SiKA VVX Vortex Flow Sensors Instruction Manual

VVX Vortex Flow Sensors
Instruction Manual

Vortex flow sensors VVX

Contents

About This Operating Manual

- Read carefully before use!
- Retain for later reference!

If you have any problems or questions, please contact your supplier or contact us directly:
SIKA Systemtechnik GmbH
Struthweg 7–9
34260 Kaufungen / Germany
☎ +49 5605 803-0
🖷 +49 5605 803-555
info@sika.net
www.sika.net

Safety Instructions

Read the operating manual carefully. Follow all instructions to avoid personal injury and property damage.
Intended use
The Vortex flow sensor VVX may only be used for measuring and metering water and aqueous solutions.

⚠ **WARNING**
The Vortex flow sensors of the series VVX are no safety components in accordance with Directive 2006/42/EC (Machine Directive).

- Never use the device as a safety component.

The operational safety of the device supplied is only guaranteed by intended use. The specified limits (→ p. 28) must not be exceeded under any circumstances. Before installation, check whether the material of the device is suitable for the medium to be measured and other media used (e.g. disinfectants and detergents) (→ p. 28).
Due to the current demands on quality and safe use of products it is not always avoidable, that substances are also included which, when considered separately, meet the criteria of Article 57, REACH directive. In the series VVX (vortex flow sensors) built-in piezoceramic bending vibrators can contain more than 0.1% lead zirconate titanate (PZT), CAS No. 12626-81-2, EC No. 235-727-4, which is listed as SVHC according to REACH.
After the sintering process, however, the powdery PZT is bound in almost insoluble crystalline form. Proper use for the intended use may result in no release. Risks can occur only with oral or inhalation intake, which can be excluded if used properly.
Qualified personnel

- The personnel entrusted with the installation, operation and maintenance of the device must be appropriately

qualified. This can be done by training or instruction.

General safety instructions

- Only operate the device when it is in perfect condition. Damaged or defective devices must be checked immediately and replaced if necessary.
- Type plates or other information on the device must not be removed or made unrecognizable, as otherwise any guarantee and manufacturer’s liability will be invalidated.

Installation

IMPORTANT

Mechanical loads, exceeding the measuring range or pressure surges can damage the VVX sensor.

- The sensor in the measuring tube must not be exposed to mechanical loads.
- Avoid water hammers during commissioning or normal operation.

IMPORTANT

Bubble formation and cavitation in the medium can cause sensor malfunction and must be avoided. Cavitation is strongly dependent on the medium, flow rate and medium temperature. SIKA recommends the following minimum system pressures.

Recommended minimum system pressure				
VVX15	**VVX20**	**VVX25**	**VVX32**	**VVX40**
1.0 bar	1.4 bar	1.6 bar	2.0 bar	2.2 bar

