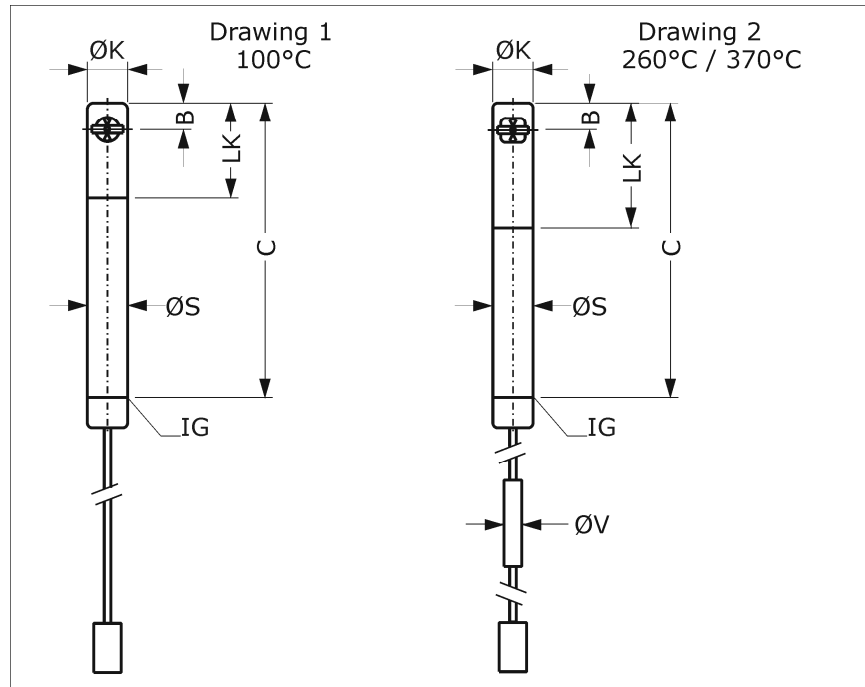




**Flow and flow rate measurement with vane wheel flow sensor FA as 16 mm cylinder probe at working temperatures of  $-40 \dots 370 \text{ }^\circ\text{C}$  for connection to a fixed or portable evaluation unit**



**Measurable variables**

- flow velocity  $v$  [m/s] and
- flow rate [m<sup>3</sup>/h] in air/gases and water/liquids
- conversion to standard velocity/standard flow rate (measuring in air/gases) by entering working pressure and temperature parameters

**Measuring range**

- 0.6 ... 120 m/s gases
- 0.06 ... 10 m/s liquids

**Medium**

- air, clean gases and gas mixtures
- water, liquids

**Functional principle**

- vane wheel flow sensor
- sensing the vane rotation; non-contact by means of inductive proximity switch

**Design**

- insertion probe with fixed cable, extendable

**Examples of application**

- flow measurement e.g. of air, exhaust gas, process gas
- in processes with varying and/or unknown gas compositions
- flow monitoring in pharmaceutical installations
- monitoring neutralisation processes
- measurement of flammable liquids
- measuring in surface waters
- measuring in non-conducting liquids such as ultra pure water, for example in the semiconductor industry

**Advantages**

- accurate measured values even in varying and/or unknown gas compositions
- turndown ratio approx. 1 : 100

- no distortion of values due to thermal radiation
- optional application in category 2 (zone 1)
- small insertion opening
- universal application spectrum
- extendable
- small pressure loss

