



ViscoScope®

**Prozess –
Viskosimeter
Systeme**

Handbuch

Installation
Bedienung

ViscoScope®

Installation and Operating Manual

Sensors

S-1*-****

S-3*-****

VA-100*-**

VA-300*-**

Transmitters

VS-D250

VS-4450

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About this manual

This manual helps you to put the ViscoScope® viscometer into operation safely and correctly. It is valid for all sensor and transmitter models.

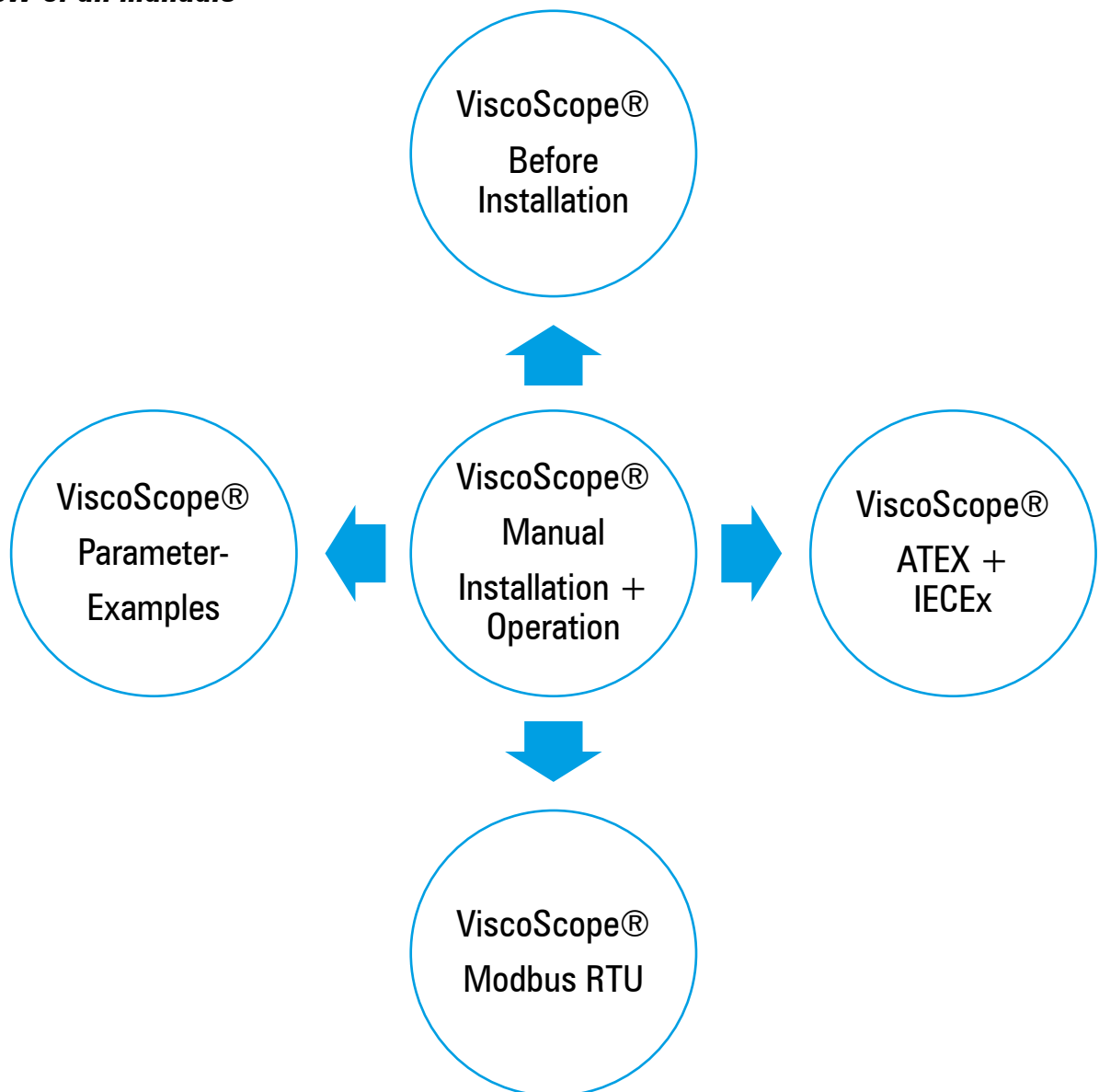
Notation

To improve clarity, some information is presented as follows:

If the text refers to just one specific model, the **model name (e.g. VS-4450)** is highlighted in yellow.

Important notes are written in red.

Overview of all manuals



Introduction

Thank you for choosing a ViscoScope® viscometer. You have purchased a rugged, reliable and durable measurement instrument. To ensure that your instrument functions correctly, please follow the instructions contained in this manual. Keep the manual in a safe place so that you can refer to it quickly whenever necessary.

Proper use

The ViscoScope® viscometer is an instrument for measuring the dynamic viscosity of liquids in continuous and batch processes in all industrial applications. In addition, the instrument measures the process temperature to facilitate calculation of temperature compensated viscosities. The viscometer can measure liquids with different properties and compositions.

The operating safety of the instrument cannot be guaranteed if it is used incorrectly or for purposes for which it was not intended. In such cases, Fluid.iO Sensor + Control GmbH & Co. KG (Marimex®) accepts no liability for damages or consequential damages.

Installation and start-up

Installation and start-up must only be performed by qualified and authorized persons employed by the plant operator. These persons must have read and understood this manual and follow its instructions.

The user is responsible for ensuring the corrosion resistance of sensor parts that come into contact with the product. Marimex® will be pleased to advise you on selecting the most appropriate components in this area.

The ViscoScope® viscometer requires no servicing or maintenance as the sensor probe has no moving parts or seals. If the system is damaged, it must be deactivated immediately. Reasons for shutting down the system include:

- visible damage to the ViscoScope® system
- visible damage due to transport
- bent sensor
- signs of corrosion or abrasion on the sensor

The system should be inspected by a qualified professional before being restarted. Do not open the sensor under any circumstances as repairs must be performed exclusively by Marimex® or its authorized specialists.

Repairs performed by third parties immediately render the warranty void and Marimex® accepts no liability for resulting damages and consequential damages. Keep the original sensor packaging and use it to store the sensor correctly or package it securely should it be necessary to send it to Marimex® for inspection or repair.

Marimex® accepts no liability for sensors that are stored or packaged incorrectly. If you do not wish to store the original packaging, we recommend that you return it at no cost to Marimex®. We will store it for you free of charge.

If you require the packaging materials, simply contact Marimex® or your local representative.

Operating safety

If ViscoScope® sensors are used in hazardous areas, **the specifications and instructions from the separate "Manual for Sensor Installation in Hazardous Areas"**, which is part of this manual, **must be applied**. The regulations and versions listed in the Ex manual must be observed and followed in all cases.

In applications with high temperatures, touching the sensor housing can cause burns. Do not cool the sensor by water jet (thermal shock). The user must take appropriate protective measures to protect against burns.

Marimex® reserves the right to make technical changes to improve the ViscoScope® system without notice.

Return deliveries

The following points must be observed for the return in the event of repair, inspection or recalibration:

To avoid transport damage, the original packaging of the ViscoScope® sensor should be used. Marimex® will not accept any guarantee or goodwill in the event of improper packaging and resulting transport damage. A completed "Binding Declaration" must be attached to the outside of the packaging, otherwise Marimex® will not transport, open and process the consignment.

All product residues must be removed from the ViscoScope® sensor, including in flange holes and on the housing. Marimex® attaches great importance to the health of its employees and the protection of the environment. Sensors that have not been cleaned lead to contamination of the calibration oils and can lead to combustion of product residues during repair (welding, stress-relieving annealing).

Before you return a ViscoScope sensor to us, you must complete a decontamination form. You can obtain the form from your distributor.

Costs due to inadequate cleaning, disposal or personal injury will be charged to the user.

System configuration and function

The system comprises a **sensor, transmission cable and transmitter**.

ViscoScope®-Sensor

The sensor can be installed anywhere in reactors, boilers, tanks, pipes or flow through cells. All standard flanges, fittings, threads or even special flanges are available for use as the process connection.

The sensor housing contains numbered terminal blocks for the electrical connection of the transmission cable. Depending on the sensor model, the transmission cable is connected.

- using a connector located on the exterior of the sensor housing cover
- through a cable gland into the sensor housing where it is electrically connected to the terminal blocks

All the sensor probes contain a Pt100 for measuring the process temperature. For applications in higher temperatures (versions ST, HT and XT), an additional Pt100 is installed in the sensor housing (only model S-3****_** / VA-300*_**).