IMPORTANT

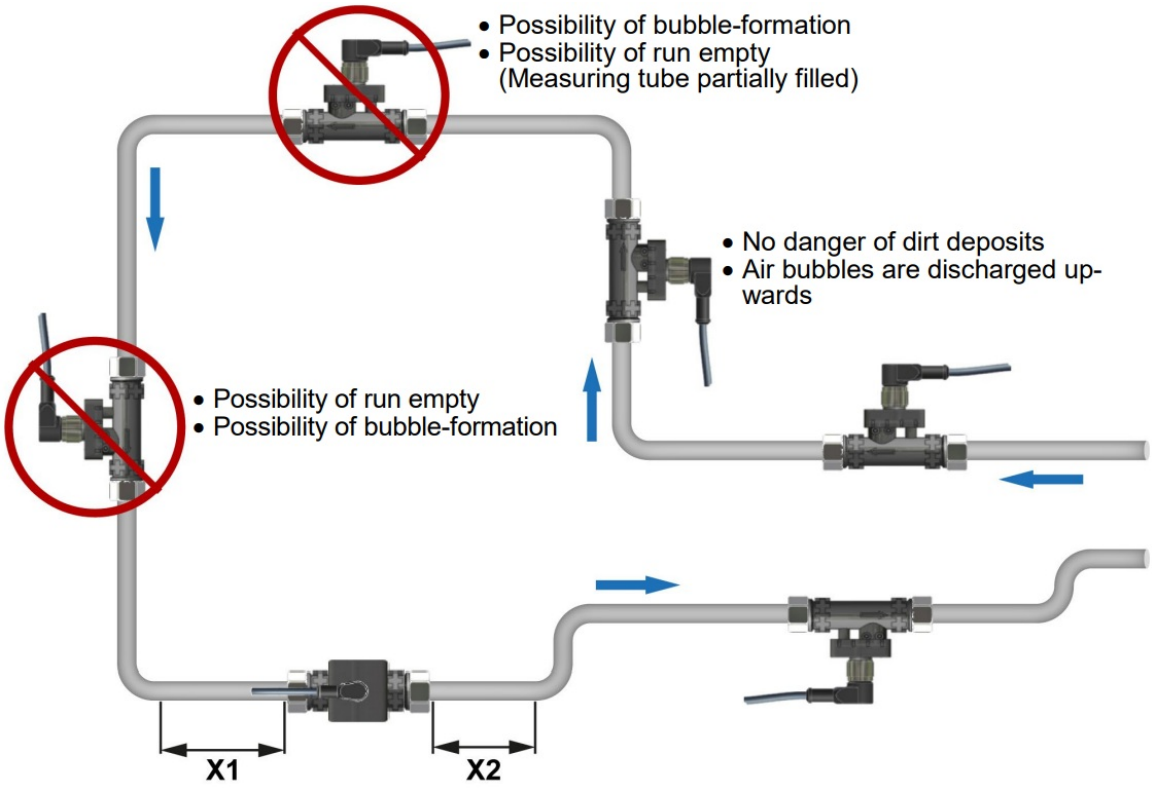
External vortices are generated by disturbances (offsets, protruding flat gaskets, changes in diameter, etc.) of the flow in the inlet and outlet sections. They lead to false pulses so that the error limits of the VVX can no longer be guaranteed.

- Ensure that the inside diameter of the pipe matches the inside diameter of the VVX.
- Avoid obstructions in the inlet and outlet sections.
- Provide suitable calming sections at the inlet and outlet.

IMPORTANT

Mechanical vibrations (e.g. pump, compressor …) transmitted to the VVX can lead to incorrect measurements.

- Select the installation location so that no vibrations are transmitted to the VVX.
- The VVX can theoretically be installed at any location on a straight pipe.
- Flow sensors with plastic pipe sections must be installed in the pipeline stress-free.



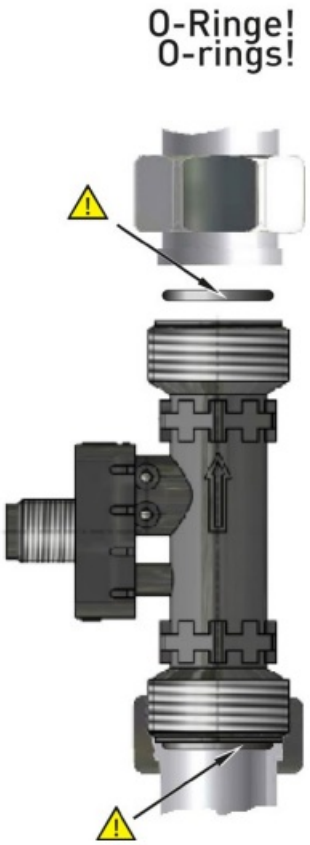
Length of inlet and outlet sections

	VVX15 / VVX20 / VVX25	**VVX32 / VVX40**
Inlet section X1	Min. 10x DN	250 mm
Outlet section X2	Min. 5 DN	Min. 5 DN

- The flow sensor can be installed in horizontal and vertical pipelines. The flow sensor is only suitable for use in completely filled pipelines.
- Vortex flow sensors are not completely independent of the flow profile due to their principle. A calming section is therefore necessary.
  In order to achieve the highest possible measuring accuracy, straight inlet and outlet pipes with an appropriate inner diameter should be used (VVX15 = 13 mm • VVX20 = 19 mm • VVX25 = 25 mm • VVX32 = 32 mm • VVX40 = 40 mm).

2.1 Mounting With Thread
IMPORTANT

- Only use the O-rings supplied.
- Observe the flow direction on the device.
- Observe the mounting dimensions (→ p. 29).



- Select a suitable location for installation (2 “Installation”).