**Connection possibilities**

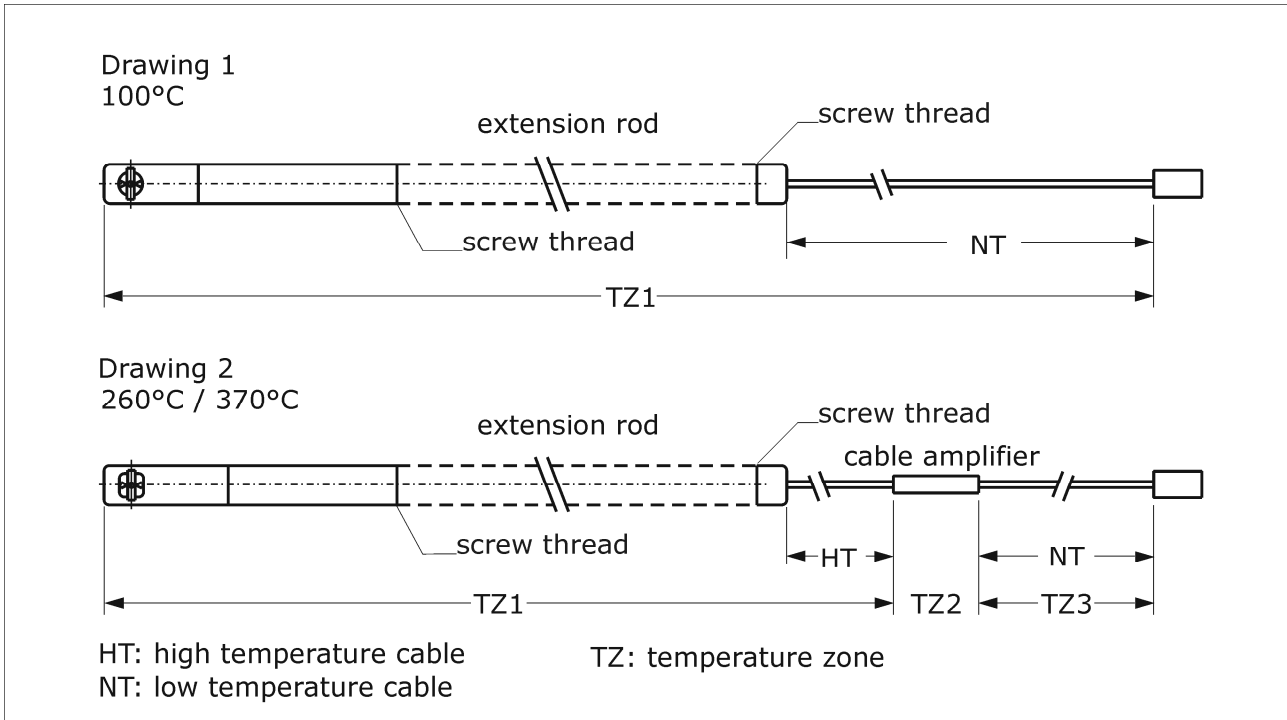
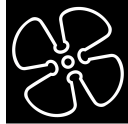
- portable and fixed evaluation units with sensor input  $v/FA$ ,  $v/FAR$  or  $v/FA-Ex$ ,  $v/FAR-Ex$

**Humidity in the sample gas**

- relative gas humidity of less than 100 % has no impact on the measurement uncertainty

**Particles in the medium**

- can cause restriction in the fatigue strength of the vane wheel set



Model designation for ZS16 (example)						
ZS16	GF	E	100	P6	2m	ZG1
(1)	(2)	(3)	(4)	(5)	(6)	(7)

Basic types			
'aluminium'	vane wheel types	cable length	article no.
ZS16GFA/100/p3/2m/ZG1	mc20A, mc40A, mc80A, mc120A	2.0 m	B005/200
ZS16GFA/100/p3/3.5m/ZG1	mc20A, mc40A, mc80A, mc120A	3.5 m	B005/201
ZS16GFA/100/p3/5m/ZG1	mc20A, mc40A, mc80A, mc120A	5.0 m	B005/202
'stainless steel'			
ZS16GFE/100/p6/2m/ZG1	mc20T, mc40T, mc80T	2.0 m	B005/210
ZS16GFE/100/p6/4m/ZG1	mc20T, mc40T, mc80T	4.0 m	B005/211
ZS16GFE/100/p6/6m/ZG1	mc20T, mc40T, mc80T	6.0 m	B005/212
ZS16GFE/260/p6/2m/ZG2	mc20T, mc40T, mc80T	HT 2 m*	B005/220
ZS16GFE/260/p6/4m/ZG2	mc20T, mc40T, mc80T	HT 4 m*	B005/221
ZS16GFE/260/p6/6m/ZG2	mc20T, mc40T, mc80T	HT 6 m*	B005/222
ZS16GE/370/p6/2m/ZG2	mc20T, mc40T, mc80T	HT 2 m*	B005/230
ZS16GE/370/p6/4m/ZG2	mc20T, mc40T, mc80T	HT 4 m*	B005/231
ZS16GE/370/p6/6m/ZG2	mc20T, mc40T, mc80T	HT 6 m*	B005/232

\* HT : length of high temperature cable plus length of low temperature cable (s. page 4, point 6)



