

# **Solutions for Fluid Technology**



## **OPERATING INSTRUCTIONS**

For Flow Meters of the Product Series "VS in Standard Version"

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#### IMPORTANT BASIC INFORMATION



#### Dear customer, dear user,

These installation and operating instructions should provide you with the information you need to properly install and commission the flow meter. Installation, commissioning and testing are to be performed by trained and qualified personnel only. These operating instructions must be read and applied carefully to ensure proper, trouble-free and safe operation of the flow meter. VSE is not liable for any damage incurred resulting from not complying with the instructions in this operating instruction. It is not permitted in any case to open the device.

These operating instructions for flow meters of the series "VS in Standard-Version" from VSE must be stored, so that they can be read by the group of authorized personnel at any time. Chapters may not be taken of these instructions at any time. A missing operating instructions manual or missing pages must be replaced immediately. VSE can supply you with new instructions or you can download the operating instructions from the internet (www.vse-flow.com). The operating instructions must be given to each subsequent user of this product.

#### **Legal information**

This document is not managed by an updating service of VSE Volumentechnik GmbH.

Changes to this document may be made without notice.

If the device has been opened, modified or incorrectly connected to the electrical circuits, the warranty of VSE Volumentechnik GmbH for safe operation is void. VSE Volumentechnik GmbH is not liable in any way for personal injuries or damage to goods resulting from improper installation or improper operating of the flow meter.

Operating manual-no.: V13 7 02 4c

#### **GENERAL FUNCTION DESCRIPTION OF FLOW METER**

Flow meters made by VSE Volumentechnik GmbH measure the volume flow of liquids according to the toothed wheel principle. A pair of very precisely adjusted toothed wheels in the housing constitutes the meter. A signal pick-up system registers meter rotation free of contact and tooth by tooth. Each tooth is put out as digital pulse.

The gaps in the teeth of the meter wheels form meter chambers in the areas, in which they are completely enclosed by the housing walls; these chambers digitalise liquid flow depending on their chamber volume. The liquid flow quantity within one meter rotation of a tooth division forms the volume measurement per pulse  $(V_m)$  and is defined in cm<sup>3</sup>/pulse. It identifies the constructional size of a flow meter.

#### **GENERAL DESCRIPTION**

Please follow all instructions in this operating manual; only this guarantees a trouble-free operation of the flow meters. VSE is not liable for any damage ensuing from non-following of these instructions.

Opening the devices during the term of guarantee is only authorised after consultation and approval of VSE.

#### FLOW METER SELECTION

The correct selection (version) of type and constructional size is crucial for a trouble-free and safe operation of the flow meters. Owing to the great number of various applications and flow meter versions, the technical specifications in the VSE catalogue material are of a general

nature. Performance of the flow meter depends on type, size and meter range and on the liquid that is to be measured. Please consult VSE for an exact description.

#### **DECLARATION OF CONFORMITY**

Flow meters of the "VS" product line are tested for their electromagnetic compatibility and interference transmission in terms of the law on electro-magnetic compatibility and correspond to the legal prescriptions enforced by EMC directives. They may not be operated independently and are to be connected via cable to a power source and supply digital electric signals for electronic evaluation. A declaration of conformity is submitted for all flow meters, which you can request if you require. Since the electromagnetic compatibility of the total measuring system depends as well on cable layout, correct connection of protective shiel-

ding and each single connected device, you must ensure that all components correspond to the electromagnetic compatibility directives and that the electromagnetic compatibility of the total system, machine or plant is guaranteed.

All flow meters are tested according to the valid, legally prescribed electromagnetic compatibility directives and possess the CE-certification. The EC-declaration of conformity is the CE-label attached to all flow meters.

#### **GENERAL CONDITIONS FOR INITIAL START-UP**

Before assembly and before initial start-up, you have to note the following properties and aspects of the corresponding characteristics of your system, so that a trouble-free and safe operation is possible.

### 1. The process fluid

- → Is the flow meter suitable for the fluid?
- → Is the fluid viscous or abrasive?
- → Is the fluid contaminated or is there solid matter in the fluid?
- → Which **granular size** does the solid matter possess and can it **block the meter**?
- → Does the fluid have fillers or other additional material?
- → Is it necessary to install a pre-switched hydraulic filter?
- → Are the **pipe lines clean** and free of assembly residues such as swarf, weld chips?
- → Is the tank clean and is it ensured that no extraneous materials can get into the pipe line system from the tank?
- → Is the fluid often changed and is sufficient flushing performed in this case?
- → Are the pipe lines and the entire system completely deaerated?
- → What cleaning agent is being used?
- → Are the fluid and the cleaning agent compatible with the seals?
- → Are the **seals suitable** for the fluid undergoing measurement (**seal compatibility**)?

#### 2. The hydraulic properties of the system

- → Is the max. operating pressure of the system lower than the max. permitted operating pressure of the flow meter?
- → Is the max. fall of pressure Δp (on flow meter) below the max. permitted fall of pressure?
- Does an excessively **great fall in pressure Δp** occur on the flow meter at max. flow (e.g. with higher viscosity)?
- → Does the flow range of the flow meter (depending on viscosity) correspond to the **provided flow**?
- → Note that flow range decreases the **greater the viscosity!**
- → Does the temperature range of the flow meter correspond to the provided max, temperature of the medium?
- → Is the **cross section** of the pipe line large enough and are the falls in pressure in the system not excessive?
- → Is the hydraulic connection (supply and reverse flow) correctly connected and leak-proof?
- → Has the **pump** sufficient power to operate the system?
- → A blocking flow meter can stop the whole flow. Is a pressure control valve/bypass provided in the system?