  To ensure the best possible measuring accuracy, a vertical installation position with increasing flow is preferable (no collecting of dirt deposits).
- Install suitable pipe fittings at the installation location.
- Insert the VVX with the gaskets.
- Screw the union nuts of the pipe fittings onto the process connections of the VVX.

IMPORTANT

Pay attention to maximum torque.
While tightening, counter the union nut on the hexagon of the process connection!
If you do not counter it, the VVX can be damaged.

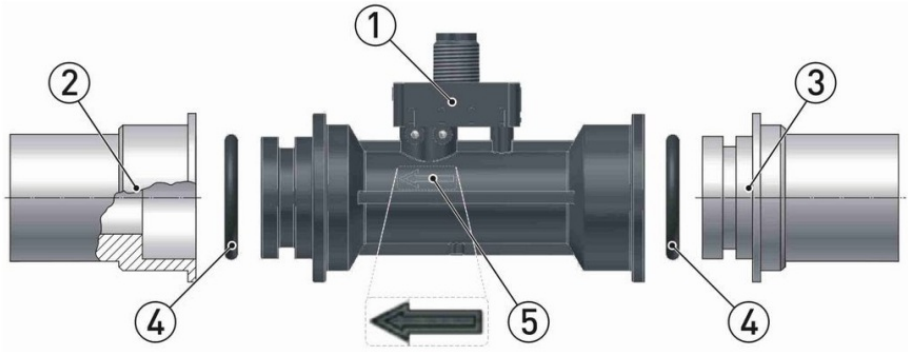
Maximum torque				
VVX15 G¾	**VVX20 G1**	**VVX25 G1¼**	**VVX32 G1 ½**	**VVX40 G2**
⎔19	⎔24	⎔30	⎔36	⎔46
9 Nm	15 Nm	20 Nm	30 Nm	60 Nm

⎔ = Width across flats
• Tighten both union nuts.
When tightening, counter the hexagon of the device with a spanner.

2.2 Mounting With QuickFasten

IMPORTANT

- Observe the mounting dimensions of the VVX 1 (→ p. 29).
- Observe the dimensions of the inlet 3 and outlet 2 (→ p. 29).
- Only use suitable O-rings 4 of the right size (25.7 x 3.5).
- Observe the flow direction on the device 5.

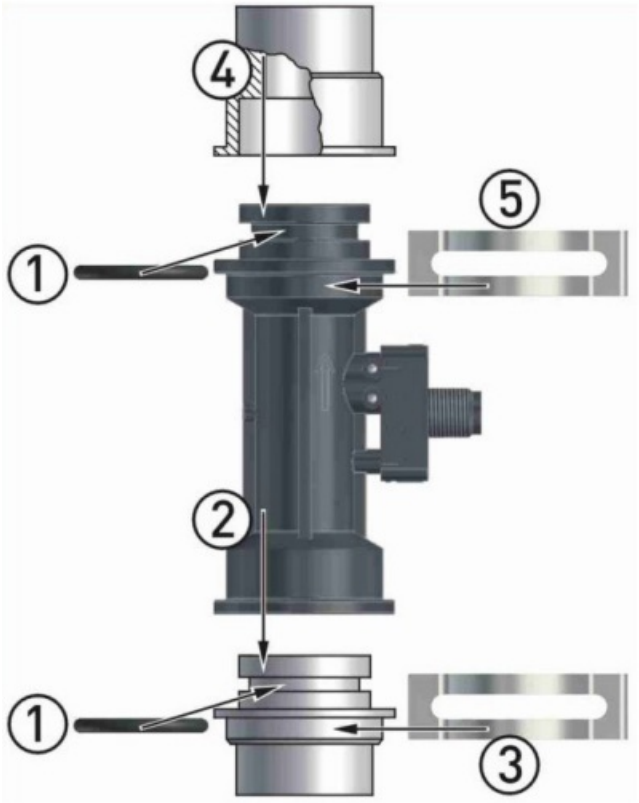


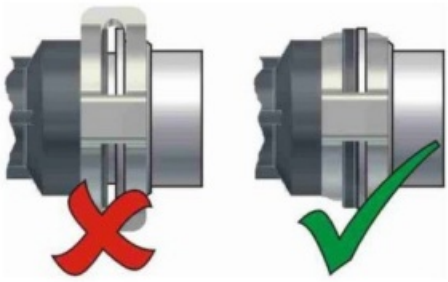
- Select a suitable location for installation (→ 2 “Installation”).
  To ensure the best possible measuring accuracy, a vertical installation position with increasing flow is preferable (no collecting of dirt deposits).
- Install suitable QuickFasten connections (inlet and outlet) at the installation location.