<b>Basic types (cont.)</b>			
'titanium'	vane wheel types	cable length	article no.
ZS16GFT/100/p6/ <b>2m</b> /ZG1	mc20T, mc40T, mc80T	2.0 m	B005/240
ZS16GFT/100/p6/ <b>4m</b> /ZG1	mc20T, mc40T, mc80T	4.0 m	B005/241
ZS16GFT/100/p6/ <b>6m</b> /ZG1	mc20T, mc40T, mc80T	6.0 m	B005/242
ZS16GFT/260/p6/ <b>2m</b> /ZG2	mc20T, mc40T, mc80T	HT 2 m*	B005/250
ZS16GFT/260/p6/ <b>4m</b> /ZG2	mc20T, mc40T, mc80T	HT 4 m*	B005/251
ZS16GFT/260/p6/ <b>6m</b> /ZG2	mc20T, mc40T, mc80T	HT 6 m*	B005/252

\* HT : length of high temperature cable plus length of low temperature cable (s. page 4, point 6)

<b>(1) Sensor type / probe diameter</b>
Vane wheel flow sensor ZS16 with probe Ø 16 mm

<b>(2) Medium</b>	
... GF ...	air / gases and water / liquids
... G ...	air / gases (probes '370 °C')

<b>(3) Materials in contact with the medium</b>	
Design	Material
... A ... aluminium	AlCuMgPb, PSU, VITON seal
... E ... stainless steel	stainless steel 1.4404 / AISI 316L, titanium 3.7035 (grade 2), ceramics Al <sub>2</sub> O <sub>3</sub> 99.9 %, pure graphite seal, up to 260 °C VITON
... T ... titanium	titanium 3.7035 (grade 2), ceramics Al <sub>2</sub> O <sub>3</sub> 99.9 %, pure graphite seal, VITON

<b>(4) Permissible temperature of the medium / ambient temperature</b>				
Design	Temperature of the medium	Ambient temperature (see Drawings, Page 2)		
		TZ1	TZ2	TZ3
... 100 ...	-20 ... +100 °C (c)	-20 ... +100 °C	-	-
... 260 ...	-40 ... +260 °C (c) -40 ... +300 °C (s)	-40 ... +260 °C	-40 ... +125 °C	-40 ... +125 °C
... 370 ...	-40 ... +370 °C (c) -40 ... +400 °C (s)	-40 ... +400 °C	-40 ... +125 °C	-40 ... +125 °C

(c) continuous; (s) short-time = max. 2 minutes



**(5) Max. working pressure**

... p3 ...	up to 3 bar / 0.3 MPa overpressure
... p6 ...	up to 6 bar / 0.6 MPa overpressure

**Ingress protection cable outlet**

sensor design 100 °C and 260 °C	IP68
sensor design 370 °C	IP50

**(6) Cable length**

Design	Description
<b>sensor design up to 100 °C *</b>	
... 2m ...	2 m fixed cable
... 3.5m ...	3.5 m fixed cable
... 4m ...	4 m fixed cable
... 5m ...	5 m fixed cable
... 6m ...	6 m fixed cable
<b>sensor design up to 260 °C and 370 °C *</b>	
... 2m ...	2 m fixed high temperature cable in front of cable amplifier + 1.5 m low temperature cable (max. +125 °C) behind cable amplifier
... 4m ...	4 m fixed high temperature cable in front of cable amplifier + 1.5 m low temperature cable (max. +125 °C) behind cable amplifier
... 6m ...	6 m fixed high temperature cable in front of cable amplifier + 1.5 m low temperature cable (max. +125 °C) behind cable amplifier

\* special cable lengths on request

**(7) Design / dimensions**

<b>'aluminium', for max. 100 °C, as in Drawing 1 (Page 1)</b>								
dimensions	Ø K	16 mm	Ø S	16 mm	B	10.65 mm	LK	53 mm
	C	163 mm	IG	M14x1.5				
<b>'stainless steel' or 'titanium', for max. 100 °C, as in Drawing 1 (Page 1)</b>								
dimensions	Ø K	16 mm	Ø S	16 mm	B	11 mm	LK	65 mm
	C	163 mm	IG	M14x1.5				
<b>'stainless steel' or 'titanium', for max. 260 °C or 370 °C, as in Drawing 2 (Page 1)</b>								
dimensions	Ø K	16 mm	Ø S	16 mm	B	11 mm	LK	65 mm
	C	163 mm	IG	M14x1.5	Ø V	9.5 mm		