Transmission cable

The transmission cable connects the sensor with the transmitter. Depending on the sensor model, the sensor end of the transmission cable is fitted with a connector or color-coded numbered cores with cable lugs for connection to terminal blocks. At the transmitter end, the cable cores are color-coded, numbered and fitted with ferrules.

The transmission cable is ready-made and can be connected immediately. **Its length should not be changed.** Contact Marimex® or your local representative if you wish to change the cable length.

ViscoScope®-Transmitter

The transmitter is available in wall, panel and DIN rail housings as well as 19" racks. Depending on the type of enclosure and installation, the transmission cable is connected to a numbered connector on the transmitter or to numbered terminals in the enclosure.

The measured values are shown on the display and can be forwarded to a process control system via analogue or digital interfaces; relays enable process controls.

The individual equipment of the transmitter can be found on the calibration sheet.

Function

The ViscoScope® sensor probe has no moving parts and therefore no joints, shafts or seals as the construction is fully welded. The ViscoScope® transmitter drives the sensor at its resonant frequency and sets the probe into oscillating torsion at a defined amplitude. Together with the received signal from the sensor, a fast control loop keeps the amplitude constant. The force required to keep the torsion at the same amplitude is a measure of viscosity:

(dynamic viscosity x density = mPa.s x g/cm³).

Calibration

The ViscoScope® system is calibrated with shear rate independent, certified calibration oils. This ensures that the systems can be checked, reproduced and compared. A basic or recalibration is therefore not necessary. However, since inline and laboratory values are measured under different conditions, a correlation between the inline and laboratory values must be determined empirically for shear rate-dependent fluids.

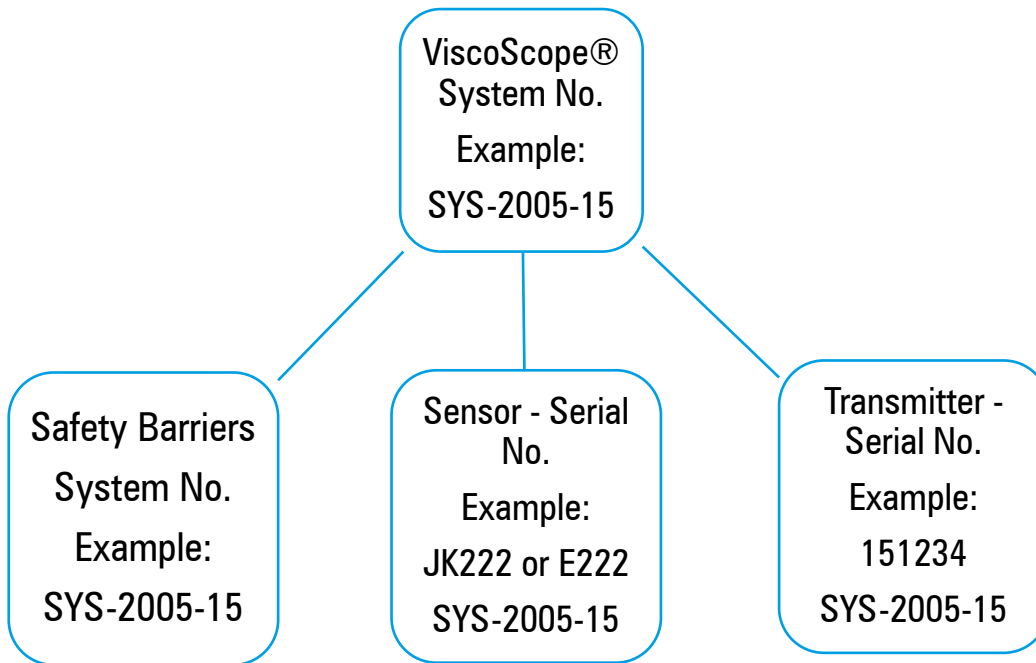
For very low viscosity and very small viscosity differences, the calibration is replaced by a reproducible, calculated viscosity after consultation with the user. The output is a relative value.

The ViscoScope® system is calibrated with a fixed transmission cable length and - if the sensor is installed in a hazardous area - with safety barriers. Any significant changes to the cable length or replacement of safety barriers should be agreed with Marimex® in advance.

IMPORTANT

The sensor, transmitter and safety barriers (if part of the delivery) are marked with a system number. The system number indicates which components are matched to each other for proper function.

We therefore recommend that you pay attention to the same system numbers when receiving the system and that you pay attention to the correct assignment of the components when installing several systems.



System types and models

Sensors

The sensors are differentiated according to two types. All sensors comply with protection class IP65.

Sensors of type S-1***.** and VA-100*.** are identical in construction. These sensors are only produced in standard versions and are regularly in stock.

Sensors of type S-3***.** and VA-300*.** are identical in construction. These sensors are manufactured individually according to the requirements of the process connection.

For the specification ***, letters and numbers are inserted for complete naming, which indicate the design and application area of the sensor

Sensor – Type S-1***.**

* Position	Refers to	Values
1.* and 2.*	Sensor design	10, 20, 1F
3.*	Viscosity range	C, B, S
4.* and 5.*	Temperature range	BT, LT

Legend

Sensor design	S-110*-.**	With housing spacer (riser)	
	S-120*-.**	Without housing spacer (riser)	
	S-11F*-.**	With housing spacer (riser) and hygiene fitting	
Viscosity range (sensor probe design)	S-1**C-.**	up to approx. 2.500 mPa.s x g/cm ³	under process conditions
	S-1**B-.**	up to approx. 25.000 mPa.s x g/cm ³	
	S-1**S-.**	Depending on sensor probe design (special design)	
Temperature range in the process	S-1***-BT	-20°C to +80°C / -5°F to +175°F	
	S-1***-LT	-20°C to +150°C / -5°F to +300°F	

To prevent condensation, the sensor housing must be purged with inert gas or clean, dry process air, depending on the application

Sensor – Type VA-100*-.**

* Position	Refers to	Values
1.*	Viscosity range	C, B, S
2.* und 3.*	Temperature range	BT, LT

Legende

Viscosity range (sensor probe design)	VA-100C-.**	up to approx. 2.500 mPa.s x g/cm ³	under process conditions
	VA-100B-.**	up to approx. 25.000 mPa.s x g/cm ³	
	VA-100S-.**	Depending on sensor probe design (special design)	

Temperature range in the process	VA-100*-LT	-20°C to +150°C / -5°F to +300°F
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To prevent condensation, the sensor housing must be purged with inert gas or clean, dry process air, depending on the application

Sensor – Type S-3*-.****

* Position	Refers to	Values
1.* and 2.*	Sensor design	10, 11, 20, 21, 50, 51, 60, 61, 1F
3.*	Viscosity range	L, M, H, X, S
4.* and 5.*	Temperature range	LT, ST, HT, XT

Legend

Sensor design	S-310*-.**	Without non-active-extension, without housing spacer (riser)
	S-311*-.**	Without non-active-extension, with housing spacer (riser)
	S-320*-.**	With non-active-extension, without housing spacer (riser)
	S-321*-.**	With non-active-extension, with housing spacer (riser)
	(These sensors are available with flanges up to PN63 / 400#)	
	S-350*-.**	Without non-active-extension, without housing spacer (riser)
	S-351*-.**	Without non-active-extension, with housing spacer (riser)
	S-360*-.**	With non-active-extension, without housing spacer (riser)
	S-361*-.**	With non-active-extension, with housing spacer (riser)

(These sensors are available with flanges from PN100 to PN400 / from 600# to 2500#)

S-31F*-** With hygiene fitting

Viscosity range (probe design)	S-3**L-**	up to approx. 2.500 mPa.s x g/cm ³	
	S-3**M-**	up to approx. 25.000 mPa.s x g/cm ³	
	S-3**H-**	up to approx. 250.000 mPa.s x g/cm ³	under process conditions
	S-3**X-**	up to approx. 2.500.000 mPa.s x g/cm ³	
	S-3**S-**	Depending on sensor probe (special design)	

Temperature range in the process	S-3***-LT	-40°C to +150°C / -40°F to +300°F
	S-3***-ST	-15°C to +300°C / -60°F to +570°F
	S-3***-HAT	-15°C to +450°C / -60°F to +840°F
	S-3***-XT	to +1700°C / +3100°F

To prevent condensation or overheating, the sensor housing must be purged with inert gas or clean, dry process air, depending on the application

Sensor – Type VA-300*-**

* Position	Refers to	Values
1.*	Viscosity range	L, M, H, X, S
2.* and 3.*	Temperature range	LT, ST, HT, XT

Legende

Viscosity range (sensor probe design)	VA-300L-**	up to approx. 2.500 mPa.s x g/cm ³	
	VA-300M-**	up to approx. 25.000 mPa.s x g/cm ³	
	VA-300H-**	up to approx. 250.000 mPa.s x g/cm ³	under process conditions
	VA-300X-**	up to approx. 2.500.000 mPa.s x g/cm ³	
	VA-300S-**	Depending on sensor probe (special design)	

Temperature range in the process	VA-100*-LT	-40°C to +150°C / -40°F to +300°F
	VA-300*-ST	-40°C to +300°C / -40°F to +570°F
	VA-300*-HT	-40°C to +450°C / -40°F to +840°F
	VA-300*-XT	to +1700°C / +3100°F

To prevent condensation or overheating, the sensor housing must be purged with inert gas or clean, dry process air, depending on the application

Transmitter

The transmitters are classified into two types. All the transmitters are compatible with all the sensors so any system configuration is possible. Every transmitter is fitted with a freely configurable analog input, e.g. for a density transmitter.