- 1 Mount the O-rings on the VVX and on the inlet.
- 2 Put the VVX on the inlet.

  Be careful not to damage the O-ring.
- 3 Slide the clip over the connection until it snaps into place.
- 4 Put the outlet on the VVX.

  Be careful not to damage the O-ring.
- 5 Slide the clip over the connection until it snaps into place.





IMPORTANT

The clip must snap properly.
The webs of the VVX and the inlet or outlet must be located in the slots of the clip.

Electrical Connection

The electrical connection of the VVX is made via an M12x1 plug mounted on the cover of the electronics housing.

CAUTION
The electrical connection may only be carried out by a qualified electrician.

- De-energize the electrical system before connecting the VVX.

IMPORTANT

Exceeding the specified limits will cause damage to the device’s electronics. In the absence of current limiting, there is a risk of fire due to device overheating.

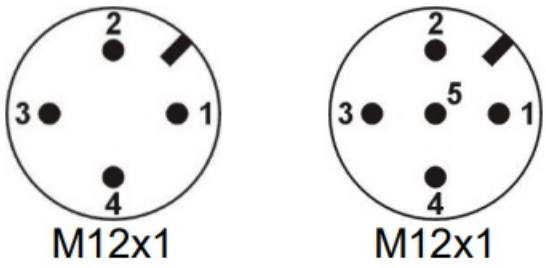
- Always connect the VVX to an electrical source with power limitation.

Optional wiring
All VVX are configured to allow one flow output (frequency or analogue) to be wired as standard.
Depending upon the selected configuration, an optional temperature output, alarm output or analogue output can also be wired.
Connection cable
Matching connection cables with female connector M12x1 are available in a various lengths as SIKA accessories.
Shielded connection cables are not necessary.
The connection cable should be fixed near the sensor. This can counteract a negative influence on the measurement result in case of strong vibrations in the environment.
IMPORTANT

Observe the temperature resistance of the connection cable at high media temperatures.
If the maximum operating temperature is less than the media temperature, avoid direct contact between the cable and the pipe.
Connection M12x1 plug

- Screw the coupling socket of the connection cable onto the plug of the VVX.
- Tighten the knurled nut of the coupling socket (do not exceed 1 Nm torque).

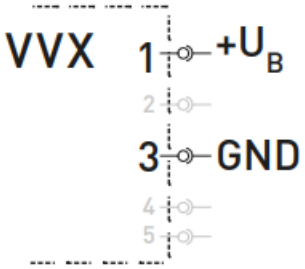
Earthing for VVX32 / VVX40
The metallic pipe section should be earthed if possible. A borehole M4x6.5 is provided on the pipe section for this purpose.
3.1 Wiring
The pin assignment differs depending on the selected configuration of the device.
Pin assignment:



Possible pin assignments:
Pin 1: +U
Pin 2: U B Flow • I Flow • R Temp • n.c. (not connected)
Pin 3: GND
Pin 4: Frequency • Alarm • IO-Link
Pin 5: UTemp • R Temp • without

- Wire the connection cable according to your device version and the pin assignment shown on the type plate.

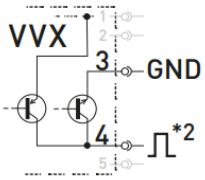
  Supply voltage:



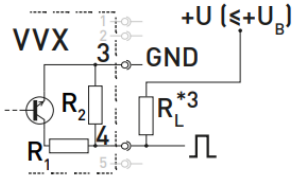
3.1.1 VVX With Frequency Output

Flow

Push-Pull *1

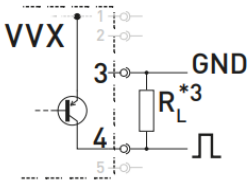


NPN Open Collector



R1 ≤ 47 Ω / R2 ≥ 10 kΩ

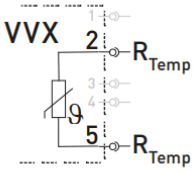
PNP Open Collector



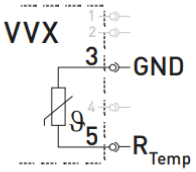
*1: Not at 5 V.
*2: Do not wire the push-pull switch outputs of multiple VVX devices in parallel.
*3: Recommended pull-up / pull-down resistance R L ~5 kΩ.