**Option 'Ex-protection'**

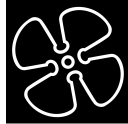
sensor	article no.	Ex-protection category 3G and 3D (zone 2 and 22)	Ex-protection category 2G (zone 1)	
		article no.	article no.	article no.
		FAEX2	FAEX1	FAEX1-3L
ZS16GFA/100/p3/2m/ZG1	B005/200	X	X *	
ZS16GFA/100/p3/3.5m/ZG1	B005/201	X	X *	
ZS16GFA/100/p3/6m/ZG1	B005/202	X	X *	
ZS16GFE/100/p6/2m/ZG1	B005/210	X	X *	
ZS16GFE/100/p6/4m/ZG1	B005/211	X	X *	
ZS16GFE/100/p6/6m/ZG1	B005/212	X	X *	
ZS16GFE/260/p6/2m/ZG2	B005/220	X	X *	
ZS16GFE/260/p6/4m/ZG2	B005/221	X	X *	
ZS16GFE/260/p6/6m/ZG2	B005/222	X		X *
ZS16GE/370/p6/2m/ZG2	B005/230	X		X *
ZS16GE/370/p6/4m/ZG2	B005/231	X		X *
ZS16GE/370/p6/6m/ZG2	B005/232	X		X *
ZS16GFT/100/p6/2m/ZG1	B005/240	X	X *	
ZS16GFT/100/p6/4m/ZG1	B005/241	X	X *	
ZS16GFT/100/p6/6m/ZG1	B005/242	X	X *	
ZS16GFT/260/p6/2m/ZG2	B005/250	X	X *	
ZS16GFT/260/p6/4m/ZG2	B005/251	X	X *	
ZS16GFT/260/p6/6m/ZG2	B005/252	X		X *

\* only in conjunction with ATEX-conform, portable or fixed evaluation units with v/FA-Ex or v/FAR-Ex input, or isolation-/supply unit

**Measuring ranges (with an air/gas density of approx. 1.2 kg/m<sup>3</sup>) / vane wheel type**

measuring range air/gases	measuring range water/liquids*	vane wheel type	article no.
<b>with 'aluminium' probes up to 100 °C</b>			
0.6 ... 20 m/s	0.06 ... 7.5 m/s	mc 20 A	V_MC20GFA
0.6 ... 40 m/s	0.06 ... 10 m/s	mc 40 A	V_MC40GFA
1.2 ... 80 m/s	0.08 ... 10 m/s	mc 80 A	V_MC80GFA
1.4 ... 120 m/s	0.10 ... 10 m/s	mc 120 A	V_MC120GFA
<b>with 'stainless steel' and 'titanium' probes up to 100 °C and 260 °C</b>			
0.8 ... 20 m/s	0.08 ... 7.5 m/s	mc 20 T	V_MC20GFT
1.0 ... 40 m/s	0.10 ... 10 m/s	mc 40 T	V_MC40GFT
1.6 ... 80 m/s	0.10 ... 10 m/s	mc 80 T	V_MC80GFT
<b>with 'stainless steel' probes up to 370 °C</b>			
0.8 ... 20 m/s		mc 20 T	V_MC20GT
1.0 ... 40 m/s		mc 40 T	V_MC40GT
1.6 ... 80 m/s		mc 80 T	V_MC80GT

\* precondition: no cavitation!



**Measurement uncertainty / repeatability (with an air/gas density of approx. 1.2 kg/m<sup>3</sup>)**

Measurement uncertainty	< 1.5 % of measured value + 0.5 % of terminal value *
Repeatability	±(0.05 % of terminal value + 0.02 m/s) *

The lowest measurement uncertainties in the field are attained with calibrations as close as possible to the operating conditions. For this, the measurement results obtained can be implemented as characteristic in the evaluation unit. Whether for applications at 400 °C, at working pressures up to 10 bar or in applications with gas mixtures of multiple gases ... we are always happy to advise! Information and details on the measurement uncertainties according to the calibrated measurement standards can be found in the document 'U183 Calibration'.

\* values also apply for liquids with viscosities up to approx. 0.0002 m<sup>2</sup>/s (200 cSt)

**Optional**

<b>Calibration certificate v/FA*</b>	article no.: KLBNEU
--------------------------------------	---------------------

\* calibration medium air, 6 calibration values in the measuring range. A punch mark on the sensor head marks the flow side during calibration. Special calibrations on request or refer to document 'U183 Calibration'

**Sensor output**

**v/FA**

**v/FA-Ex**  
with option 'Ex' for category 2G (zone 1)

**Evaluation unit for signal evaluation**

- with input **v/FA** or **v/FAR**

- with intrinsically safe **v/FA-Ex** or **v/FAR-Ex** input  
- with **v/FA** or **v/FAR** input connected in series with an isolation/supply unit ATEX