#### 3. Electronic evaluation and electrical safety

- → Have you selected the optimal flow meter and is this equipped with the appropriate preamplifier?
- → Does the **power supply voltage** of the flow meter correspond to the provided voltage?
- → Is the power supply voltage supplied by the mains or evaluation device sufficiently **steady**?
- → Does the output of the power supply voltage correspond to the required power output?
- → Has the electric connection been installed based on the enclosed **connection plan**?
- → Is the cable protected by a shielding?
- → Is there a **connection** of the cable protective shielding via the 4-pin round plug to the housing of the flow meter?
- → Is there a **potential difference** between the earth conductor connection PE on the flow meter and the earth conductor PE on the evaluation device?
- → Does a correcting lead have to be laid to eliminate the **potential difference** between the flow meter and the evaluation device?
- ⇒ Is the flow meter connected firmly to the **earth conductor PE** (e.g. via the pipe lines)?
- ⇒ Is the flow meter mounted to be **insulated** to the earth conductor PE (e.g. connection via hoses)? If this is the case, the earth conductor PE has to be connected to the flow meter!
- → Is the cable laid fault-free and the installation secured from input of interference pulses?
- → Is the **round plug** of the connection cable firmly screwed together with the plug of the flow meter?
- → Are the wires on the evaluation device correctly and properly connected?
- → Does the entire system correspond to the directives of the electromagnetic compatibility laws (EMC)?
- → Have all local valid regulations, **applicable directives**, guidelines and background conditions of the **electromagnetic compatibility** laws been maintained and observed?
- Systems that can lead to personal injury through malfunction or failure are to be equipped with the appropriate safety devices. The functioning of these safety devices is to be checked at regular intervals.

#### **MAXIMUM OPERATING PRESSURE**

Before assembling the flow meter, you have to test that the max. operating pressure of the system does not exceed the max. permitted operating pressure of the flow meter. Meanwhile, observe the top pressures that can occur, when operating the system.

The following operating pressures are permitted depending on flow meter version:

→ Flow meter in grey cast iron version  $p_{max} = 315 \text{ bar}/4500 \text{ psi}$ 

→ Flow meter in stainless steel version  $p_{max} = 450 \text{ bar}/6500 \text{ psi}$ 

→ Flow meter in special version  $p_{max} = up to 700 bar/10100 psi$ 

#### **Important:**

Please consult VSE for all operating pressures > 450 bar/6500 psi and for special versions.



## **INFORMATION ON EU DIRECTIVE 2014/68/EU ON PRESSURE EQUIPMENT**

In terms of Article 2, No. 5 of the directive named above, VSE volume sensors are so-called "pressuremaintaining components" and this directive thereby relates to them.

VSE volume sensors must thereby comply with the technical requirements named in Section 4 of the directive in accordance with Article 4, Paragraph (1d), Piping according to Paragraph (1c).

Typically, the fluids measured fall into Group 2 in accordance with Article 13, Paragraph (1b). The volume sensors sold by VSE do not comply with the limit values defined under Article 4, Paragraph (1a).

The technical requirements on volume sensors from VSE are therefore limited to the criteria defined in Article 4, Paragraph (3). That means that the devices must be designed and manufactured in accordance with the good engineering practices prevailing in the member state. We hereby confirm this. The paragraph also states that these units may not bear the CE label named in Article 18.

A CE declaration of conformity is therefore not issued in accordance with 2014/68/EU.

The CE label of our volume sensors refers to Directive 2014/30/EU.

#### **FLOW METER RANGE**

The flow meter range specified in the flow meter data sheet ( $Q_{\min}$  -  $Q_{\max}$ ) refers to the testing fluid "hydraulic oil" with a viscosity of 21 mm²/s at a temperature of 20°C. For this flow meter range, VSE specifies measurement accuracy of up to 0.3% of the measurement value and a repetition accuracy of 0.05%.

For fluids of lower viscosity (< 21 mm²/s) measurement accuracy deteriorates, while for fluids of higher viscosity (> 21 mm²/s) it can improve. Also note, however, that the flow meter range is restricted in case of higher viscosity (see "Technical specifications").

#### Important:

Make sure that the specified maximum permitted operating pressure of the flow meter cannot be exceeded, whatever the operating mode of the system. Note the flow meter range that is dependent on the viscosity of the fluid to be measured.



#### ASSEMBLY OF THE FLOW METER

The flow meter should be mounted on an easily accessible location, so that dismantling for cleaning the meter presents no problem. Since flow meters can work in any installation position and flow direction, you can mount it on any location of your system that you wish. Take care when installing the flow meter that always liquid remains in the flow meter even at system standstill and that it can never run empty. The outflow of the flow meter should therefore always show a certain back pressure. In critical cases or when the pipe line is at standstill or standby and can run empty, we recommend installing an extra non-return valve in the outflow line.

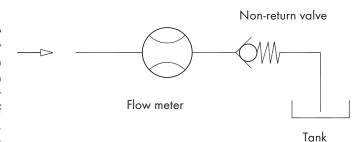


Fig. 1: Flow meter installation with non-return valve

#### Important:

Make sure that the flow meter is always completely filled both in inflow and outflow and that the outflow has a little back pressure. This prevents the meter being damaged by a sudden and steep increase of flow and at the same time improves measurement accuracy.



Flow meters of the "VS" product line can be mounted directly onto a block or into the pipe line using four screws. Always select large cross sections for the hydraulic supply and return flow respectively for the entire pipe line system (if possible). This lowers the fall in pressure and the flow rate in the total system.

