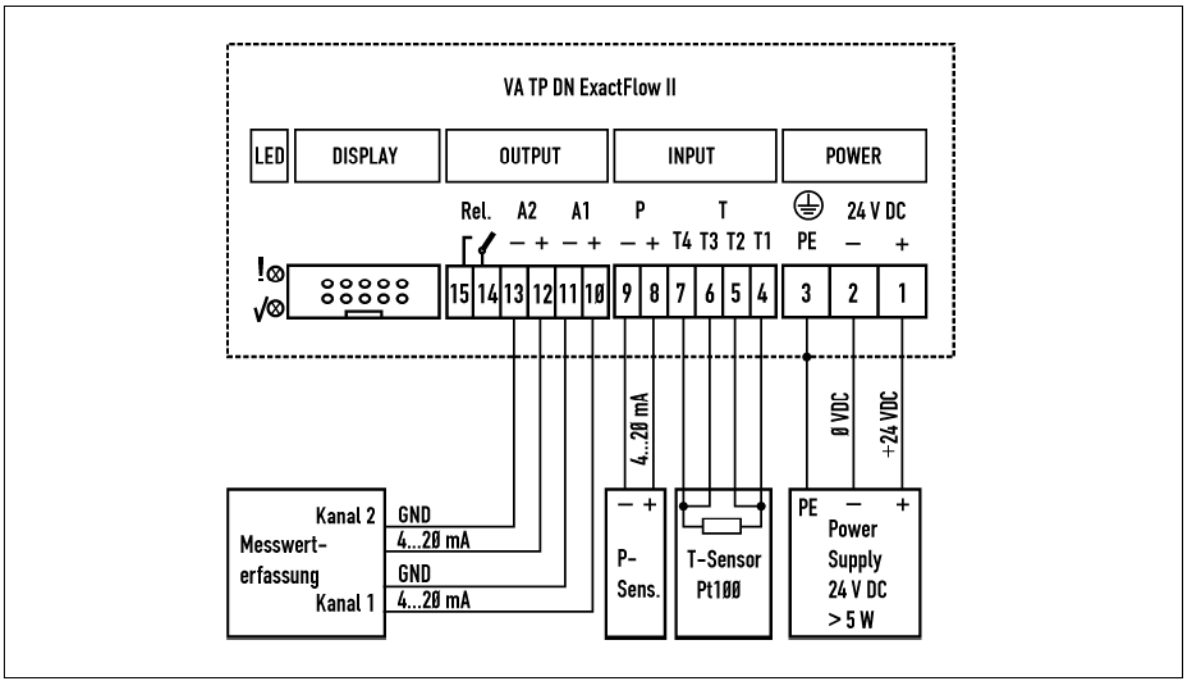
	Installation length [mm]
GL-R DN 80	200
GL-R DN 100	200
GL-R DN 120	200
GL-R DN 140	200
GL-R DN 150	200
GL-R DN 175	200
GL-R DN 200	200

Quick action tension ring
SR DN 80
SR DN 100
SR DN 120
SR DN 140
SR DN 150
SR DN 175
SR DN 200
each with cooper gasket (silicone)



Tube piece for input and output section with cooper gasket

Quick action tension ring



Anschlussschema Messumformer VTP-VA-AS102