3.1.2 VVX With Temperature (Optional)

NTC / Pt 1000



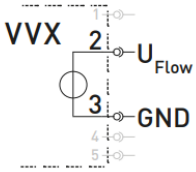
NTC / Pt 1000 (only VVX15 / VVX20 / VVX25)



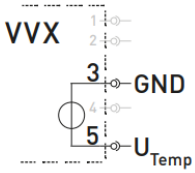
If Pin 2 has been assigned by another function.

3.1.3 VVX With Analogue Output 0.5…3.5 V (Optional)

Flow U_{Flow}



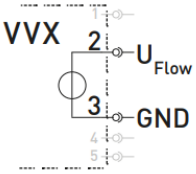
Temperature U_{Temp}



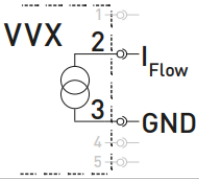
3.1.4 VVX With Voltage 0…10 V or Current Output 4…20 mA (Optional)

Flow

0…10V



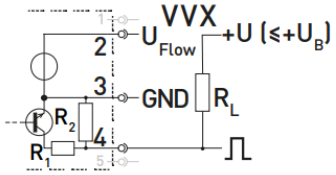
4…20 mA



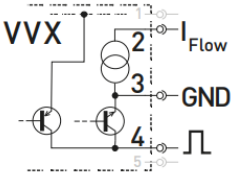
3.1.5 Use of Frequency Output and Optional Functions

The frequency output can be combined with the optional functions. However, not all combinations are possible. In principle, only one function may be assigned to each of pins 2, 4 and 5. Multiple assignments are not possible. The wiring results from superimposing the circuit diagrams of the corresponding functions, as shown in the following two examples.

Flow NPN + Analogue 0.5…3.5V



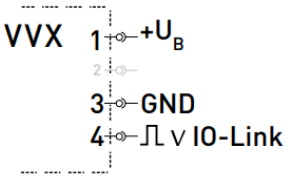
Flow Push-Pull + current 4…20 mA



R1 ≤ 47 Ω / R2 ≥ 10 kΩ
Recommendation for resistance R_L ~5 kΩ

3.1.6 VVX With Frequency Output and IO-Link

Flow



Commissioning and Measuring Operation

IMPORTANT

Before the first commissioning, check whether the measuring system has been vented by flushing.

4.1 Measuring Operation

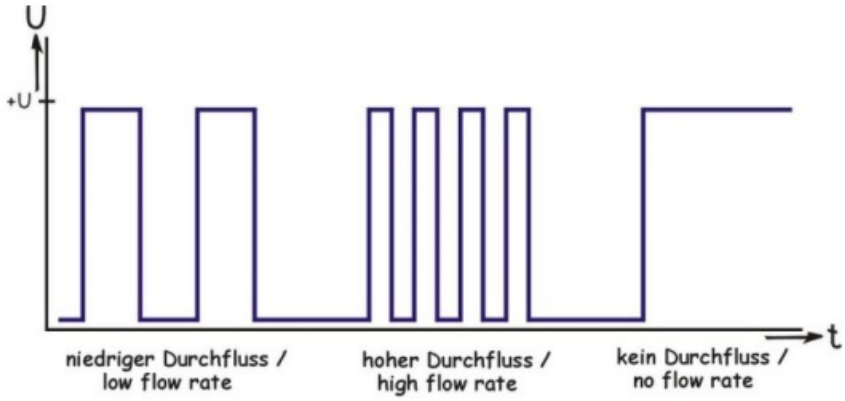
Type	**VVX15**	**VVX20**	**VVX25**	**VVX32**	**VVX40**
Output signal characteristics					
Flow frequency output:					
Pulse rate / K-factor [1/l]r	500	200	100	100l	50
optional:	3…1,000	2…800	1…500	-/-	-/-
Signal shape	Square wave signal • duty cycle 50:50 NPN open collector (o.c.), PNP o.c. or push-pull				
Signal current	≤ 20 mA				
Flow analogue output 0.5…3.5 V (optional):					
Output signal	0.5…3.5 V *2				
Scaling [l/min] *4	2…40	2…65 or 5…80	7…150	12…250	22…400
Voltage rate [V / l/min]	0.07895	0.04762 or 0.04000	0.02098	0.0126	0.0079
Signal current	≤ 1 mA				
Flow voltage and current output (optional):					
Output signal	0…10 V • 4…20 mA *3				
Scaling [l/min] *4	0…40	0…80	0…150	0…250	0…400
Voltage / current rate – 0 …10 V [V / l/min]	0.25000	0.12500	0.06667	0.04000	0.02500
– 4…20 mA [mA / l/min]	0.40000	0.20000	0.10667	0.06400	0.04000
Signal current	≤ 1 mA (Voltage output)				
Working resistance	≤ 125 Ω at max. 24 V signal voltage (Current output)				
Temperature (optional):					
· Sensor directly	Pt1000 (2-wire, class B) or NTC (R25=10.74 kΩ, B 0/100 3450)				
· Analogue output	0.5…3.5 V *2 corresponds to 0…90°C with (Pt1000 *5 or NTC *6)				
*2) Resolution 7 bit or 10 bit (depending on version). *3) Resolution 12 bit. *4) other scales possible.					