Transmitter VS-D250

Type VS-D250 transmitters have a switchable 2-sided display with 4 lines each. The VSD250 is only available with a power supply of 24 V DC and in a DIN rail housing. The transmitter has two plug-in sockets intended for a maximum of two analogue outputs or one analogue and one digital output.

Transmitter VS-4450

Type VS-4450 transmitters have a switchable 2-sided display with 4 lines each. The VS- 4450 is available with a power supply of 95..250 V AC or 24 V AC / DC. The 19" standard of the transmitter allows installation in a panel or wall housing as well as in a 19" rack. Four plug-in sockets are provided for a maximum of four analogue outputs or a maximum of three analogue and one digital output. A relay board with two SPDT relays can also be installed.

Before installation

Taking delivery

Check the delivery against your order to ensure it contains all the parts you requested.

Transport and storage

Only transport the instrument to its measuring point in its original packaging. Store the instrument only in its original packaging.

Unpacking

Do not lift the sensor by the probe when removing it from the packaging. Improper handling can bend the sensor.

Therefore, observe the following instructions for unpacking the ViscoScope® sensor to prevent damage to the sensor.

Type S-1***-** / VA-100*-** sensors are packed in a cardboard box. Sensors of type S-3***-** / VA-300*-** are packed in two different cartons or in wooden boxes.



Sensor S-1***-** / VA-100*-** - Cardboard packaging

These sensors are packaged and shipped in cardboard boxes with a foam insert. Remove the sensor from the packaging without lifting it by the sensor probe. Inspect it for any visible damage.



Fig. 1:
Open the box.



Fig. 2:
Remove the foam cover

**Fig 3:**

Grasp the sensor by the flange or spacer and remove it from the foam inlet. Do not lift the sensor out of the inlet by the probe.

**Fig 4:**

Place the sensor on a straight surface without bumping the probe. Inspect the sensor for visible damage.

Sensor **S-3***-** / VA-300*-**** - Cardboard packaging 1

Up to a certain size, these sensors are packed and shipped in cardboard boxes with a foam inlet. Remove the sensor from the packaging without lifting it by the probe and check for visible damage.

**Fig 5:**

Open the box

**Fig 6:**

Remove the cover and place it upside down on a stable, straight surface. Pull the sensor out of the inlet by the 4 support strips.

**Fig 7:**

Pull the sensor straight out of the packaging without bumping the probe

**Fig 8:**

Carefully turn the sensor and insert it into the inverted cover

**Fig 9:**

Here the sensor lies securely. Prevent carrying on the sensor and do not bump it with hard objects

**Fig 10:**

Cut the support strips with a side cutter

Sensor **S-3***-** / VA-300*-**** - Cardboard packaging 2



Fig 11:

Short cables are on the inlet. Remove the cable and the inlet.



Fig 12:

After removing the upper inlet

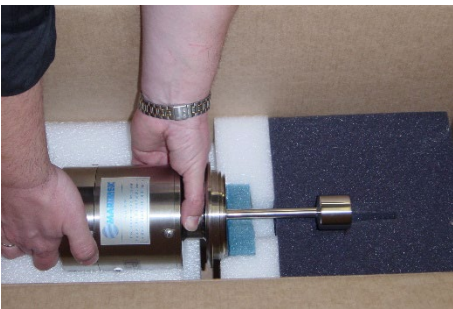


Fig 13:

Lift the sensor out of the box by the housing, do not lift by the sensor

Sensor **S-3***-** / VA-300*-**** - Wooden box packaging

Particularly large or heavy sensors are packed and shipped in a wooden box. Take the sensor out of the box without lifting it by the probe or damaging it with tools and check it for visible damage.



Fig 14:

Remove the wooden inlet from the box or carton

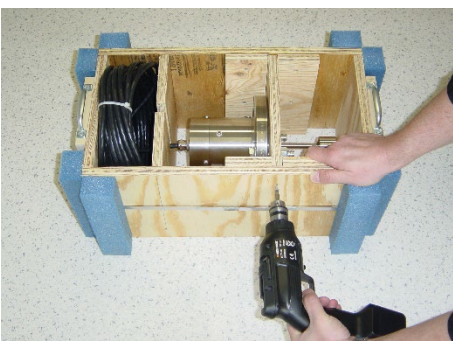
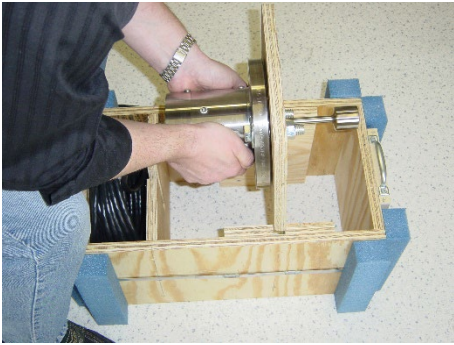


Fig 15:

If the sensor cannot be removed directly from the mounting plate (by loosening the screw bolts), then remove the mounting plate screws

**Fig 16:**

After removing the screws, pull the mounting plate out of the wooden inlet

**Fig 17:**

When removing the screw bolts, take care, Do not bump into the probe

Installing the sensor

Please follow the instructions below when installing the sensor:

- Never lift the sensor by the sensor probe. Only hold it by the housing and the flange
- Never jam the sensor probe during installation
- The sensor must be mounted firmly and stress-free on the process connection. Please take into account the specified tightening torques and seals (torque wrench).
- Install the sensor in a location with no or only a low level of vibrations
- Do not install the sensor close to electrical motors, frequency converters or other magnetic fields. The influence of a magnetic field can be reduced or even eliminated by turning the sensor through 90°. A marking (arrow) on the flange provides a guide
- The sensor can be mounted in a horizontal, vertical or any other position
- Do not lay the transmission cable in the direct proximity of high voltage current power cables. Ensure that it is installed in a manner that complies with local regulations and the usual installation requirements. If you use a conduit, the connection to the sensor must be flexible.
- Before beginning the installation, check that the system numbers of the sensor, transmitter and safety barriers (if included in the scope of delivery) are identical

Please follow the instructions below when uninstalling the sensor:

- Under no circumstances jam the sensor probe, carry the sensor by the sensor probe or lie the sensor on the sensor probe
- If material has solidified around the sensor probe, do not attempt to remove the sensor by force. Remove the solidified material, e.g. by using a solvent or heating the flange

Operating conditions

Please note the following recommendations for obtaining a successful and reproducible measurement:

- The sensor probe must be completely immersed in the liquid to be measured.
- There should be an adequate exchange of the liquid in the area of the sensor probe.
- Avoid dead spaces where the liquid is not exchanged or gas bubbles can form, especially if the liquid can change while in this dead space.
- To prevent / reduce the formation of deposits or coatings on the sensor probe, the sensor probe should be positioned at or close to the central point of the flow. Regular cleaning may be necessary.
- To achieve optimum reproducibility with slurries, we recommend keeping the flow speed low and constant. Sedimentation should be avoided.
- Solid elements in the liquid, e.g. clumps, must not be permitted to impact on the sensor probe. This could cause damage to it. Ask Marimex® or your local representative about suitable protection measures you can install.
- The sensor specifications define the minimum and maximum requirements of the ViscoScope® system. In particular, it is important not to exceed the limit values for temperature and pressure.
- Avoid strong vibrations from external sources. Filled tanks > 1 m³ with an agitator operating at a normal speed offer sufficient vibration damping. Ask Marimex® or your local representative about suitable vibration damping measures you can install for smaller tanks.
- In the proximity of the sensor, pipes must be securely anchored using a vibration-free bracket (wall, pillar, floor)
- Additional measures for damping vibrations from external sources:
 - Connect the sensor, tank or pipe with a larger mass
 - Connect the anchored section of pipe using flexible hoses
 - Install the sensor in an anchored flow-through cell with flexible hoses
 - Increase the diameter of the pipe to reduce flow speed
- Please remember that vibrations from external sources have less influence on liquids with higher viscosities than those with lower viscosities.
- An acceptable value for external vibrations can be established while adjusting the zero-point or even during operation (stable values). Ask Marimex® or your local representative for information regarding unstable values

Connection diagrams: sensor – transmitter

The following drawings show the connection diagrams for all sensor models to all Transmitter models.