VSE supplies subplates for all flow meters of the "VS" product line; they have various pipe threads and side or rearside connection. Depending on the provided conditions, the installed pipe line, the pipe cross section or pipe thread, the operator can choose the suitable subplate and incorporate this into the system or machine without additional reductions.

The flow meter is screwed onto the block or subplate with four DIN 912 cheese head screws. The screws are to be evenly pre-tensed crosswise with the following torques.

When changing the fastening screws you must take great care that the screws are of property class 10.9 and 12.9.

Table 1: Torque of fastening screws

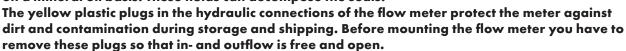
Flow meter, size (cast iron and 1.4305)	Torque
VS 0.02; VS 0.04; VS 0.1; VS 0.2	15 Nm
VS 0.4; VS 1; VS 2	35 Nm
VS 4	120 Nm
VS 10	250 Nm

Please note the special instructions for mounting sizes VS 4 and VS 10 (see appendix)

#### Important:

When mounting the flow meter, you must take great care that the seals are not damaged and correctly placed in the hydraulic connections of the flow meter. Wrongly installed or damaged seals lead to leakage and to an leaky system, which may have dire consequences.

Please make sure that flow meters with EPDM seals do not come into contact with oil and greases on a mineral oil basis. These fluids can decompose the seals.





#### CLEANING AND FLUSHING OF PIPE LINES BEFORE INITIAL START-UP

Before initial start-up of the flow meter, you must flush and clean the whole system. Contaminated fluids can affect the correct function of the flow meter or seriously damage the meter.

After preparing and connecting up the system pipes, you must first carefully flush and clean the whole pipe line system and the tank. To do this, you have to mount a diversion plate onto the block or subplate instead of the flow meter, so that the fluid can flow through the diversion plate and all extraneous material (e.g. swarf, metal chips, etc.) can be flushed out without obstruction. Use a fluid as cleansing agent, which is compatible with the fluid being used later and which does not cause undesirable reactions. You can consult the suppliers and manufacturers of the fluid or contact VSE for the corresponding information. VSE supplies bypass-plates the corresponding for all VS flow meter sizes.

Flow meters are measurement pick-up systems made with high-level precision. They have a mechanical meter consisting of two toothed wheels and which is adapted to the housing with narrow slots. Even the tiniest damage to the toothed wheels and bearings can cause a measurement error. So always make sure that no extraneous material gets into the meter and that the fluid flowing through is always free from dirt and contamination.

After the system has been carefully flushed out and no extraneous material is in the pipe line, you can mount the flow meter and commence the initial start-up.

## Important:

Please flush out the pipe lines and the tank thoroughly, to prevent contamination with the flow meter.



#### **FILTERING OF LIQUID**

Strongly contaminated fluid or extraneous material in the fluid can block, damage or even destroy the flow meter. Always install a sufficiently large filter for these cases in front of the flow meter to prevent damage. The necessary filtering depends on size, bearing system and version of flow meter.

Table 2: Pre-switched filters

Flow meter size	Filter size for ball bearings
VS 0.02 / 0.04 / 0.1	10 µm
VS 0.2 / 0.4	20 µm
VS 1 / 2 / 4 / 10	50 μm

For information on filter size for flow meters with plain bearings, in special version, or with specially adjusted meter tolerances, please consult **VSE Volumentechnik GmbH**.

#### Important:

A blocking flow meter can stop the whole flow. You have to provide a control valve / bypass for the system.



#### **PREAMPLIFIER**

The preamplifier for the standard version is short-circuit-proof, reverse-polarity-proof and processes the signals of the scan sensors. A high level of interference protection is achieved through the push-pull output stages of the preamplifier. You can easily connect evaluation devices

with both PNP and NPN inputs to the outputs. The two-channel output of digital signals enables a higher measurement resolution and also a direction recognition of the flow.

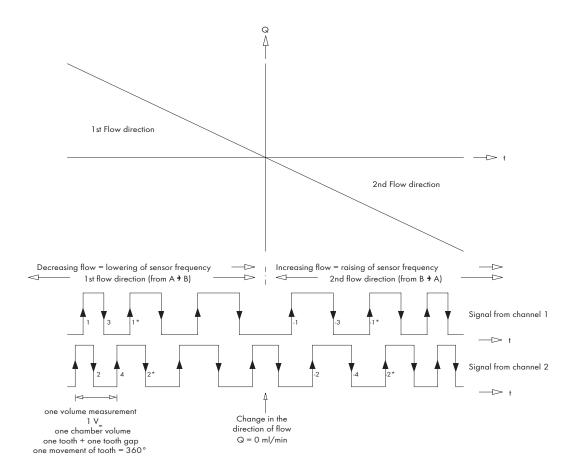


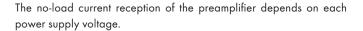
Fig. 2: Signal output of preamplifier

The power supply voltage range is  $U_b = 10 \dots 28 \text{ V DC}$ . You can operate the preamplifier with any voltage in this voltage range  $U_b$  but make sure that the signal voltage is always adjusted to the power supply

voltage. Permitted for the power supply is a steady direct voltage with a maximum residual ripple of  $\pm 15\%$ .

#### Important:

Please make sure that no extra inductive elements are connected in the power supply of the flow meter, such as contactors, relays, valves etc. These components are potential sources of interference, which generate high interference pulses when switched and can interfere with the functioning of the flow meter, although this complies with the electromagnetic compatibility directives (especially if the inductive elements are not provided with an adequate protective circuit).