Type	VVX15	VVX20	VVX25	VVX32	VVX40
IO-Link:					
IO-Link specification	Version 1.1				
IO-Link Device ID	2				
Transmission type	COM2 (38.4 kBaud)				
Ready for operation	2 seconds after supply voltage is applied				
Min. cycle time	103 ms				
SIO mode	Yes				
Profiles	Smart Sensor, Device Identification, Device Diagnosis				
SDCI standard	IEC 61131-9				
Required master port	Class A				
Process data analogue	3				
Download IODD device de scription	https://www.sika.net or https://ioddfinder.io-link.com				
Temperature (optional):					
· Sensor directly	Pt1000 (2-wire, class B) or NTC (R25=10.74 kΩ, B 0/100 3450)				
· Analogue output	0.5…3.5 V *2 corresponds to 0…90°C with (Pt1000 *5 or NTC *6)				
*2) Resolution 7 bit or 10 bit (depending on version). *3) Resolution 12 bit. *4) other scales possible. *5) Dual slope measurement method with basic accuracy ±0.5 K. *6) Dual slope measurement method with basic accuracy ±1.0 K.					

4.1.1 Flow Measurement

VVX with frequency output:

Depending on the version, the VVX provides a flow-proportional NPN, PNP or push-pull square-wave signal. The frequency of the frequency output changes with the flow (→ Fig.).



VVX with analogue, voltage or current output (optional):

The output of the VVX is either the voltage U Flow or the current I Flow .

The output signal is proportional to the measured flow. The scaling of the output is indicated on the type plate and on p. 25.

4.1.2 Temperature Measurement (Optional)

The temperature is measured by an additional sensor RTemp integrated into the measuring tube.

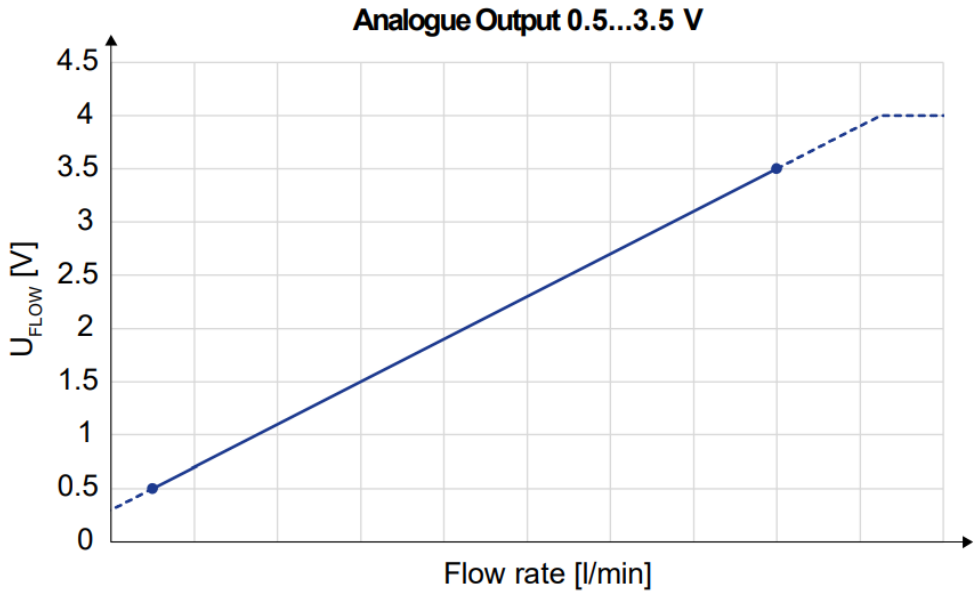
Depending on the version, this is an NTC or Pt1000.

