- → Series **induQ®** VMM
- → Series **induQ®** VMI
- → Series **induQ®** VMZ

MAGNETIC INDUCTIVE FLOW SENSORS

Magnetic inductive flow sensors

Principle of operation

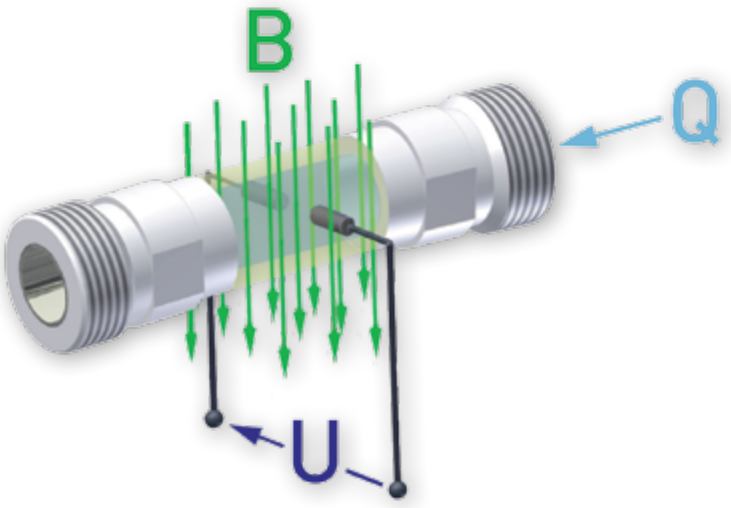
The smart flow sensors of the **induQ®** series operate according to the principle of induction: The measuring pipe is in a magnetic field (**B**). If an electrically conductive medium, with the flow (**Q**) to be measured, flows through the measuring pipe and thereby at a right-angle to the magnetic field, a voltage (**U**) is induced in the medium. This voltage is proportional to the average flow velocity and is picked up by two electrodes.

Regarding flow proportional output signals two versions are available depending on the model:

- Frequency output signal
- Analogue and frequency output signal

The pulse rate can be configured at the factory or on-site.

The **induQ®** sensors enable the flow measurement/volume flow measurement or dosing of electrically conductive liquids without any moving parts. They are the ideal flow sensors when accuracy and reliability are a must.



Three product lines to meet every requirement

From robust field devices to cost-effective plastic devices for series applications, the magnetic inductive **induQ®** flow sensors offer a suitable device for each application. The time-tested measurement method - deployed for decades in the field of process engineering - can now also be used in mechanical engineering and plant construction. Changes to the temperature, density, viscosity, concentration or electrical conductivity of the medium do not affect the output signal. The advantages of the **induQ®** series will convince you:

- No moving parts
- No mechanical wear*
- Free pipe cross-section → no additional pressure drop
- Maintenance-free
- Fast response (< 500 ms or < 100 ms)
- Minimum inlet section requirements

* For aqueous media without solid fractions

Overview			
Product line	**VMM**	**VMI**	**VMZ**
Version / Application	Standard, process	Single and series applications	Cost-optimised, plastic
Nominal diameter	DN 15...DN 200	DN 07...DN 20	DN 03...DN 25
Housing	Metal	Metal	Plastic
Process connection	Flanges	Metal thread	Plastic thread
Max. medium temperature	Up to 180 °C	90 °C	60 °C
Pressure rating	According to flange specification	PN 16	PN 10
Signal outputs	Analogue and Frequency	Frequency / Analogue and Frequency	Frequency
Local display	✓		
Electrical connection	Connection terminals	Plug connector M12 x 1	Plug connector M12 x 1

Magnetic inductive flow sensors

Series induQ® VMM

Advantages

- Rapid signal processing with a 16-bit microcontroller
- Password protection
- Self-test
- Language selection: German, English
- Low-flow suppression
- Empty pipe detection
- Easy menu-driven operation and programming (e.g. measuring range, pulse rate) by the user by means of a two-line alphanumeric display
- Delivery inlcuding works calibration certificate

Outputs

- Analogue output (0)4...20 mA
- Frequency or Impulse output
- 2 alarm / status outputs

Displays

- Flow rate, several total flows
- Flow velocity
- Relative flow rate [%]
- Mass and mass flow (enter density)

Units

- Divers, e.g. m³/h, l/s, USG/min, kg/h (density programmed)