IMPORTANT!

If a cable gland is located on the sensor housing, only the sensor housing cover may be removed in order to connect the cable. Opening the sensor housing voids the warranty.

Do not loosen the wires that lead into the interior of the sensor. Do not pull these wires.

The connection plans for installing the sensor in a hazardous area (Ex) can be found in the separate "Manual for Sensor Installation in Hazardous Areas (Ex)".

Sensor with connector

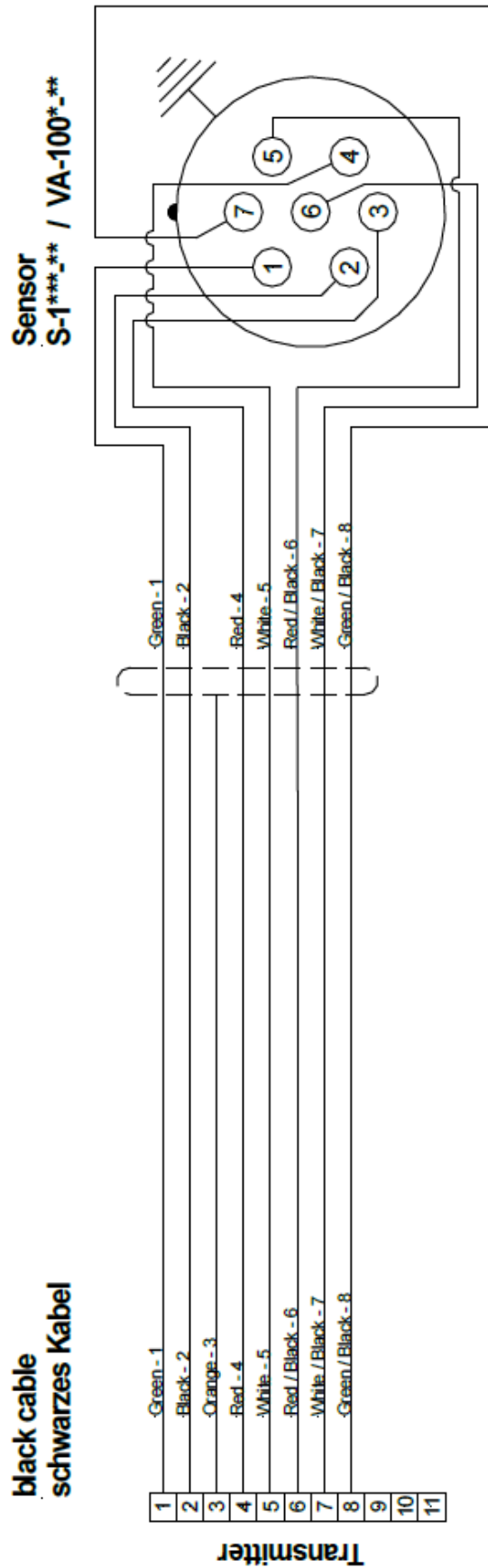
Depending on the temperature class of the sensor, a 7- or 12-pin connector is located on the sensor housing. The transmission cable is fitted with the appropriate male connection jack. The male and female connection jacks can only be connected in one orientation. The union nut on the male connection jack must be completely screwed onto the female connection jack in order to ensure IP65 protection.

Sensor with cable gland

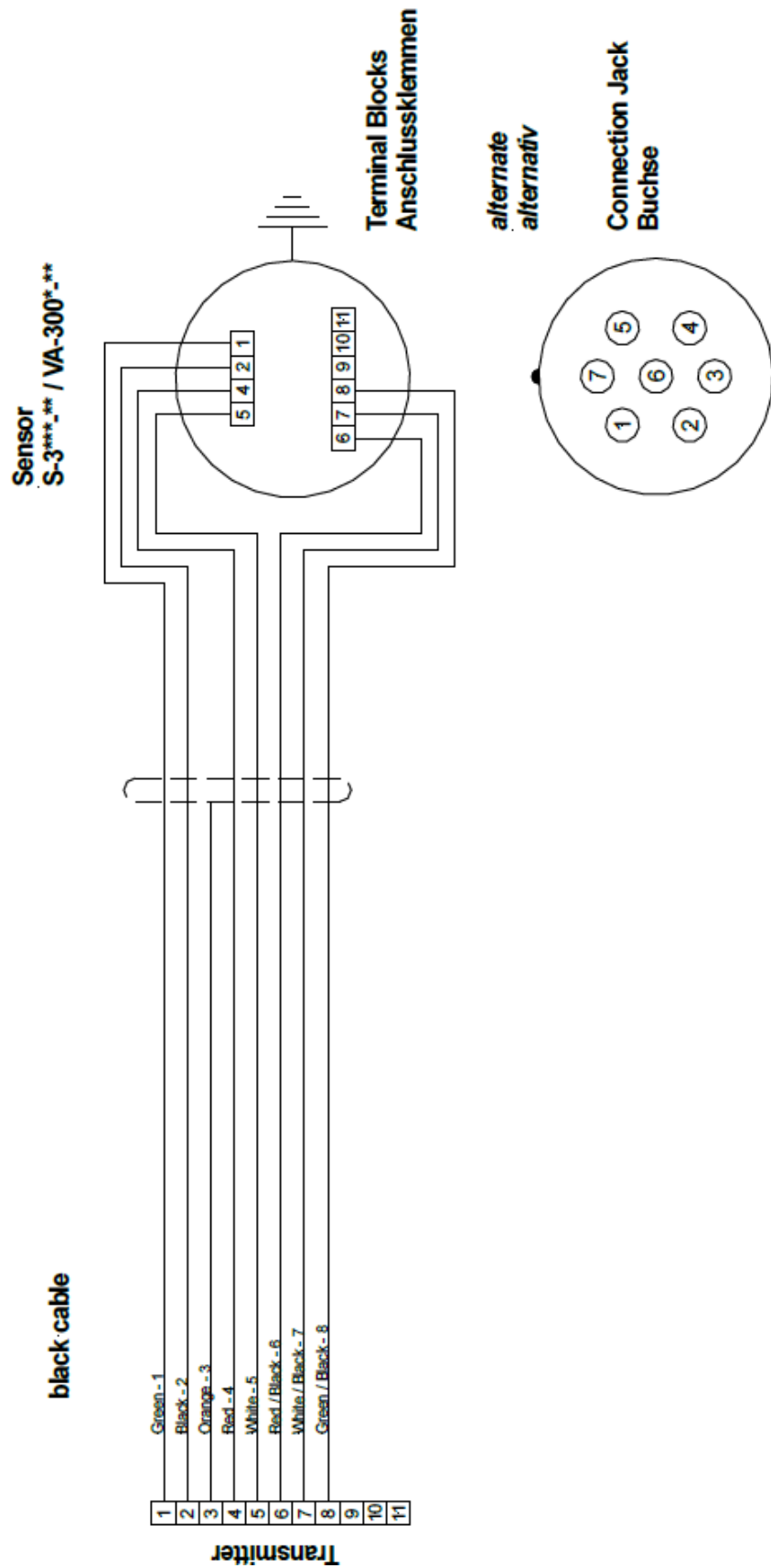
A cable gland is located on the sensor housing. Open the cover of the sensor housing, guide the transmission cable with the cable lugs through the cable gland and connect the numbered cores to the numbered terminals. In order to prevent a ground loop, the transmission cable is not shielded at this end. If the sensor is not grounded due to its mechanical connection, it must be fitted with a grounded connection.

Once you have connected the transmission cable to the terminals, fasten the cover back onto the sensor housing. Take care not to pull out the transmission cable. Now you can tighten the cable gland in order to relieve any strain on the cable and complete IP65 protection.