Power supply voltage  $U_b = 12 \text{ V DC}$   $I_{0max12} = 25 \text{ mA}$ Power supply voltage  $U_b = 24 \text{ V DC}$   $I_{0max24} = 40 \text{ mA}$ Max. current per channel  $I_{Kmax} = 20 \text{ mA}$ 

(the current  $I_{K}$  is dependent on the input impedance of the evaluation electronics)

Total current reception (at 12 V DC)  $I_{Otot.} = 65 \text{ mA}$  $I_{Otot.} = I_{Omax12} + (2 \times I_{Kmax})$   $P_{max} = 0.78 \text{ W}$ 

Total current reception (at 24 V DC)  $I_{Otot.} = 80 \text{ mA}$  $I_{Otot.} = I_{Omax24} + (2 \times I_{Kmax})$   $P_{max} = 1.92 \text{ W}$  The electric connection of the flow meter is performed via the 4-pin round plug located on the preamplifier housing. The connection cable plug is plugged into the plug connection of the flow meter and screwed together.

#### Important:

Only use well-shielded cables for the connection cable, with a wire cross section of  $\ge 4 \times 0.25$  mm<sup>2</sup>. Please make sure that the housing of the round plug is metallic, that it has a connection for the shielding and that the potential of the earth conductor PE is connected to the housing.



The shielding of the connection cable could be placed on both sides. The earth conductor PE is then connected via the shielding from the evaluation electronics to the preamplifier housing and the meter. The cable shielding should always be laid continuously as far as the flow meter and not interrupted in cross connectors or branch sockets. Lay the connection cable as directly as possible from the evaluating device to the flow meter, since interruptions are always a potential source of error.

The flow meter must be connected electrically with the earth conductor PE. This is normally secured by the earthed pipe lines.

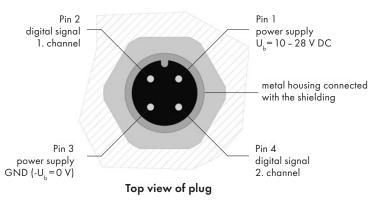


Fig. 3: M12 plug connector installed in the preamplifier housing of the flow meter

#### **Important:**

If there are potential differences between the preamplifier housing and the earth conductor PE of the evaluating electronics, you have to lay a potential equalisation (see connection diagram).

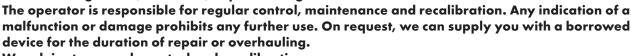


The maximum cable length between flow meter and the evaluation electronics is approx. 120 m. With extensive cable lengths (as of approx. 40 m) you must take care that the connecting cable is laid in an in-

terference-free environment, that the shielding is preferably connected on both sides of the earth conductor PE and that there is no potential difference between the two earth conductor connections.

#### MAINTENANCE

Working life is dependent on operating conditions and thus the specific properties of the devices, limited through wear, corrosion, deposits or age.







#### SENDING BACK OF REPAIRS AND SAMPLE DEVICES

It is imperative that you enclose an exact description of the complaint, objection or fault, when returning the device so as to ensure a rapid and economic repair of the flow meters and other components. Furthermore, you must include a security sheet, which informs unambiguously, which fluid was run with the flow meter and how dangerous this fluid is. The maintenance of legal regulations as regards work safety, such as workplace regulations, accident prevention regulations, stipulations on environmental protection, waste disposal and the water management law, obliges industrial corporations to protect their employees and other persons and environment against harmful effects, when handling

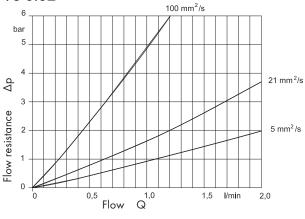
hazardous materials. If further safety precautions are still necessary despite careful emptying and cleaning of the flow meter, information on this is imperative and must be included with the returned despatch. When returning flow meters to VSE Volumentechnik GmbH, please note that inspection and repair will only be performed if the **safety specifications sheet** of the utilised medium is enclosed and the flow meters completely cleaned and flushed. This protects our employees and simplifies our work.

If this is not followed, the despatch will be returned, chargeable to the recipient.

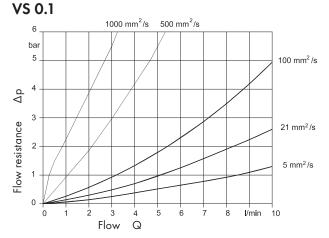
Size	Measuring range I/min	Frequency Hz	Pulse value cm³/pulse	K-factor pulse/litre
VS 0.02	0.002 2	1.667 1666.67	0.02	50 000
VS 0.04	0.004 4	1.667 1666.67	0.04	25 000
VS 0.1	0.01 10	1.667 1666.67	0.1	10 000
VS 0.2	0.02 18	1.667 1500.00	0.2	5 000
VS 0.4	0.03 40	1.250 1666.67	0.4	2 500
VS 1	0.05 80	0.833 1333.33	1	1 000
VS 2	0.1 120	0.833 1000.00	2	500
VS 4	1.0 250	4,167 1041.67	4	250

Measurement accuracy	up to $0.3\%$ of measurement value (with viscosity > $20 \text{ mm}^2/\text{s}$ )					
Repetition accuracy	± 0.05% under the same operating conditions					
Material	Cast iron EN-GJS-400-15 (EN 1563) or Stainless steel 1.4305					
Meter bearing	Ball bearings or steel plain bearings (medium-dependent)					
Seals	FPM (standard), NBR, PTFE or EPDM					
Max. operating pressure	Cast iron EN-GJS-400-15 (EN 1563) 315 bar/4500 psi Stainless steel 1.4305 450 bar/6500 psi					
Medium temperature	-40 + 120°C (-40°F 248°F)					
Ambient temperature	-20 + 50°C (-4°F 122°F)					
Viscosity range	1 100 000 mm²/s					
Installation position	any					
Flow direction	any					
Running noise	max. 72 db(A)					
Power supply version	10 to 28 volts/DC					
Pulse output	2 x push-pull output stages reverse-polarity-proof, short-circuit-proof low signal: 0 = GND; high signal: 1 = U <sub>b</sub> -1 I <sub>max</sub> = 80 mA (at 24 V) P <sub>max</sub> = 1.92 W (at 24 V)					
Channel offset	90° ± 30° max.					
Pulse-width repetition rate	1/1 ± 15° max.					
Preamplifier housing	Aluminium					
Protection type	IP 65					