Compact type

Separate type

Type	VMM15	VMM25	VMM32	VMM40	VMM50	VMM65	VMM80	VMM100	VMM125	VMM150	VMM200
Characteristics											
Nominal diameter	DN 15	DN 25	DN 32	DN 40	DN 50	DN 65	DN 80	DN 100	DN 125	DN 150	DN 200
Process connection	Flange connection in accordance with EN 1092-1, JIS B2220 10K or ANSI B16.5										
Flow range											
→ Flow velocity [m/s]	0...10										
→ Volumetric flow [m³/h]	0...6.3	0...17.6	0...28.9	0...45.2	0...70.6	0...119.4	0...180.9	0...282.7	0...441.7	0...636.1	0...1130
Accuracy*											
v = 1...10 m/s	±0.5 % of reading										
v < 1 m/s	±0.4 % of reading ±1 mm/s										
additionally											
Frequency output	±0.05 % per 10 K										
Analogue output	±0.1 % per 10 K										
Repeatability	±0.15 %										
Response time	< 100 ms**										
Signal output starting from	> 0 m/s										
Medium / min. conductivity of medium	Water and other conductive liquids / 50 µS/cm										
Medium temperature											
→ Hard rubber	0...90 °C										
→ PTFE	-20...100 °C at 40 bar -20...150 °C at 25 bar -20...180 °C at 16 bar										
→ Process connections	Min. -10 °C (steel)										
→ Process connections	Min. -20 °C (stainless steel)										
Ambient temperature											
→ Hard rubber	0...80 °C										
→ PTFE	-20...100 °C										
→ Process connections	Min. -10 °C (steel)										
→ Process connections	Min. -20 °C (stainless steel)										
→ Display	-20...50 °C***										
Storage and transport temperature	-20...60 °C										
Pressure rating											
→ EN1092-1	PN 40	PN 40	PN 40	PN 40	PN 40	PN 16**** PN 40	PN 16 PN 40	PN 16 PN 40	PN 16 PN 40	PN 16 PN 40	PN 10 PN 16 PN 25 PN 40
→ JIS B2220 10K	9.8 bar										
→ ANSI B16.5 150 RF	19.6 bar (Process connection, steel) 15.9 bar (Process connection, stainless steel)										
Display	LCD two-line, backlight										
Operation	6 keys, menu-driven										
Degree of protection EN 60529	IP67										

* Reference conditions: Media temperature 10...30 °C; Ambient temperature 20...30 °C; warm-up period 30 min.; straight pipe lengths; inlet 5 x DN, outlet 2 x DN, regularly centered and earthed

** Depending on the electronics settings

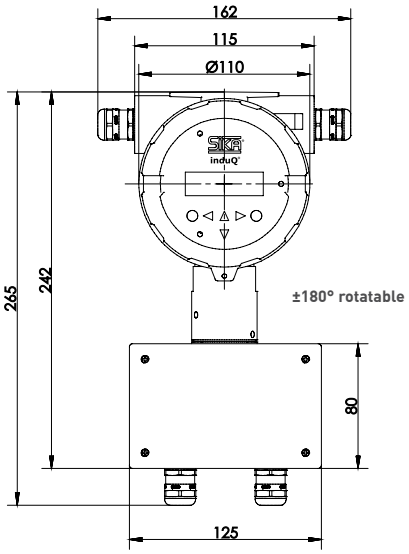
*** The readability of the LCD display is restricted below 0 °C

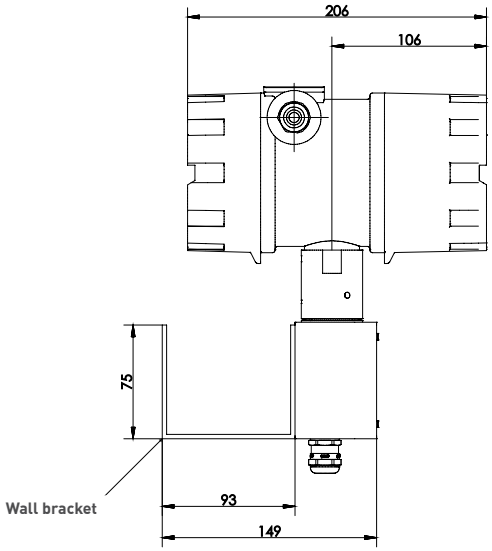
**** 8 bolt flanges

Output signals											
Type	**VMM15**	**VMM25**	**VMM32**	**VMM40**	**VMM50**	**VMM65**	**VMM80**	**VMM100**	**VMM125**	**VMM150**	**VMM200**
Pulse / frequency output											
→ Configuration	Pulse signal or frequency signal selectable										
Pulse output											
→ Pulse rate (factory-set) [pulses/m³]	1000	1000	1000	1000	1000	1000	1000	1000	100	100	100
→ Pulses/Time	⩽ 1000 Pulses/s										
→ Pulse width	⩾ 0.1 ms (max. 2 s), adjustable										
→ Signal shape	Squarewave signal										
Frequency output											
→ Factory-scaled measuring range corresponds to 0...1 kHz [m³/h]	0...3	0...10	0...10	0...10	0...20	0...50	0...50	0...70	0...100	0...150	0...250
→ Frequency	0...1 kHz										
→ Signal shape	Squarewave signal										
Analogue output											
→ Factory-scaled measuring range corresponds to 4...20 mA [m³/h]	0...3	0...10	0...10	0...10	0...20	0...50	0...50	0...70	0...100	0...150	0...250
→ Operating range	0 ... 20 mA / 4 ... 20 mA, selectable										
→ Current limitation	21.6 mA										
→ Max. burden	600 Ω										
→ Short-circuit proof	Permanent										
Alarm output											
→ Quantity	2										
→ Version	Optocoupler										
→ Function	Status output: Preflow, backflow, MIN flow rate, MAX flow rate, alarm (adjustable)										
→ Switching values	U_{max}: 30 V; I_{max}: 60 mA; P_{max}: 1,8 W										