For the VVX with analogue output (0.5…3.5 V), the voltage signal U-Temp can also be measured. The scaling of the output is indicated on the type plate and on p. 25.

On-Site Test

VVX with analogue output 0.5…3.5 V

- Connect the supply voltage (→ p. 23).
- Use a digital multimeter to check whether the supply voltage is present at pin 1 and pin 3.
- Check the voltage output (pin 2 and pin 3) with a digital multimeter:
- Without flow, the voltage output should be between 0.3…0.5 V.
- For a flow rate in the measuring range (see type plate), the voltage output should be between 0.5…3.5 V depending on the flow rate.



Disposal

In accordance with Directives 2011/65/EU (RoHS) and 2012/19/EU (WEEE)*, the device must be disposed of separately as electrical and electronic waste.
NO HOUSEHOLD WASTE
The device consists of various different materials. It must not be disposed of with household waste.

- Take the device to your local recycling plant

  or
- return the device to your supplier or to SIKA.

  * WEEE reg. no.: DE 25976360

Technical Data

The technical data of customised versions may differ from the data in this operating manual.
Please observe the information specified on the type plate.
7.1 Characteristics VVX

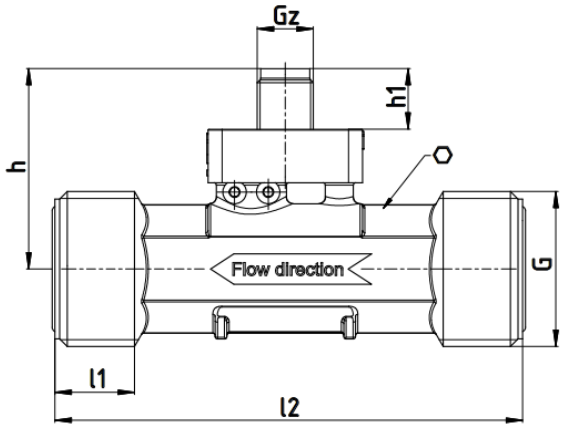
Type	VVX15	VVX20	VVX25	VVX32	VVX40
Electrical characteristics					
Supply voltage • Standard • Voltage / Current output 0…10 V / 4…20 mA	8…30 VDC or 5 VDC ±5% 12…24 VDC				
Current consumption • Frequency / Analogue output	< 15 mA				
Electrical connection	5-pin-plug M12x1 or 4-pin plug M12x1				
Degree of protection (EN 60529)	IP65 *1 and IP67 *1				
Connecting cable (Accessory)	Female connector M12x1 with cable				
Process variables					
Medium to measure	Water and aqueous solutions				
Temperature range: – Medium – Ambient	-20…90 °C (non-freezing) -20…70 °C				
Nominal diameter	DN 15	DN 20	DN 25	DN 32	DN 40
Inner diameter	Ø 13 mm	Ø 19 mm	Ø 25 mm	Ø 32 mm	Ø 40 mm
Nominal pressure	PN 10			PN 16	
Process connection	G ¾ ISO 228 male	G1 – ISO 228 male • Quick-Fasten	G 1¼ ISO 228 male	G 1½-ISO 228 male	G 2-ISO 228 male
*1) Only with attached coupling					