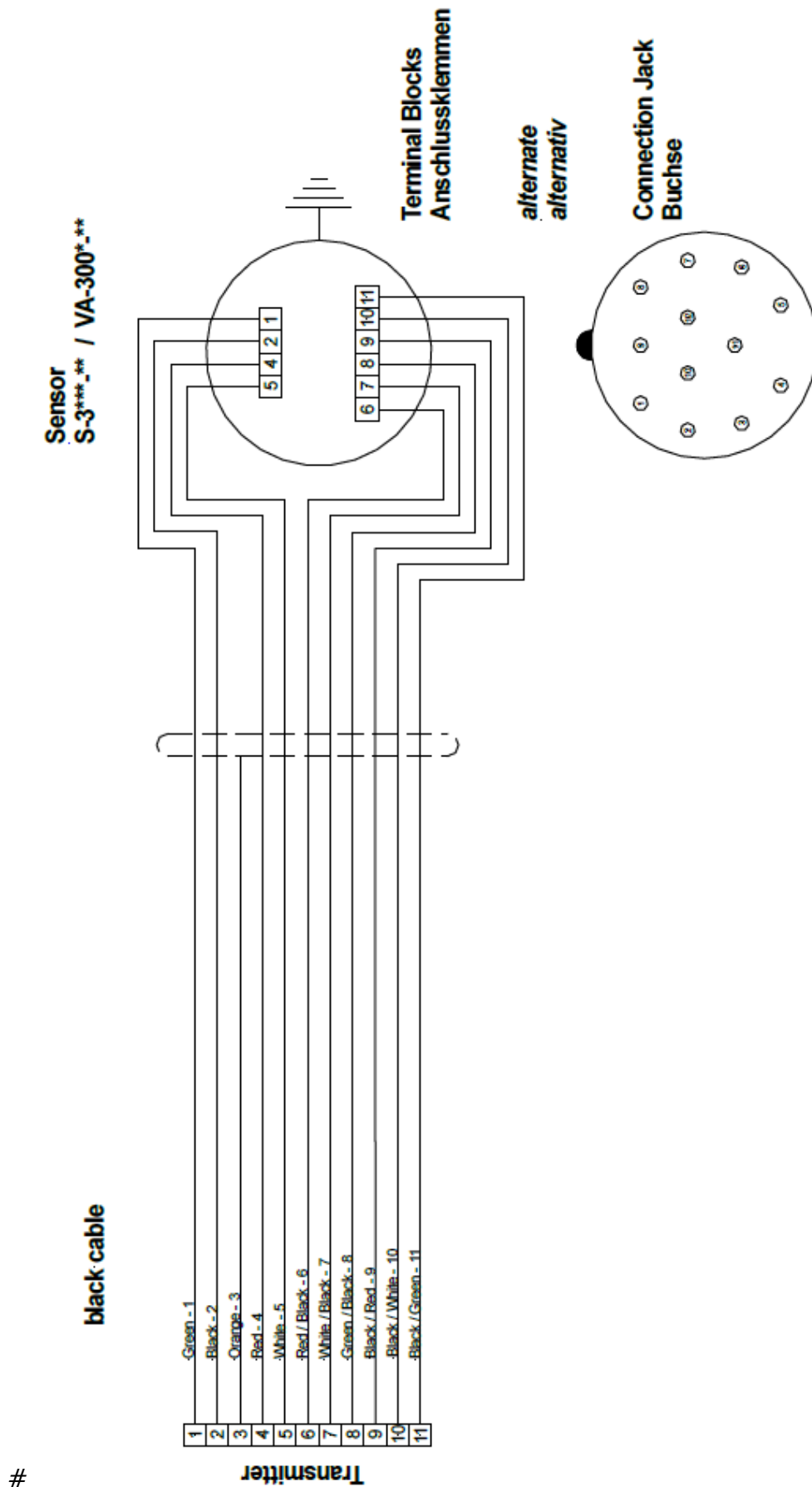
Connection diagram Sensor S-1*-** / VA-100*** with 1 Pt100 / RTD**



Connection diagram Sensor S-3*-** / VA-300*-** with 1 Pt100 / RTD**



Connection diagram Sensor S-3*-** / VA-300*-** with 2 Pt100's / RTD's**



#

ViscoScope®-Transmitter – Installation

The transmitter is supplied in versions for DIN rail-, panel- or wall-mounted housing or installation in a 19" rack. Do not install the transmitter in the proximity of frequency converters.

Gehäuse-Varianten

- The DIN rail-mounted housing (protection class IP42) is mounted by simply snapping the housing onto 35 / 15 or 35 / 7.5 DIN-rails. This housing is mostly used in control cabinets. This transmitter can also be installed in a wall housing (protection class IP65).
- Control panel housings (protection class IP42) are installed in control cabinet doors or control panels. The housing is mounted using screw-on brackets
- Wall-mounted housings (protection class IP65) are installed on walls or pillars, usually close to the sensor
- 19" racks (protection class IP20) are mounted in control cabinets or control rooms. Racks allow you to install several transmitters on one level, e.g. a rack with a width of 84HP can accommodate a total of 4 Type VS-4450 transmitters

Safety notes

Please read these important safety notes:

- Remove the transmitter from its packaging and inspect the housing for visible signs of damage. Do not put the transmitter into operation if it is damaged but inform Marimex® and the transport company immediately.
- Check that the system numbers of the sensor, transmitter and safety barriers (if included in the scope of delivery) are identical otherwise the system will not function perfectly or only to a limited extent.
- Before connecting the transmitter to the supply voltage, check that the transmitter housing is closed or that the transmitter is firmly screwed into the housing.
- Please ensure that you only connect the transmitter to the correct supply voltage, which is stated on the rating plate. The transmitter does not have an on / off switch so you must ensure that you provide a system for shutting down the transmitter that complies with local regulations.
- The VS-4450 (95..250 V) transmitter is equipped with a thermal fuse (PTC thermistor) as overcurrent protection. When the thermistor cools down, the current can flow again.
- Live parts are exposed when the transmitter housing is open. It is therefore essential to disconnect the transmitter from the supply voltage before opening the housing.

Digital outputs

Communication for all serial connections is via the royalty-free Modbus RTU protocol. If you wish to integrate the ViscoScope® viscometer into a different bus system, you can connect it via a separate Anybus® communicator, e.g. for Profibus DP or Profinet. The Modbus protocol and connection diagrams for integrating the unit into the bus system can be found in the separate "Modbus RTU Manual".

The front sides of the **VS-D250** and **VS-4450** transmitters are equipped with an integrated RS232 interface. RS232 or RS485 output cards are also available for serial connections. On the RS485 card there are an integrated terminal resistor of 160 Ohm and pull-up and pulldown resistors of 330 Ohm respectively. These are switched on or off using jumpers. If there is only one transmitter on the bus system, the terminal resistor must be activated. If several transmitters are on the bus, the terminal resistor of the last transmitter must be activated. Using analog and digital outputs at the same time can affect the analog signal.

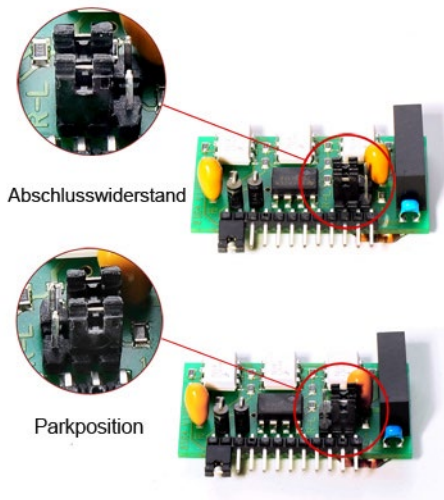


Fig 19:

Position of the jumper for the terminal resistor on the RS485 card for **VS-D250** and **VS-4450** transmitters

Relays

Relay boards with 2 SPDT relays are only available for the **VS-4450** transmitter.

- In the **VS-4450** transmitter, the relay board is integrated by replacing the spacer bolts

Connecting inputs, outputs and relays

The connections for the inputs, outputs and relays are shown in the following connection diagrams.