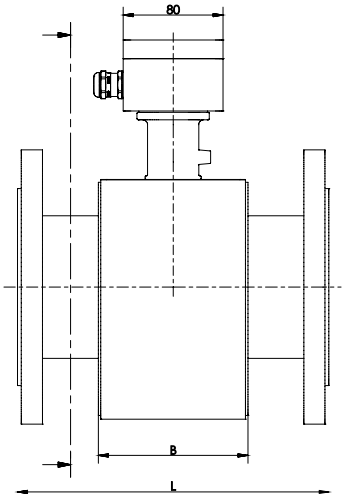
Electrical data	
Electrical connection	Cable gland M20 x 1.5
Power supply	230 VAC (-15 % / +10 %), 50/60 Hz or 115 VAC (-15 % / +10 %), 50/60 Hz or 19...36 VDC
Current consumption	15 VA

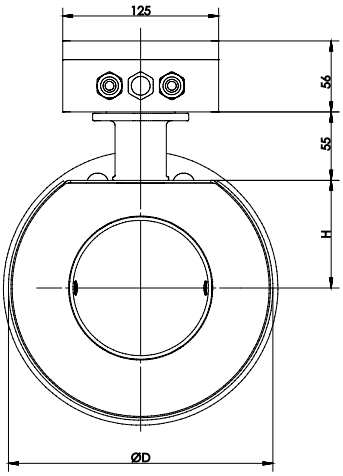
Separate type (Display)





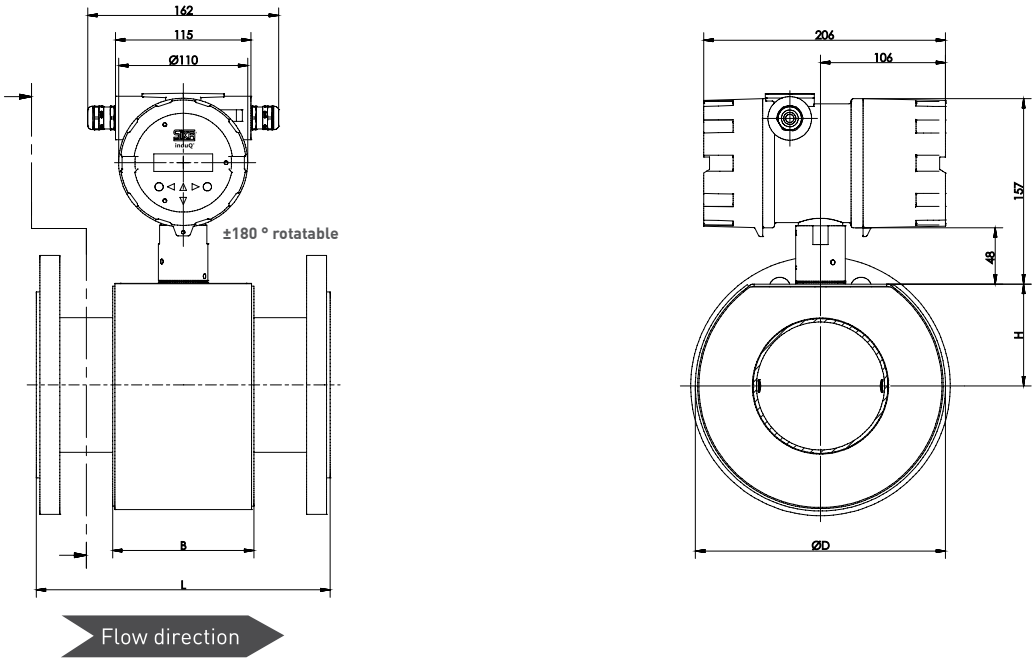
Separate type (Sensor)





Flow direction

Compact type



Dimensions [mm]										
Process connection		**Installation length L**							**Weight EN 1092-1 [kg]***	
EN 1092-1 JIS B2220 10K	ANSI B16.5	Hard rubber	PTFE		Tolerance	B	D	H	Sensor	Compact type
			Without protection rings	With protection rings						
DN 15	½"	200	200	206	+0 / -3	80	130	53	5	8
DN 25	1"	200	200	206	+0 / -3	80	130	53	6	9
DN 32	1¼"	200	200	206	+0 / -3	80	130	53	7	10
DN 40	1½"	200	200	206	+0 / -3	80	130	53	7.5	10.5
DN 50	2"	200	200	206	+0 / -3	80	140	57	9	12
DN 65	2½"	200	200	206	+0 / -3	80	155	63	10	13
DN 80	3"	200	200	206	+0 / -3	80	170	70	13	16
DN 100	4"	250	250	256	+0 / -3	120	210	86	15	18
DN 125	5"	250	250	256	+0 / -3	120	240	98	19	22
DN 150	6"	300	300	306	+0 / -3	120	285	117	23	26
DN 200	8"	350	350	360	+0 / -3	200	350	143	36	39

* valid for DN 15...DN 50 (PN 40), DN 65...DN 150 (PN 16), DN 200 (PN 10)

Materials	
Not in contact with fluid	
Display housing	Casted aluminium
Sensor housing	Steel
Measuring pipe	Stainless steel
Process connection	Steel 1.0460 or stainless steel 1.4404
In contact with fluid	
Electrodes	Stainless steel 1.4571 or Hastelloy C276
Measuring pipe lining	PTFE or Hard rubber