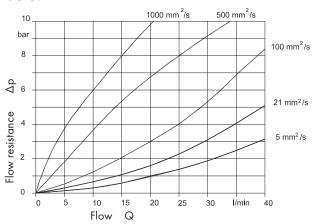




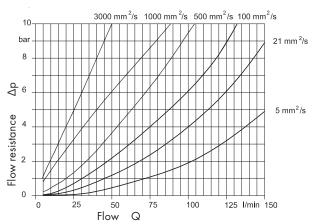
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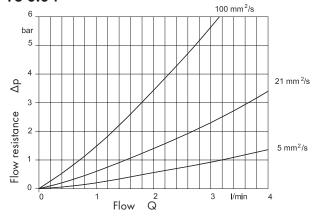
#### **VS 0.4**



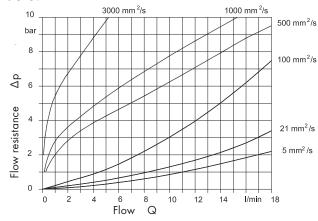
## **VS 2**



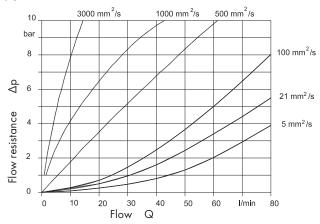
## **VS 0.04**



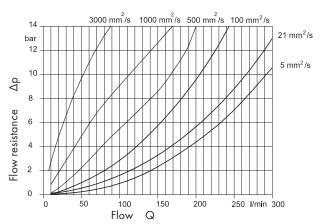
**VS 0.2** 



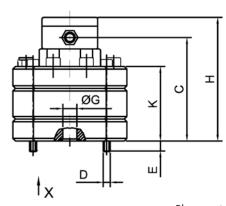
**VS 1** 

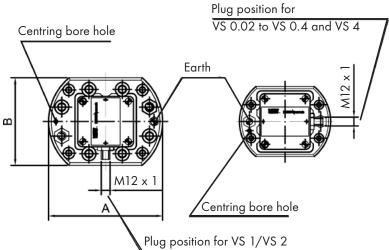


**VS 4** 



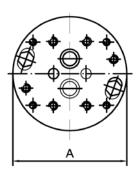
## Cast iron version

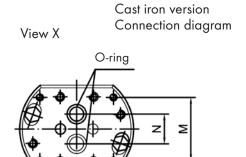




View X

Stainless steel version
Connection diagram
Housing without milled edge

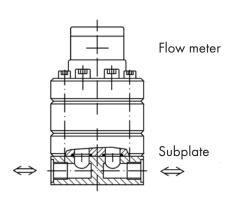


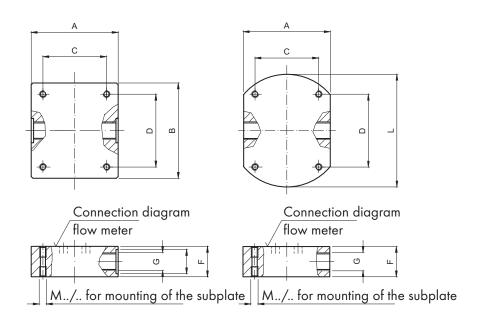


size	Α	В	С	D	E	øG	Н	K	L	М	N	O-ring	Weigh	
VS													GCI kg	SS kg
0.02	100	80	91	M6	12.0	9	114	58	70	40	20	11 x 2	2.8	3.4
0.04	100	80	92	M6	11.5	9	115	59	70	40	20	11 x 2	2.8	3.4
0.1	100	80	94	M6	9	9	117	61	70	40	20	11 x 2	2.8	3.4
0.2	100	80	94	M6	9.5	9	117	61	70	40	20	11 x 2	3.0	3.7
0.4	115	90	96.5	M8	11.5	16	120	63.5	80	38	34	17.96 x 2.62	4.0	5.0
1	130	100	101	M8	12.5	16	124	68	84	72	34	17.96 x 2.62	5.3	6.8
2	130	100	118	M8	15	16	141	85	84	72	34	17.96 x 2.62	6.7	8.4
4	180	140	143	M12	20	30	166	110	46	95	45	36.17 x 2.62	14.7	18.4