Connection VS-D250

n.a.	12
-	13
+	14
-	15
+	16
	17
-	18
+	19
n.a.	20

Analog Input (galvanically isolated)
0...20 mA / 4...20 mA

Analog Output 1 (galvanically isolated)
0...20 mA / 4...20 mA
0...10 Volt / 2...10 Volt

Analog Output 2 (galvanically isolated)
0...20 mA / 4...20 mA
0...10 Volt / 2...10 Volt

Transmitter with 2 analog outputs

n.a.	12
-	13
+	14
-	15
+	16
Gnd	17
+	18
-	19
n.a.	20

Analog Input (galvanically isolated)
0...20 mA / 4...20 mA

Analog Output 1 (galvanically isolated)
0...20 mA / 4...20 mA
0...10 Volt / 2...10 Volt

Shield	
RS232 TxD	RS485 +
RS232 RxD	RS485 -

Transmitter with 1 analog and 1 digital output
Using analog and digital outputs at the same time can affect the analog signal.

Connection VS-4450

-	13
+	14
-	15
+	16
-	17
+	18
-	19
+	20
	21
-	22
+	23

Analog Input (galvanically isolated)
0...20 mA / 4...20 mA

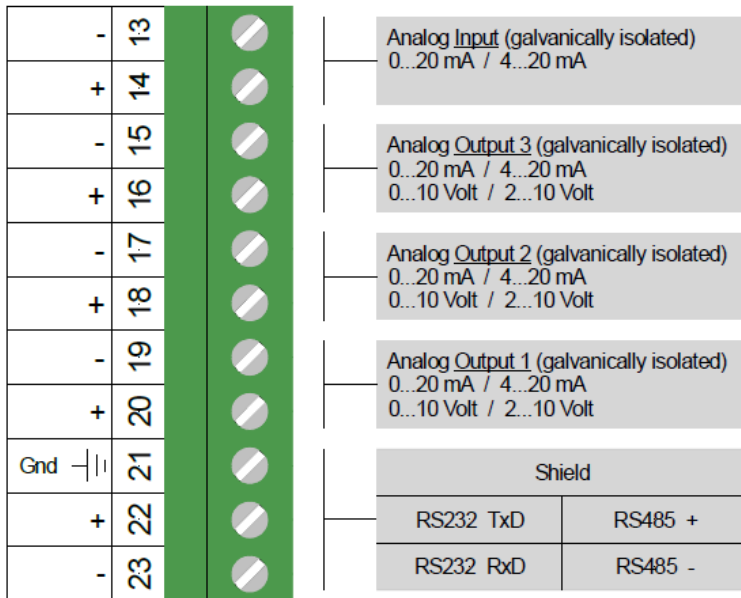
Analog Output 3 (galvanically isolated)
0...20 mA / 4...20 mA
0...10 Volt / 2...10 Volt

Analog Output 2 (galvanically isolated)
0...20 mA / 4...20 mA
0...10 Volt / 2...10 Volt

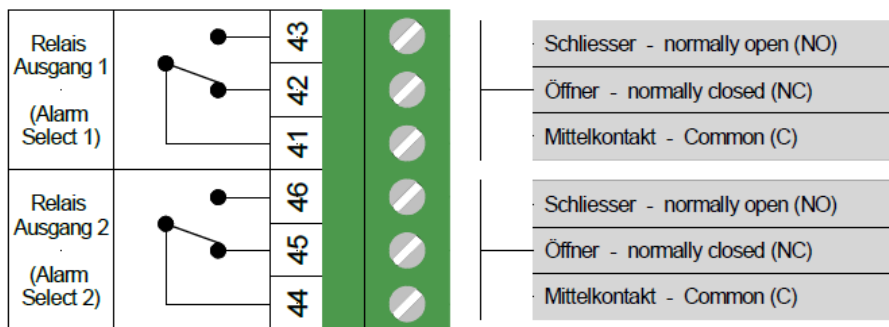
Analog Output 1 (galvanically isolated)
0...20 mA / 4...20 mA
0...10 Volt / 2...10 Volt

Analog Output 4 (galvanically isolated)
0...20 mA / 4...20 mA
0...10 Volt / 2...10 Volt

Transmitter with max. 4 analog outputs



Transmitter with max. 3 analog and 1 digital output
Using analog and digital outputs at the same time can affect the analog signal.



Relay board with 2 SPDT relays

Analog and digital outputs as well as the relay board are options. According to your Purchase Order, the transmitter may not be equipped with all listed outputs.

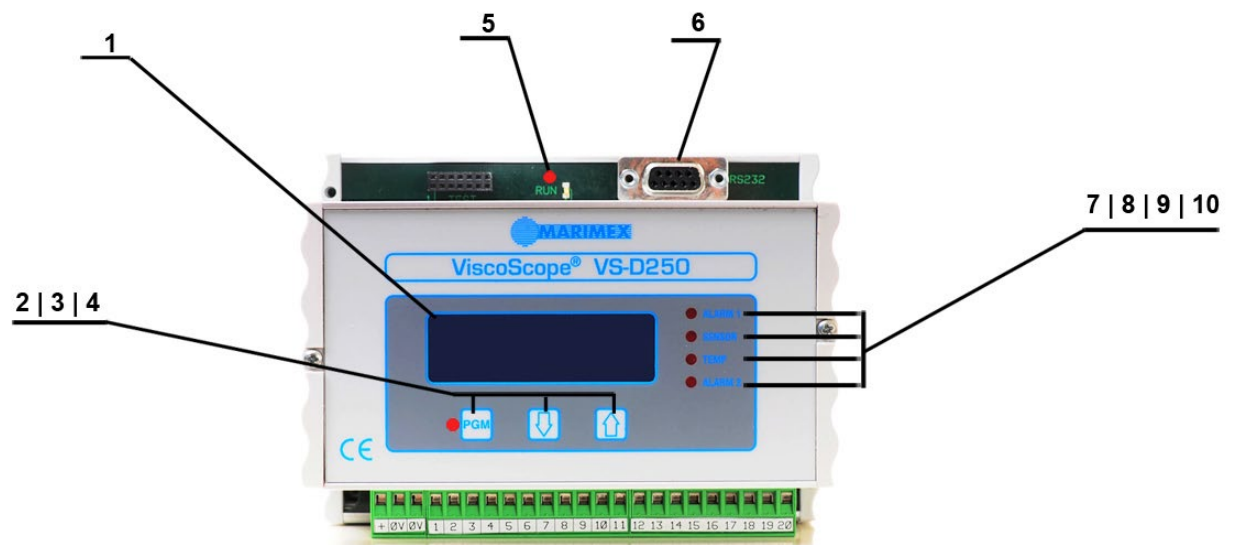
ViscoScope®-Transmitter – Operation

VS-D250 and VS-4450 transmitters

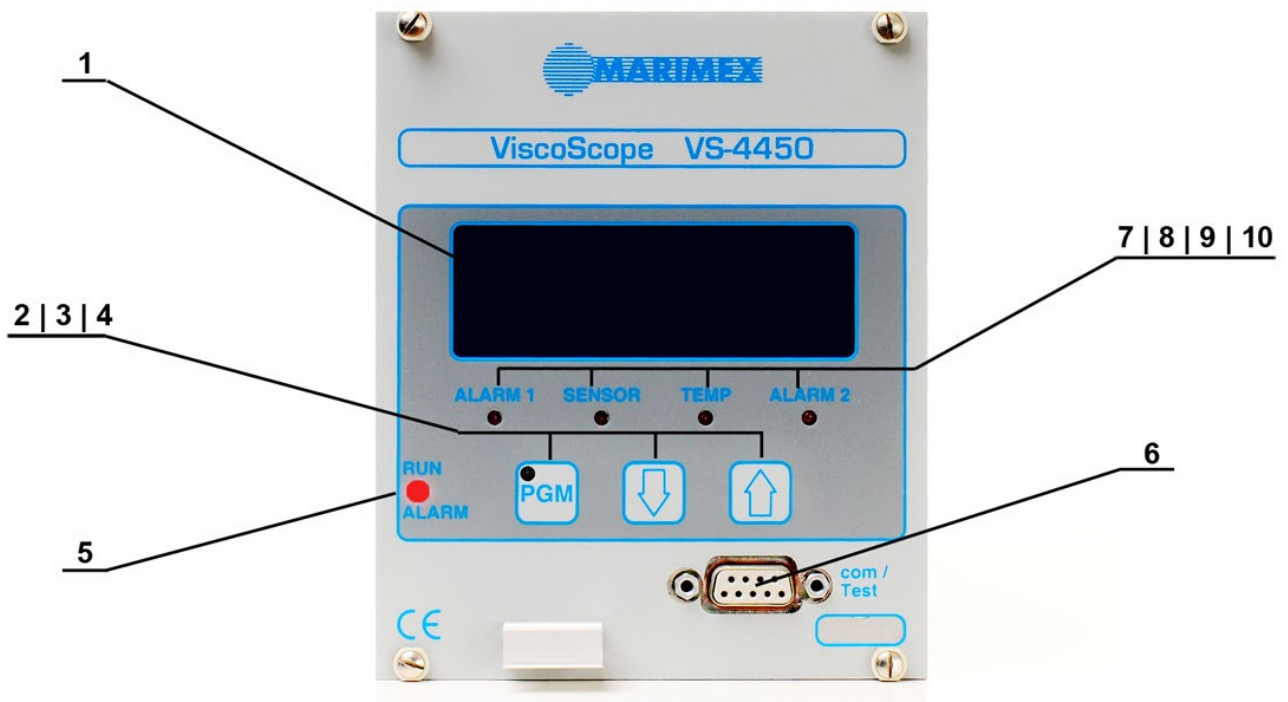
When it is switched on, the ViscoScope® transmitter starts automatically in **“Operator Mode”**. While it is booting up, it displays the current version of the firmware. The transmitter is ready to receive input and perform measurements after approx. 5 seconds.