Order code	Example → VMM32	A	1	0	1	0	KAMA	20
Nominal diameter								
DN 15 / ½"	VMM15							
DN 25 / 1"	VMM25							
DN 32 / 1¼"	VMM32							
DN 40 / 1½"	VMM40							
DN 50 / 2"	VMM50							
DN 65 / 2½"	VMM65							
DN 80 / 3"	VMM80							
DN 100 / 4"	VMM1C							
DN 125 / 5"	VMMV3							
DN 150 / 6"	VMM3L							
DN 200 / 8"	VMM2C							
Process connection								
EN 1092-1 PN 10 starting from DN 200		A						
EN 1092-1 PN 16 starting from DN 65		B						
EN 1092-1 PN 25 starting from DN 200		C						
EN 1092-1 PN 40 starting from DN 15		D						
JIS B2220 10K		J						
ANSI B16.5 150 RF		I						
Material process connection								
Steel 1.0460			1					
Stainless steel 1.4571			2					
Lining								
PTFE				0				
Hard rubber				1				
Material electrodes								
Stainless steel 1.4571					1			
Hastelloy C276					2			
Earth electrode								
Without						0		
One						1		
Two						2		
Type								
Compact type with display							KAMA	
Separate type with display							GAMA	
Power supply								
230 VAC, 50/60 Hz								20
115 VAC, 50/60 Hz								40
19...36 VDC								30

Accessories

Earthing ring VMM

Earthing ring

An earthing ring is used for the electrical reference and earthing of the medium being measured. It is necessary if the pipes are not electrically conductive or lined (plastic or concrete pipes, etc.). The earthing ring must be connected to the provided earthing screw of the sensor. Retrofitting is possible. Material stainless steel 1.4571.

Sensor cable set

Sensor cable between sensor and display unit (separate design) consisting of magnetic power cable and electrode cable for configuration of M16 x 1.5 screw connection.

Protection rings VMM

Pair of protection rings

Protection rings protect the inlet and outlet edges of the sensor against mechanical damage, in particular when abrasive media such as gravel, sand, etc. are concerned. At the same time, they also serve as earthing rings. The protection rings are firmly screwed to the sensor. Material stainless steel 1.4571.

Order example	VMMZEW	32	A	1
Type				
Earthing ring	VMMZEW			
Protection rings (pair)	VMMZPR			
Nominal diameter				
DN 15 / ½"		15		
DN 25 / 1"		25		
DN 32 / 1¼"		32		
DN 40 / 1½"		40		
DN 50 / 2"		50		
DN 65 / 2½"		65		
DN 80 / 3"		80		
DN 100 / 4"		1C		
DN 125 / 5"		V3		
DN 150 / 6"		3L		
DN 200 / 8"		2C		
Process connection				
EN 1092-1			E	
JIS B2220 10K			J	
ANSI B16.5 150 RF			A	
Lining				
PTFE				0
Hard rubber				1

Sensor cable set - length of cable	Order code
5 m	VMMZSC000Z0005
10 m	VMMZSC000Z0010

Magnetic inductive flow sensors

Series induQ® VMI

Advantages

- Robust metal housing
- Nominal diameter DN 7, DN 10 and DN 20
- Wide measuring range 1:60 (1:50)
- Frequency or analogue and frequency output
- Delivery inlcuding works calibration certificate

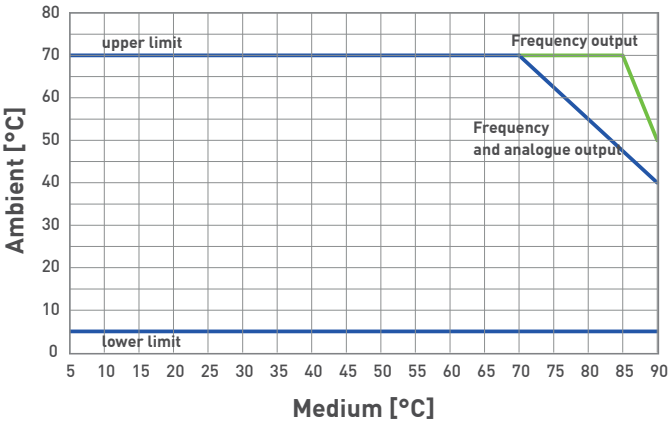
Type VMI20 / VMI10

Free pipe cross-section

Type	VMI07	VMI10	VMI20
Characteristics			
Nominal diameter	DN 7	DN 10	DN 20
Process connection	G½-ISO 228 male	G½-ISO 228 male or G¾-ISO 228 male	G 1-ISO 228 male
Inner diameter	4 x 10 mm	10 mm	20 mm
Flow range	0.5...30 l/min	1...60 l/min	5...250 l/min
Accuracy*	±1.5 % of reading ±0.3 % of range		
Repeatability*	1 %		
Response time	<500 ms		
Signal output starting from	0.4 l/min	0.9 l/min	4 l/min
Medium / min. conductivity of medium	Water and other conductive liquids / 50 µS/cm		
Medium temperature	5...90 °C		
Ambient temperature	Min. 5 °C, max. see figure temperature limits		
Pressure rating	PN 16		
Flow indication	LED green, flow proportional flashing		
Degree of protection EN 60529	IP65 (with attached cable socket)		
Electrical data			
Electrical connection	Plug connector M12 x 1		
Power supply	24 VDC (±10 %)		
Current consumption	⩽ 150 mA		