Dimensions in mm

## Connection position, side

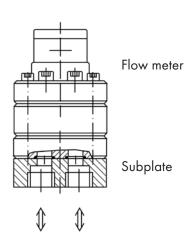


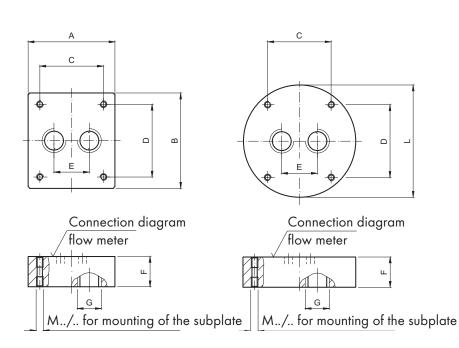


Size	Connection thread	F	øΗ	Α	В	С	D	E	L	Thread/depth	Weight	
VS	G									М	kg	
0.02	G 1/4"		20					26				
0.04	G 3/8"	35	23	80	90	40	70	30	100	M6/12	1.8	
0.1	G 1/2"		28					38	1	,		
	G 1/2"	35	28	00	100			46	115	140 /15	2.7	
0.4	G 3/4"	40	33	90	100	38	8 80	52	115	M8/15		
	G 1/2"	35	28					46				
1 2	G 3/4"	40	33	100	110	110 72	72 84	84	52 130	130	M8/15	3.6
2	G 1"	55	41	1				55	]			
	G 1 1/4"	70	51	100			110	60			7,	
4	*G 1 1/2"	70	<b>_</b>	120	130	100 100 120 M8/15	M8/15	7.4				
	G 1 1/2"	80	56	140	1		110	72	180	1	12.0	

only for AP. 4 U...

## Connection position below

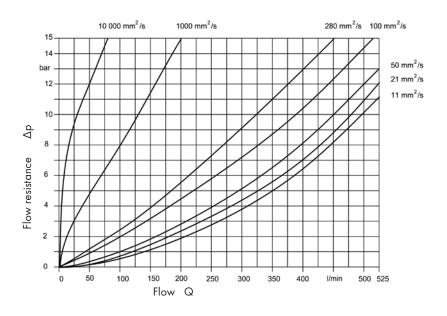




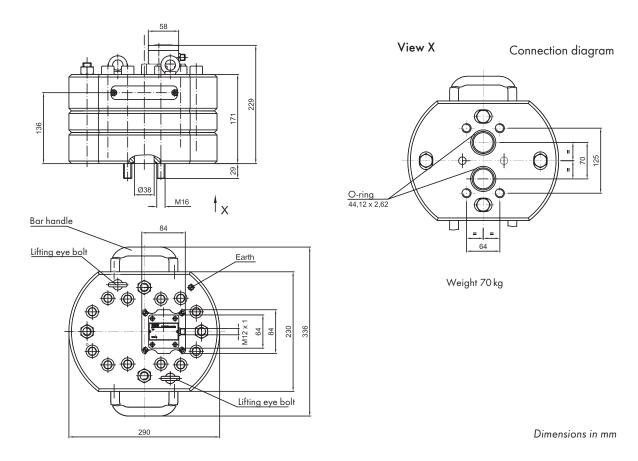
## **TECHNICAL SPECIFICATIONS VS 10**

Size	Measuring range l/min	Frequency Hz	Pulse value cm³/pulse	K-factor pulse/litre				
VS 10	1.5 525	7.50 2625.00	3.333	300				
Measurement accuracy		up to 0.3% of measure	ement value (with viscosity	> 20 mm²/s)				
Repetition accuracy		± 0.05% under the sa	me operating conditions					
Material		Cast iron EN-GJS-600	D-3 (EN 1563)					
Meter bearing		Ball bearings or steel	plain bearings (medium-de <sub>l</sub>	pendent)				
Weight		70 kg without subplat	е					
Seals		FPM (standard), NBR	, PTFE or EPDM					
Max. operating pressur	е	420 bar/6000 psi						
Medium temperature		-40 120°C (-40°F 248°F)						
Ambient temperature		-20 + 50°C (-4°F 122°F)						
Viscosity range		5 100 000 mm <sup>2</sup> /s						
Installation position		any						
Flow direction		any						
Running noise		> 80 db(A)						
Power supply version		10 to 28 volts/DC						
Frequency range		0 2625 Hz						
Pulse output		2 x push-pull output st reverse-polarity-proof low signal: 0 = GND; I <sub>max</sub> = 80 mA (at 24 V P <sub>max</sub> = 1.92 W (at 24 V	, short-circuit-proof high signal: 1 = U <sub>b</sub> -1 /)					
Channel offset		90° ± 30° max.						
Pulse-width repetition re	ate	1/1 ± 15° max.						
Preamplifier housing		Aluminium						
Protection type		IP 65						