The parameters are stored in various levels, which can be accessed using numerical codes. Each level consists of an endless loop.

The front panel has a 2-page display with 4 lines per page, three keys, four LEDs for alarms and other functions as well as a status LED. The transmitter can be connected to a PC using a DB9 connection jack.



Front panel of the **VS-D250** ViscoScope®-Transmitters



Front panel of the **VS-4450** ViscoScope®-Transmitters

- | | |
|------------------------------------|---|
| 1 Display | 6 Integrated RS232 output |
| 2 Programming and enter key | 7 LED for alarm 1 |
| 3 Navigation key | 8 LED for sensor function |
| 4 Navigation key | 9 LED for temperature compensation |
| 5 Function LED | 10 LED LED for alarm 2 |

- 1** 2-page display with 4 lines per page
A maximum of 4 lines can be displayed per page. Factory default settings: Line 1 = viscosity, Line 2 = process temperature and Line 3 = coil temperature (if available). All lines can be activated or deactivated at any time in the **"Configuration Level"** using the available parameters.
- 2** PGM key
This key is used to activate and deactivate the programming mode and confirm settings.
After you press the PGM key, the display will show the message "Enter Password". You can then enter a numerical code using the \int and $>$ keys in order to access the various levels. Each level has its own numerical code.
- 3** \int Key
Navigation key. In **"Operator Mode"** you can use this key to switch to page 2 of the display. Otherwise, this key is used to enter the numerical codes. Holding this key will scroll down the numbers in descending order.
Pressing this key and then pressing the $>$ key accelerates entry by a factor of 10.
- 4** $>$ key
Navigation key. In **"Operator Mode"** you can use this key to switch to page 1 of the display. Otherwise, this key is used to enter the numerical codes. Holding this key will scroll down the numbers in ascending order.
Pressing this key and then pressing the \int key accelerates entry by a factor of 10.
- 5** Run / Alarms LED
This LED flashes green when the microprocessor in the transmitter is functioning correctly.
If there is a fault in the microprocessor, the LED glows red.
- 6** com / Test
DB9 connection jack. You can use a modified null modem cable to create an RS232 connection between the transmitter and a PC. The protocol used is Modbus (RTU). In the VS-4450 transmitter, this connection jack is also factory set for diagnosis
- 7** Alarm 1 LED
This LED can display alarms for viscosity, the external input, process temperature or coil temperature. Alternatively, the LED can be used to display the cycle time for the time-proportional control. The LED is illuminated red if an alarm or the time proportional controller is activated. The alarm function must be configured in the **"Configuration Level"**. The factory setting is "Off".
After you have configured the alarm function you require, you can set the value in **"Alarm and Parameter Level"**
- 8** Sensor LED
This LED displays the function of sensor. As soon as the LED is illuminated red, the resonance frequency of the sensor is outside the expected range. Possible reasons for this could be mechanical damage, a thick coating on the sensor probe or an incorrectly connected wire
- 9** Temp LED
This LED is illuminated red when the temperature compensation in the **"Configuration Level"** is activated. If this is the case, the compensated viscosity will be displayed.
The factory setting for temperature compensation is "Off"
- 10** Alarm 2 LED
This LED can display alarms for viscosity, the external input, process temperature or coil temperature. The LED is illuminated red when an alarm is activated. The alarm function must be configured in the **"Configuration Level"**. The factory setting is "Off".
After you have configured the alarm function you require, you can set the value in **"Alarm and Parameter Level."**

Start-up

After you have installed the sensor and connected the transmitter, you must adjust the zero-point. This is because the mass ratios change when the sensor is installed. The optimum conditions for adjustment of the zero-point are as follows:

- A clean sensor probe
- Against air
- at the process temperature

These conditions are not always achievable. However, the zero-point can also be performed at the ambient temperature or when the sensor probe is immersed in a watery liquid (e.g. a solvent). These conditions should be reproducible.

If the sensor is removed and reinstalled, you must adjust the zero-point under the same conditions as during the previous zero-point adjustment. This procedure guarantees the reproducibility of the system.

Never adjust the zero-point while production is in progress as this will set the currently measured viscosity to zero.

While you are performing the zero-point adjustment, values will appear on the transmitter display. The range of fluctuation in these values reflects the stability of the installation and the degree to which it is influenced by external vibrations. Fluctuations of < approx. 5% are in a good range. However, it is possible to achieve stable viscosity values even if the fluctuation range is greater, e.g., by using a narrow calibration range or setting a filter. Please consult Marimex® or your local representative if you require support.

Once you have adjusted the zero-point, you can begin measuring immediately. Without a filter setting, the value will be displayed within 1 – 5 seconds depending on the viscosity.

Sensor protection

The ViscoScope® transmitter protects the sensor against excessively high process or coil temperatures. It switches the sensor off when the temperature exceeds the limit values. The type of monitoring used depends on the sensor model and operating conditions.

a) Process temperature:

The **VS-D250** and **VS-4450** ViscoScope® transmitters switch off the viscosity measurement when the process temperature exceeds the limit value for the specific model. The transmitter immediately switches the sensor back on as soon as the process temperature for the specific model falls back below the limit value. The limit value is factory set in the transmitter. The following message appears in the display on Page 1 when the process temperature exceeds the limit value:

TEMPERATURE WARNING

Please refer

Operator manual /

Operator Interface

If this message appears, you must reduce the process temperature in order to switch the system back on and prevent damage to the sensor.

If the process temperature continuously exceeds the limit value, you should upgrade the sensor accordingly. Please contact Fluid.iO Sensor + Control GmbH & Co. KG or your local representative.

b) Coil-Temperature:

The coil temperature is monitored in the models S-3***-ST, S-3***-HT, S-3***-XT, VA-300*-ST, VA-300*-HT and VA-300*-XT. The Pt100 is mounted close to a coil in the sensor housing.

The ViscoScope® transmitter switches off the viscosity measurement when the limit value for the maximum coil temperature is exceeded. The coils can therefore cope with a higher temperature in order to minimize the possible damage caused.

This is a permanent error and can only be eliminated with an unlock code.

In order to identify the cause of the shutdown, press the PGM key on the transmitter. Enter the code 173 and then press the PGM key once again. Now enter the code 21 and press the PGM key twice.

If the reason for the shutdown no longer exists, the system will return to **“Operator Mode”**.

If the reason for the shutdown still exists, the display will show the parameters, incl. the coil temperature for about 2 seconds. Please note the coil temperature and contact Fluid.iO Sensor + Control GmbH & Co. KG or your local representative. If you are unable to note the coil temperature the first time, you can repeat the procedure whenever necessary.

The maximum coil temperature is limited to 190°C (we recommend that you keep the coil temperature below 170°C). It is important to maintain the coil temperature at a constant level. For this purpose, inert gas connections are provided on the sensor housing into which you can screw, e.g. a hose connection. Only use inert gas or clean, dry process air for cooling in order to avoid the interior of the sensor becoming dirty. A flexible hose is the best method for connecting the inert gas supply. The air pressure should not be higher than 0.7 bar, the quantity of air depends on the coil temperature. To maintain the coil temperature at a constant level, the VS-4450 transmitter can use a time-proportional control mode (optional relay board required). The coils can burn out if they overheat. This makes it necessary not only to replace the coils but also to recalibrate the system.

If the sensor is installed in a hazardous area (Ex), please refer to the separate “Manual for Sensor Installation in Hazardous Areas (Ex)” for the maximum surface temperature (coil temperature).