* Test conditions: Water 23 °C at 150 ±100 µS/cm; standard pulse rate

Temperature limits



Three different versions available:

- *Frequency output*
- *Analogue output 4...20 mA and frequency output*
- *Analogue output 0...10 V and frequency output*

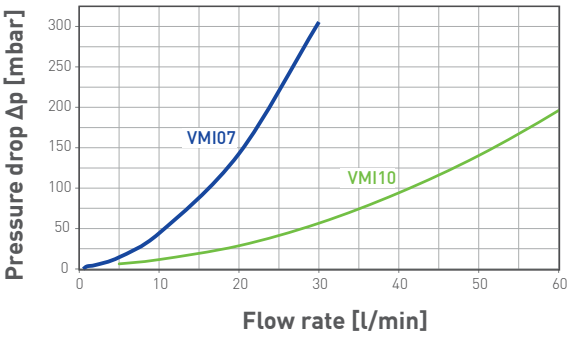
Frequency output	VMI07	VMI10	VMI20
Pulse rate **→ Optional***	1000 pulses/l 1...2000 pulses/l	500 pulses/l 1...1000 pulses/l	100 pulses/l 1...200 pulses/l
Resolution **→ Optional***	1.0 ml/pulse 1000...0.5 ml/pulse	2.0 ml/pulse 1000...1 ml/pulse	10 ml/pulse 1000...5 ml/pulse
Signal shape	Square wave signal, pulse duty ratio 50:50, Push-Pull		
Signal current	⩽ 100 mA, current limited		

Analogue output 4...20 mA	VMI07	VMI10	VMI20
Corresponds to flow rate**	0..20 l/min or 0...30 l/min	0..40 l/min or 0...60 l/min	0...200 l/min or 0...250 l/min
Max. burden	250 Ω against GND		

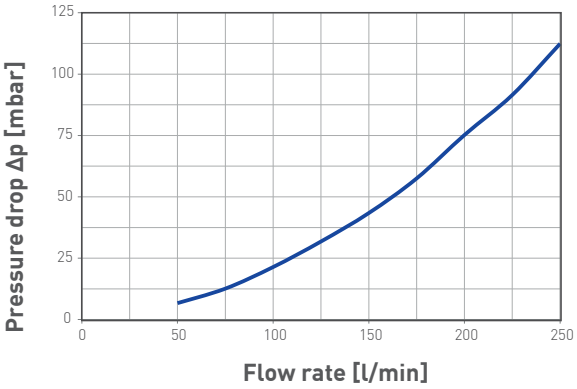
Analogue output 0...10 V	VMI07	VMI10	VMI20
Corresponds to flow rate**	0..20 l/min or 0...30 l/min	0..40 l/min or 0...60 l/min	0...200 l/min or 0...250 l/min