## **FLOW RESPONSE CURVES VS 10**

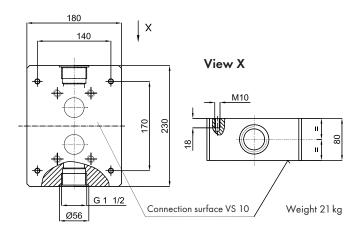


DIMENSIONS VS 10

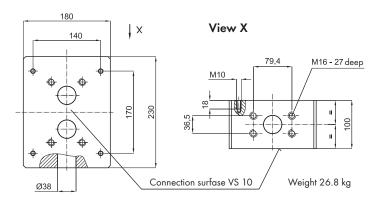


## **DIMENSIONS, SUBPLATE APG 10.**

**APG 10 SG0N / 1** 

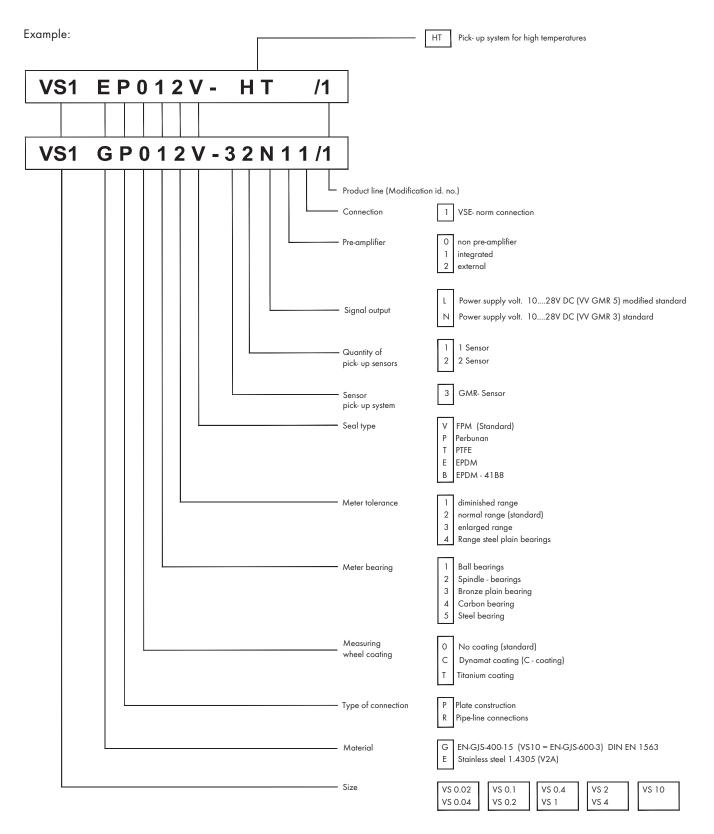


## **APG 10 SW0N / 1**



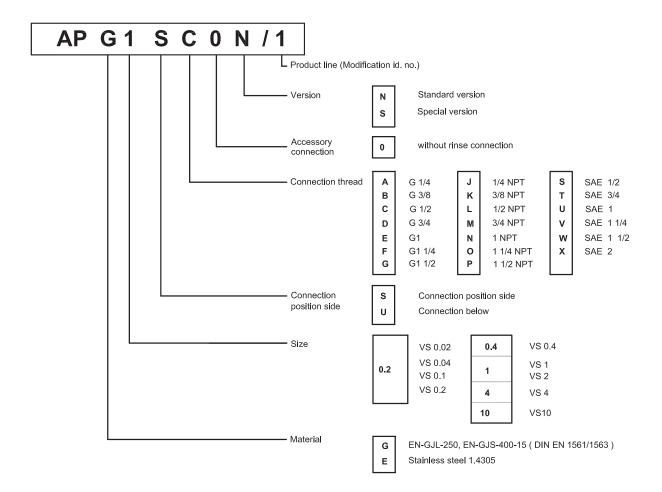
Dimensions in mm

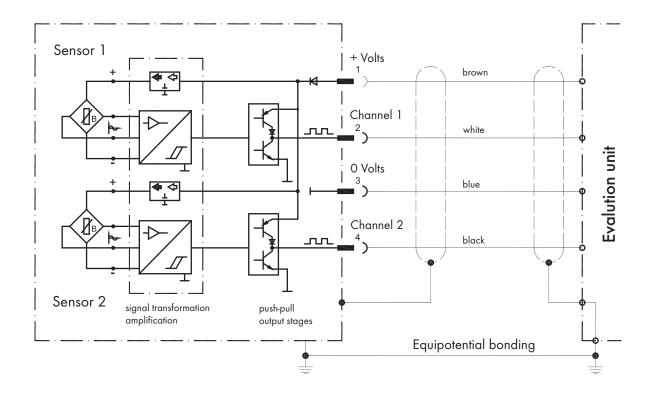
#### Flow meters VS



## Subplates AP ...

Example:

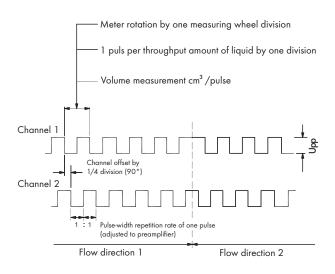


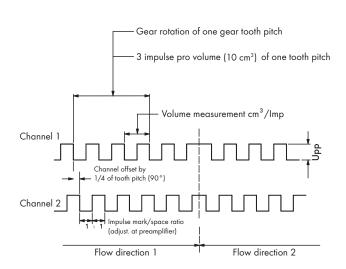


## **OUTPUT SIGNALS ON PREAMPLIFIER**

Flow meter VS 0.02 ... VS 4

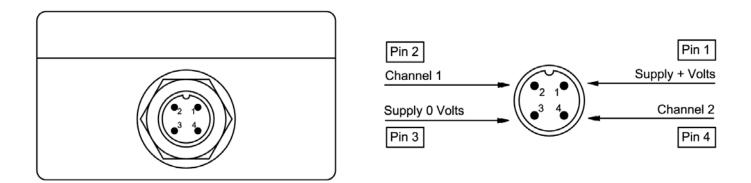
Flow meter VS 10



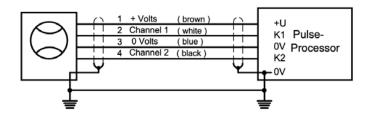


## Voltage ranges

Power supply voltage:  $U_v = 10 \dots 28 \text{ V DC}$ Signal voltage:  $U_{ss} = U_v - 1 \text{ V}$  PLUG ASSIGNMENT



#### **CONNECTION DIAGRAM**



Modification of flow direction indication (+ to - / - to +) by interchanging channels (channel 1, channel 2)

#### PICK-UP SYSTEM FOR HIGH TEMPERATURES HT

For medium temperatures >120 °C, the high temperature (HT) versions by VSE have to be deployed. Flow meters of stainless steel are used exclusively in this case.