7.2 Materials in Contact With Media

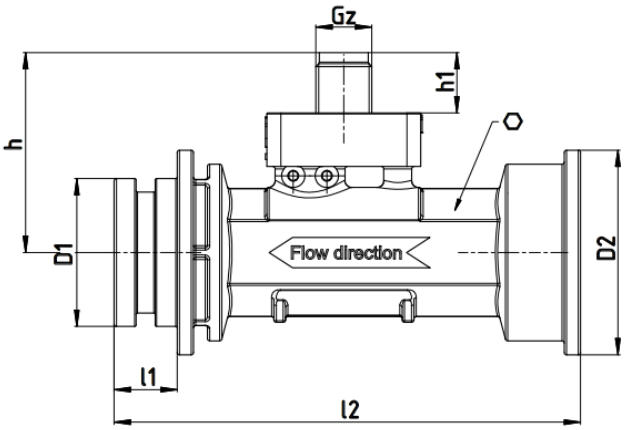
Type Component	VVX15 • VVX20 • VVX25	VVX32 • VVX40	
Tube	PPS 40 % glass fibre reinforced	Brass CW617N-DW	Stainless steel 1.4581
Sensor	ETFE or PFA		
O-rings	EPDM		
Immersion sleeve	-/-	Brass CW724R	Stainless steel 1.4571
Bluff body	-/-	PPS 40 % glass fibre reinforced	

7.3 Dimensions

VVX threaded version

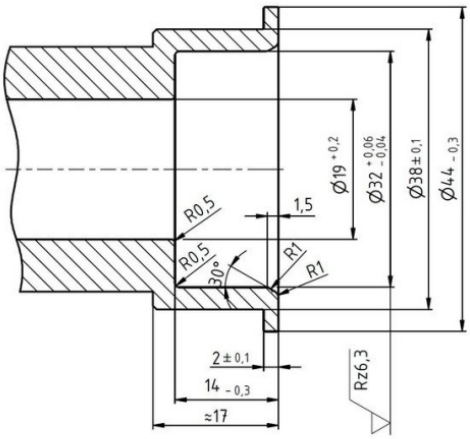


VVX QuickFasten

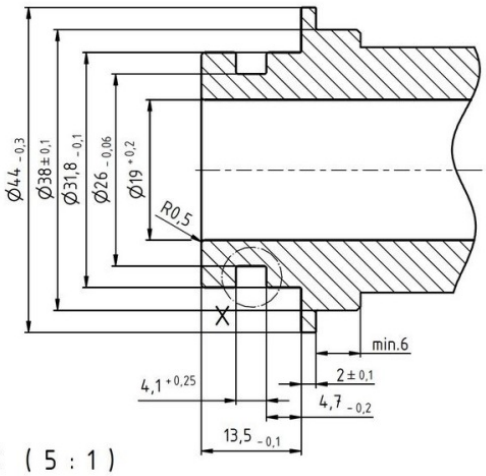


Dimensions [mm]	h	h1	D1	D2	l1	l2	G	Gz	⬡*
Threaded version									
VVX15	40	13			16.5	80	G ¾	M12 x 1	19
VVX20	43	13			16.5	100	G 1	M12 x 1	24
VVX25	46	13			16.5	95	G 1¼	M12 x 1	30
VVX32	49.6	13			18	100	G 1½	M12 x 1	36
VVX40	53.6	13			18.2	110	G 2	M12 x 1	46
QuickFasten									
VVX20	43	13	31.8	44	13.5	100		M12x1	24

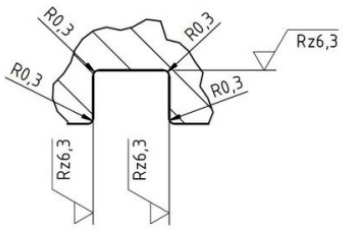
Outlet section



Inlet section



X (5 : 1)



SIKA Systemtechnik GmbH
Struthweg 7–9
34260 Kaufungen / Germany
+49 5605 803-0
+49 5605 803-555
info@sika.net
www.sika.net

Documents / Resources

	SiKA VVX Vortex Flow Sensors [pdf] Instruction Manual VVX Vortex Flow Sensors, VVX, Vortex Flow Sensors, Flow Sensors, Sensors

References

- SIKA » Clevere Mess- & Kalibriertechnik seit 1901
- IODDfinder
- SIKA » Clevere Mess- & Kalibriertechnik seit 1901
- User Manual