* Factory configurable
** Other ranges available on request

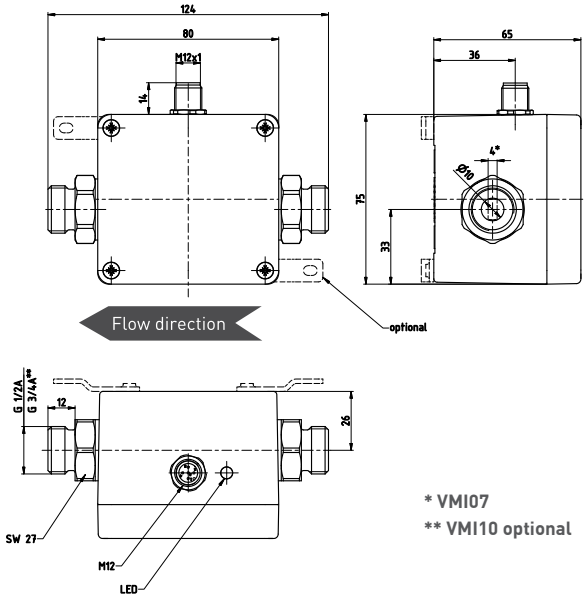
Typical pressure drop VMI07 / VMI10



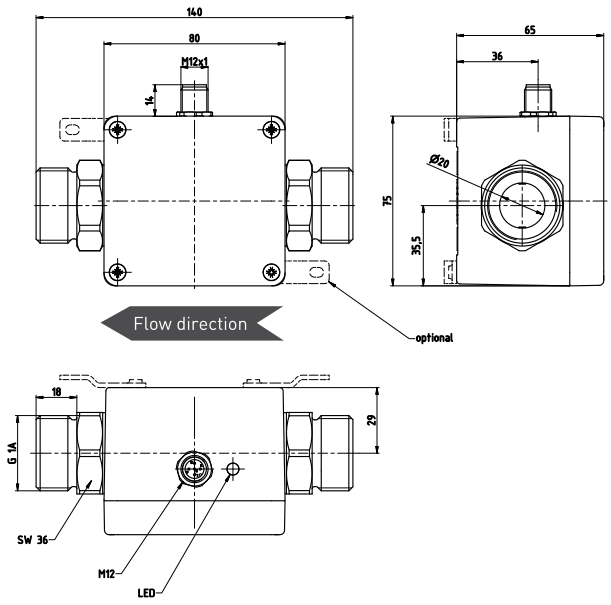
Typical pressure drop VMI20



VMI07 / VMI10

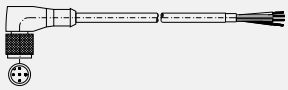


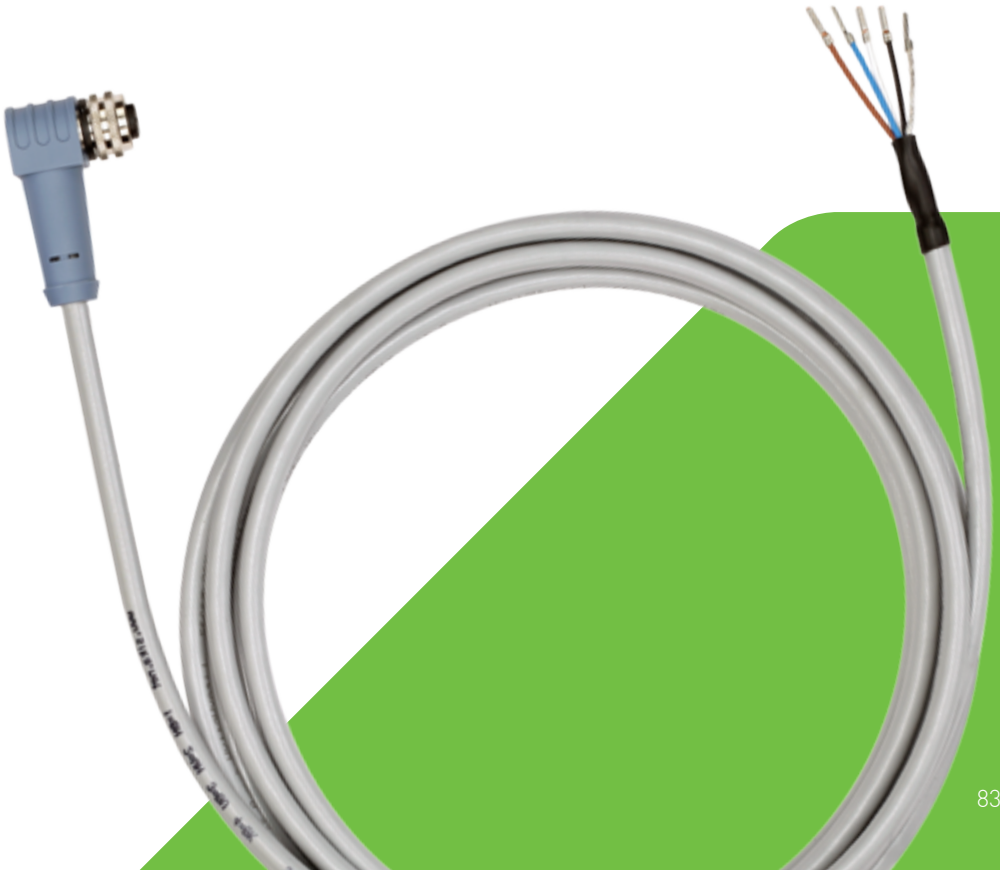
VMI20



Materials	
Electrodes	Stainless steel 1.4571
Process connections	Stainless steel 1.4571
Measuring pipe	PEEK-GF30
O-rings	EPDM / FKM optional
Housing	Casted aluminium

Order code	Example → VMI	07A	SS	0	0YGX000
Type					
VMI	VMI				
Nominal diameter / Process connection					
DN 07 / G½ male thread					
Output signals	**corresponds to flow rate**				
Frequency signal		07A			0YGX000
Frequency signal and analogue signal 4...20 mA	0...20 l/min	07A			0YGI005
	0...30 l/min	07A			0YGI000
Frequency signal and analogue signal 0...10 V	0...20 l/min	07A			0YGU005
	0...30 l/min	07A			0YGU000
DN 10 / G½ male thread					
Output signals	**corresponds to flow rate**				
Frequency signal		10A			0YGX000
Frequency signal and analogue signal 4...20 mA	0...40 l/min	10A			0YGI005
	0...60 l/min	10A			0YGI000
Frequency signal and analogue signal 0...10 V	0...40 l/min	10A			0YGU005
	0...60 l/min	10A			0YGU000
DN 10 / G¾ male thread					
Output signals	**corresponds to flow rate**				
Frequency signal		10E			0YGX000
Frequency signal and analogue signal 4...20 mA	0...40 l/min	10E			0YGI005
	0...60 l/min	10E			0YGI000
Frequency signal and analogue signal 0...10 V	0...40 l/min	10E			0YGU005
	0...60 l/min	10E			0YGU000
DN 20 / G1 male thread					
Output signals	**corresponds to flow rate**				
Frequency signal		20A			0YGX000
Frequency signal and analogue signal 4...20 mA	0...200 l/min	20A			0YGI005
	0...250 l/min	20A			0YGI000
Frequency signal and analogue signal 0...10 V	0...200 l/min	20A			0YGU005
	0...250 l/min	20A			0YGU000
Mounting straps					
Without (standard)			SS		
With mounting straps			LS		
Material O-rings					
EPDM (Standard)				0	
FKM (Option)				1	