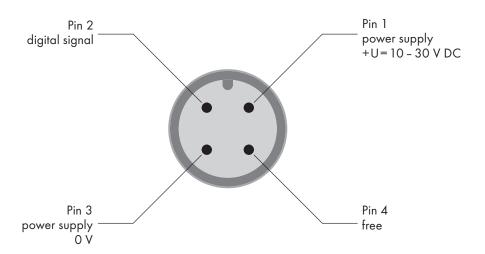
The sensor or pick-up system consists of a sensor unit, which is screwed into the cover of the flow meter and a downstream amplifier. The amplifier is connected with the flow meter via a temperature-stable cable

and has to be installed outside the high temperature zone. The ambient temperature should be no more than 50°C in this area.

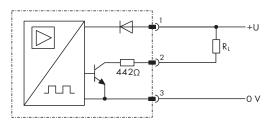
The digital signals are emitted as PNP- or NPN-signals, depending on amplifier version.

With extensive cable lengths, we recommend using shielded cables and a pull-down (PNP signal) or pull-up impedance (NPN signal).

## Plug assignment HT



Top view of plug



Pulse output NPN-version

# +U +U 442Ω 2 R<sub>L</sub>

Pulse output PNP-version

# Technical specifications HT

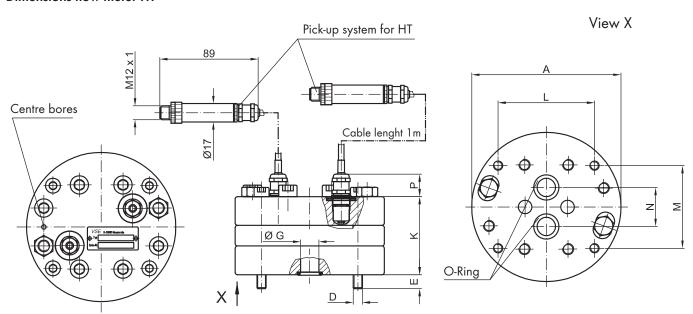
## **Sensor Unit**

Medium temperature	-40°C 210°C
Number of pick-ups	1 or 2 pick ups
Pick-up	magnetoresistive
Electrical connection	cable gland
Seals	FPM or EPDM

## Amplifier pick-up system for high temperature range HTS

Supply voltage	U <sub>b</sub> = 10 30 V DC+/- 10%
Current consumption	I <sub>b</sub> = ca. 18 mA (idle motion, without lead)
Signal output PNP	High Sign.: $U_S = U_b-1 V$ ; $I_S = 25 \text{ mA max}$
Signal output NPN	Low Sign.: $U_s = 0 \text{ V}$ ; $I_s = 25 \text{ mA max}$
Electrical connection	4 pin round plug M12
Max. ambient temperature	-20°C 50°C
Protection – class	IP 64
Pull-Down resistor Rc	4.7 10 KΩ PNP-Version
Pull-Up resistor Rc	4.7 10 KΩ NPN-Version

## **Dimensions flow meter HT**



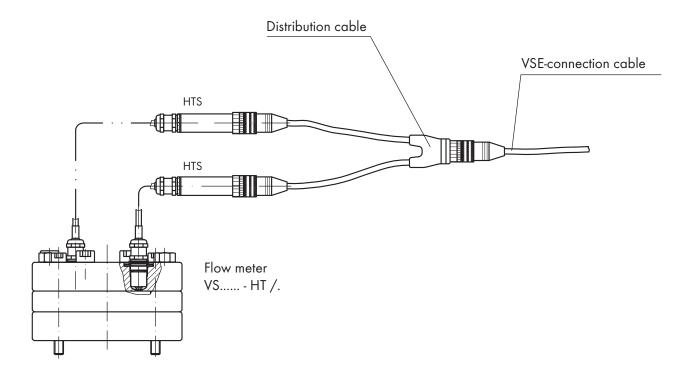
size	Α	D	E	øG	K	L	М	N	Р	O-ring	Weight
VS 0.04*	100	M6	11.5	ø 9	59	70	40	20	22	11 x 2	3.3
VS 0.1	100	M6	9	ø 9	61	70	40	20	22	11 x 2	3.3
VS 0.2	100	M6	9.5	ø 9	61	70	40	20	22	11 x 2	3.6
VS 0.4	115	M8	11.5	ø 16	63.5	80	38	34	22	18 x 2.62	4.9
VS 1	130	M8	12.5	ø 16	68	84	72	34	22	18 x 2.62	6.7
VS 2	130	M8	15	ø 16	85	84	72	34	22	18 x 2.62	8.3
VS 4	180	M12	20	ø 30	110	46	95	45	12	36.17 x 2.62	18.3

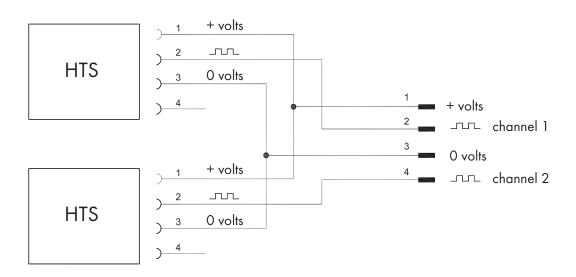
<sup>\*</sup>only available as single-channel version

#### **Accessories HT**

Distribution cable for connection of two HT-pick-ups on a VSE-connecting cable.

## Connection diagram 2-channel HT-pick-up system





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VSE Volumentechnik GmbH Hönnestraße 49 58809 Neuenrade/Germany

VSE Volumentechnik GmbH Postfach/P.O.Box 1229 58804 Neuenrade/Germany

Phone +49 (0) 23 94 / 6 16-30 Fax +49 (0) 23 94 / 6 16-33 info@vse-flow.com

www.vse-flow.com

e.holding
FLUID TECHNOLOGY GROUP
www.e-holding.de