**Smallest measurable value, density influence**

The smallest measurable value for measurements in air/gases specified in our documents results from a measuring medium density  $\rho \cong 1.204 \text{ kg/m}^3$ . The smallest measurable value  $v_0$  is also increased / decreased negligibly even with a considerably different medium density from  $1.204 \text{ kg/m}^3$  and follows in good approximation the relation:

$$v_{0,real} = v_{0,specif} * \sqrt{1.204 \text{ kg/m}^3 / \rho_{real}}$$

The characteristic is displaced by the difference

$$v_{0,specif} - v_{0,real} = \Delta v.$$

Readout of measured values is too great by the amount  $\Delta v$  when measuring in gases of a density of greater than  $1.204 \text{ kg/m}^3$ , and too small by the amount  $\Delta v$  when measuring in gases of a density of  $\rho_{real}$  less than  $1.204 \text{ kg/m}^3$ .  $\Delta v$  is to be added to or subtracted from the respective output value.



**Evaluation unit connection**

**for unit with 8-pin screw-type connector**

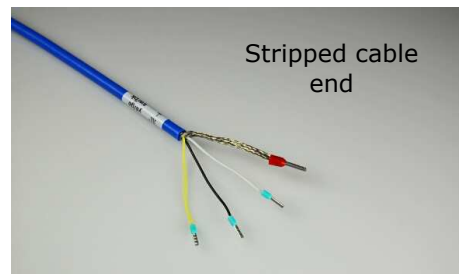
		<b>article no.</b>
plug 680-8*	type of protection IP65	A099/055
plug 423-8*	type of protection IP67	A099/056
plug LEMO.0-4	with extension rods VS16 ... incl. LEMO.0-4 / 680-8 adapter cable	A099/053

**for unit with connecting terminals**

stripped cable end ...	... marked strands with end sleeves	A099/110
------------------------	-------------------------------------	----------

\* with extension rods VS16 ... please use article no. A099/053 or A099/110

Connection possibilities

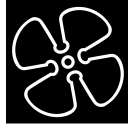


**Extension rods**

	<b>material</b>	<b>length</b>	<b>outside diameter</b>	<b>article no.</b>
VS16A-350	aluminium VITON O-Ring	350 mm	16 mm	B099/000
VS16E-350	stainless steel VITON O-Ring	350 mm	16 mm	B099/001

**Other accessories**

	<b>article no.</b>
direction indicator RZ16	B099/950

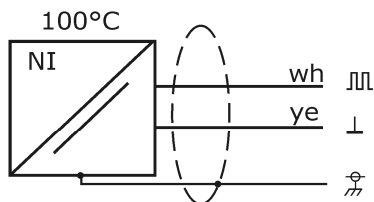


**Profile factors depending on inside diameter (see also 'Measuring ranges', Page 5)**

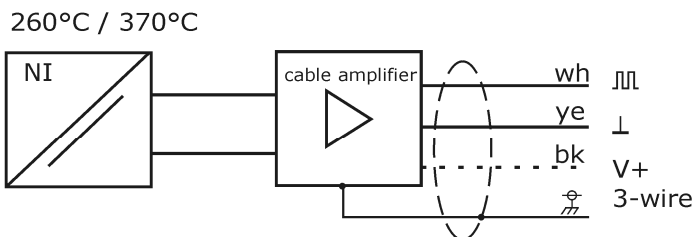
Measuring tube inside diameter Di [mm]	Profile factor PF* [-]	Measuring tube inside diameter Di [mm]	Profile factor PF* [-]
40	0.914	100	0.994
50	0.933	120	1.004
60	0.950	170	1.008
70	0.964	180	1.008
80	0.976	220	1.008
90	0.987	...	1.008

\* These profile factors are only accurate with centric sensor positioning, turbulent, non-rotational inlet flow and sufficiently dimensioned input and output sections (see Operating Instructions). The profile factor describes the ratio of average flow velocity in the measurement cross section area and the flow velocity measured from the sensor. The above mentioned operating conditions apply.

**Wiring Diagram 100 °C Sensors**



**Wiring Diagram 260 °C or 370 °C Sensors**



**Höntzsch GmbH**  
Gottlieb-Daimler-Straße 37  
D-71334 Waiblingen (Hegnach)  
Tel: +49 7151 / 17 16-0  
Fax: +49 7151 / 5 84 02  
E-Mail info@hoentzsch.com  
Internet www.hoentzsch.com

Subject to alteration