Accessories	Length	Order code	
Connection cable with 4-pin cable socket M12 x 1, angle type moulded lead, sheathing material PUR, shielded, (T_{max} = 80 °C) UL-approval	3 m 5 m 10 m	XVT2053 XVT2009 XVT2070	



Magnetic inductive flow sensors

Series induQ® VMZ

Advantages

- Cost-optimised plastic version
- Specially for series applications
- Compact lightweight design, low space requirement
- Nominal sizes DN 3...DN 25
- Delivery inlcuding works calibration certificate

Type VMZ15 / VMZ03

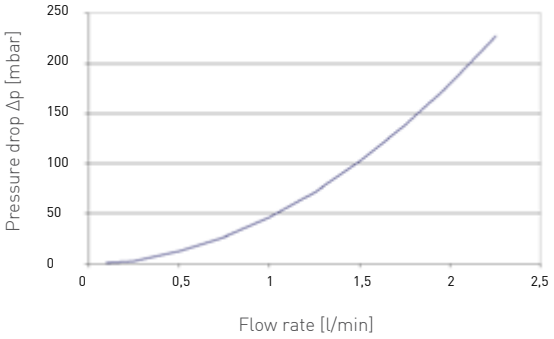
Free pipe cross-section

Type	VMZ030	VMZ081	VMZ082	VMZ153	VMZ204	VMZ205	VMZ256
Characteristics							
Nominal diameter	DN 3	DN 8	DN 8	DN 15	DN 20	DN 20	DN 25
Process connection	G⅜ B male	G½ B male	G½ B male	G¾ B male	G 1 B male	G 1 B male	G 1¼ B male
Inner diameter	3 mm	8 mm	8 mm	14 mm	18 mm	18 mm	25 mm
Flow range	0.1...2 l/min	0.25...5 l/min	1...20 l/min	2.5...50 l/min	5...100 l/min	10...200 l/min	12.5...250 l/min
Accuracy*	±1 % of reading						
Repeatability	±1 %						
Response time	<100 ms						
Signal output starting from	0.05 l/min	0.1 l/min	0.25 l/min	1 l/min	2 l/min	4 l/min	5 l/min
Max. Flow rate	2.5 l/min	6 l/min	25 l/min	60 l/min	120 l/min	240 l/min	300 l/min
Medium / min. conductivity of medium	Water and other conductive liquids / 20 µS/cm						
Medium temperature	-10...60 °C (non-freezing)						
Ambient temperature	5...60 °C						
Max. pressure rating	10 bar at 20 °C, 8 bar at 40 °C, 6 bar at 60 °C						
Indications	Red LED = power, green LED = flow rate						
Degree of protection EN 60529	IP65 (with attached cable socket)						
Output signals							
→ Pulse rate**	10 000 pulses/l	4000 pulses/l	1000 pulses/l	400 pulses/l	200 pulses/l	100 pulses/l	80 pulses/l
→ Resolution**	0.1 ml/pulse	0.25 ml/pulse	1 ml/pulse	2.5 ml/pulse	5 ml/pulse	10 ml/pulse	12.5 ml/pulse
→ Signal shape	Frequency signal, square wave, can be connected as PNP or NPN open collector pulse duty ratio 50:50						
→ Signal current	Max. 25 mA						
Electrical data							
Electrical connection	4 pin plug connector M12 x 1						
Power supply	24 VDC (±15 %) or 12 VDC (±15 %)						
Power consumption	0.6 W						
Electrical protection measures	Short-circuit proof and polarity protection						

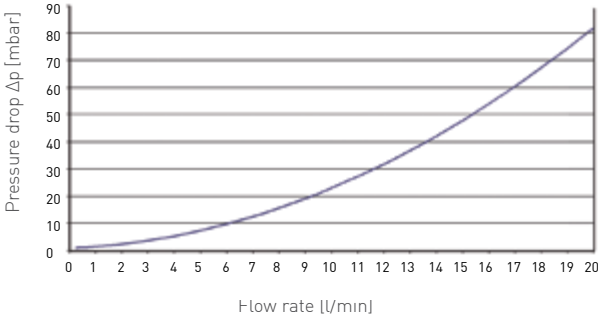
* Test conditions: Water 23 °C

** Other pulse rates / resolutions available on request
optional output signal with lower frequency, designed specifically for connection to digital PLC inputs

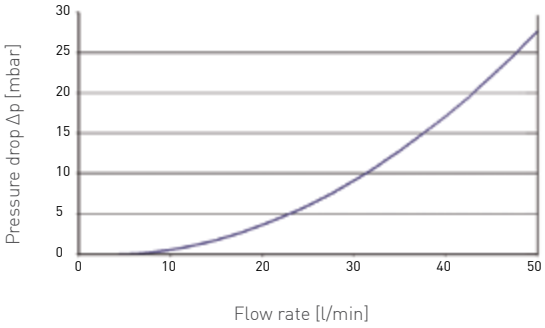
Typical pressure drop VMZ030



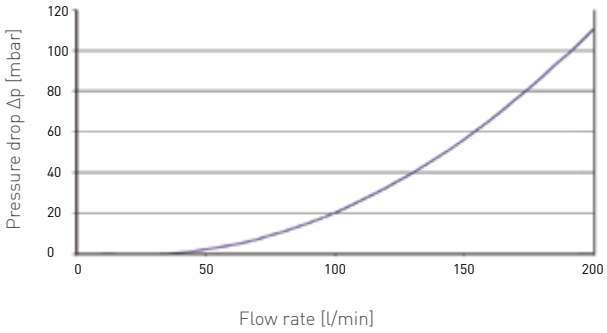
Typical pressure drop VMZ081 / VMZ082



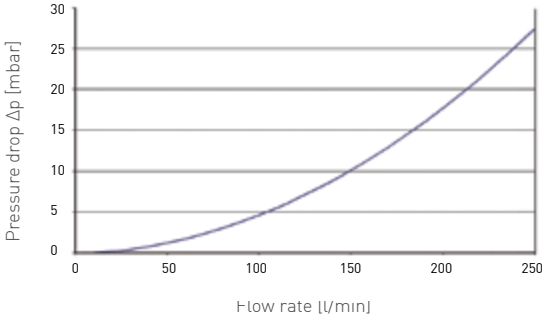
Typical pressure drop VMZ153



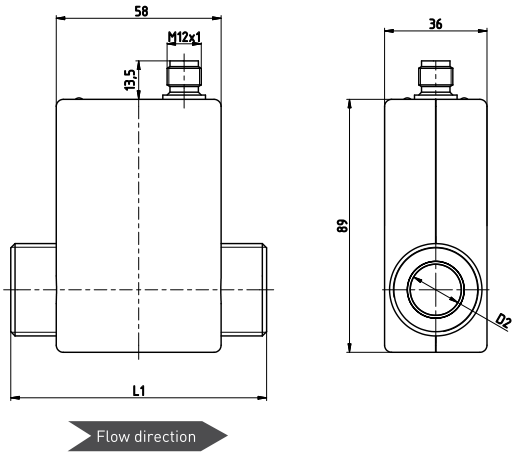
Typical pressure drop VMZ204 / VMZ205

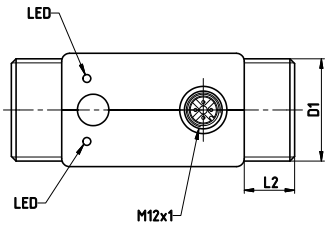


Typical pressure drop VMZ256

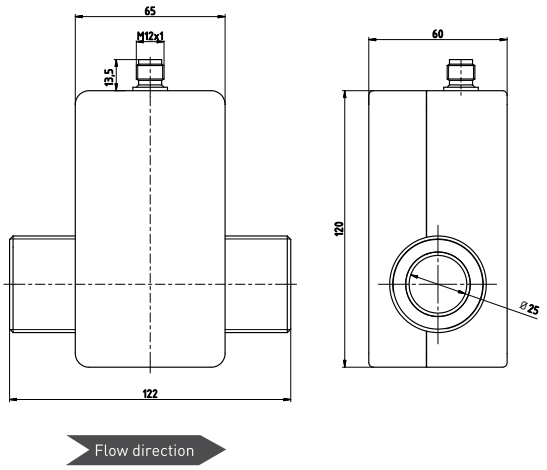


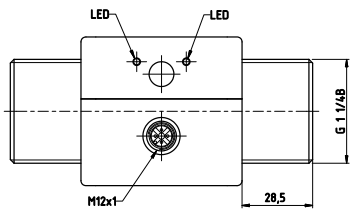
VMZ03 / VMZ08 / VMZ15 / VMZ20





VMZ25





Dimensions [mm]				
Type	**L1**	**L2**	**D1**	**D2**
VMZ030	85	13.3	G⅜ B	Ø 3
VMZ081	85	13.3	G½ B	Ø 8
VMZ082	85	13.3	G½ B	Ø 8
VMZ153	90	16	G¾ B	Ø 14
VMZ204	90	16	G 1 B	Ø 18
VMZ205	90	16	G 1 B	Ø 18

Materials	
Electrodes and earthing rings	Stainless steel 316L
Measuring pipe and process connections	POM or PVDF
O-rings	EPDM
Housing	ABS

Order code	Example → VMZ030S1	DE	G14	211
Flow range				
0.1...2 l/min	VMZ030S1			211
0.25...5 l/min	VMZ081S1			310
1...20 l/min	VMZ082S1			320
2.5...50 l/min	VMZ153S1			430
5...100 l/min	VMZ204S1			540
10...200 l/min	VMZ205S1			550
12.5...250 l/min	VMZ256S2			660
Measuring pipe				
POM		DE		
PVDF		PE		
Power supply				
12 VDC			G14	
24 VDC			G24	

Accessories	Length	Order code	
Connection cable with 4-pin cable socket M12 x 1, angle type moulded lead, sheathing material PUR, shielded, (T_{max} = 80 °C) - UL-approval	3 m 5 m 10 m	XVT2053 XVT2009 XVT2070	
4 pin cable socket M12 x 1 angle type, unassembled		VT1331