The following warning will be displayed continuously if the coil temperature is exceeded:

<p>TEMPERATURE SHUTDOWN</p> <p>Please contact</p> <p>Marimex Industries</p> <p>www.marimex.de <></p>	<p>Marimex Industries</p> <p>Germany</p> <p>+49-(0)2045/4038-0</p> <p>www.marimex.de <></p>
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Page 2

ATTENTION: Older firmware versions still show the old website address Please always use the current website <https://www.fluidio.de> .

ATTENTION: Older firmware versions show telephone numbers that are no longer valid. Please contact Fluid.iO Sensor + Control GmbH & Co. KG using only the following number +49-(0)6251-8462-0.

If the coil temperature has been exceeded, the sensor may be damaged. If this happens, please contact Fluid.iO Sensor + Control GmbH & Co. KG auf.

c) Condensation in the sensor housing:

Particularly in food processing and chemical applications, low process temperatures can lead to condensation forming in the sensor housing due to moisture in the air. If this happens, we recommend that you purge the sensor housing with inert gas or clean, dry and oil-free process air. The required connections are provided on the sensor housing, e.g. for hose connections.

ViscoScope®-Transmitter – Configuration

Configuration - general description for VS-D250 and VS-4450

The operating controls of the ViscoScope® transmitters are divided into different levels. These levels are accessed using numerical codes. The structures for the VS-D250 and VS-4450 transmitters are identical.

Levels

„Operator Modus“:

- This level is not protected. The display shows the factory parameter settings. Viscosity and process temperature are shown on the first two lines.
- Press the 0 key to display the second page with the corresponding factory parameter settings. Press the > key to return to the first page. The display parameters can be configured by the operator as required.

„Zero adjustment Level“:

- This level is used to adjust the zero-point. This level is secured by a numerical code.
- During zero-point adjustment, the current values for the hardware and software are displayed. You can check these values when you re-select the zero-point setting but without performing the actual zero-point adjustment itself.
- The hardware value for this inspection lies in a range between 0 and 99 and the software value between 0 and approx. 2000. Note the current values in case you have to run a diagnosis.

„Parameter Level“:

- This level is used to set alarm thresholds and the alarm hysteresis. Access to the alarm level is secured using a numerical code.

„Configuration Level“:

- Access to the configuration level is secured using a numerical code.
- Here you can set customer-specific configurations. These include production of moving averages, configuration of the analog outputs incl. their assignment and scale, setting the serial output (Modbus RTU protocol), configuration of the display as well as access codes and setting the relay functions.

„PID control Level“:

- This level is used to set the PID parameters if alarm relay 1 is used for time-proportional control. Access to this level is secured using a numerical code.

„Linearization Level“:

- This is where the calibrated analog / digital converter values (Lin A/D Value x) and the associated viscosity values are saved (Lin Display x). The converter values cannot be changed. However, you can change the viscosity values and this affects the calibration of the system. Entering the original values restores the calibration.
- Access to this level is secured using a numerical code.

„Temperature Compensation Level“:

- In this level you can enter up to 10 double pairs of temperature compensation values in accordance with ASTM. You can then select these values in the **“Configuration Level”**. Access to this level is secured using a numerical code.

Navigation

Press the PGM key and the message **“Enter Password”** will appear in the display. Use the \uparrow key to enter the access codes (numerical codes) for the various levels. Press the PGM key again to reach the corresponding level.

The factory-set access codes are listed in the following tables and on the calibration sheet. You can change the access codes in the **“Configuration Level”**. Please record any changes you make to the access codes.

Select the various parameters in the different levels using the \uparrow and \downarrow keys. After you have selected a parameter, enter the settings mode by pressing the PGM key. You can change the preset values using the \uparrow and \downarrow keys. Pressing the PGM key confirms and saves the value you have selected. The tables below list the possible values.

Endless loops in all levels simplify operation of the system. Select the parameters in the individual levels using the \uparrow and \downarrow keys.

As soon as you select the menu item **“End”** and press the PGM key, the transmitter will return to **“Operator Mode”**. If the transmitter is switched off, the values you have entered will be retained.

You can alter the speed at which the numbers in the display change while you are entering the parameters. Pressing the other (second) arrow key in addition increases the speed by a factor of ten.

Zero-point adjustment

After mounting the sensor, you must adjust the zero-point. The requirements for zero-point adjustment are listed in the section "Start-up".

Zero-point adjustment comprises two parameters:

- Hardware calibration (Zero – Hardware) for the sensor
- Software calibration (Zero – Software) for the transmitter

Führen Sie folgende Schritte aus:

Press key	Display	Comment	Your Values
PGM	Enter Password 0	Original code that must be changed to reach the "Zero Adjustment Level"	
⊕	Enter Password XX	Now enter the numerical code. The default value is 22. The code is also stated on the calibration sheet	
PGM	Zero – Hardware 0	The transmitter is now ready for the hardware calibration	
PGM	Zero – Hardware Save actual xxxxx	A number with up to 5 digits is now displayed. Observe the stability of the values for approx. 30 seconds. The more stable the values, the better the installation.	
PGM	Zero – Hardware Save actual xyxy	The value has now been stored internally – the hardware calibration has been completed	Value: @ Process-Temp.:
⊕	Zero – Software 0	The transmitter is now ready for the software calibration	
PGM	Zero – Software Save actual xxxx	A number of approx. 2000 or less is now displayed. Observe the stability of the values for approx. 30 seconds. The more stable the values, the better the installation.	
PGM	Zero – Software xzxz	The value has now been stored internally – the software calibration has been completed	Value: @ Process-Temp.:
⊕	End	Zero-point adjustment completed	
PGM	Current values on the display. Viscosity = 0	This is the "Operator Mode". The system is ready to measure	

Configuration tables**„Zero Adjustment Level“ (Default access code 22)**

Display parameter	Range	Default	Comment
Zero – Hardware	0 ... 65535	none	Sets the sensor probe to its zero-point
Zero – Software	0 ... 65535	none	Sets the transmitter to the zero-point of the sensor probe. The system has now reached its system zeropoint.
End	none	0	This setting returns you to the “Operator Mode” user level.

„Alarm and Parameter Level“ (Default access code 44)

Display parameter	Range	Default	Comment	Your values
Alarm Value 1	-9999 ... 999999	0	Alarm value for Alarm 1	
Alarm Hysteresis 1	0 ... 999999	0	Hysteresis for Alarm 1	
Alarm Value 2	-9999 ... 999999	0	Alarm value for Alarm 2	
Alarm Hysteresis 2	0 ... 999999	0	Hysteresis for Alarm 2	
Set-point	0 ... 999999	0	<u>Only VS-4450</u> Target value for time-proportional control. This control is only possible with integrated relays	
Analog Output Manual	0.0	0.0	No function. Factory setting, cannot be changed	none
End	none	0	This setting returns you to the “Operator Mode” user level.	none

„Configuration Level“ (Default access code 88)

Display parameter	Range	Default	Comment	Your values
Moving Average	1 ... 200	1	Number of viscosity values used to create the average value (signal smoothing)	
Viscosity - Offset	-9999 ... 99999	0	Sets a deviation by which the zeropoint should be offset	
Viscosity - Factor	0.000 ... 99.999	1,000	Sets a factor by which the viscosity value should be changed	

Display parameter	Range	Default	Comment	Your values
Temperature Unit	0...1	0	Selection of Celsius or Fahrenheit units 0 = Celsius 1 = Fahrenheit Note: Fahrenheit is only displayed in the "Operator Mode" and "Alarm and Parameter Level". All other settings must be made in Celsius	
Output 1 0/4...20 mA	0...1	1	Analog output 1 0 = 0...20 mA / 0...10 VDC 1 = 4...20 mA / 2...10 VDC The selection of current or voltage output is made on the output card	
Output 1 Select	0...8	0	Selection of the output value for analog output 1 0 = Viscosity 1 = External input 2 = Process temperature 3 = Coil temperature 4 = Frequency 5 = Dynamic viscosity 6 = Kinematic viscosity 7 = Raw viscosity (without calculating factors) 8 = Automatic range switch for the decadic output. 5 ranges each of 25%, only viscosity	
Output 1 min. Value	-9999 ... 999999	0	Lower range setting for analog output 1 Value corresponds to 0 or 4 mA or 0 or 2 VDC respectively	
Output 1 max. Value	-9999 ... 999999	See calibration sheet	Upper range setting for Analog output 1 Value corresponds to 20 mA or 10 VDC respectively	
Output 1 Secure Val.	0.0 ... 100.0	0	No Function. Secure default value	
Output 2 0/4...20 mA	0...1	1	Analog output 2 0 = 0...20 mA / 0...10 VDC 1 = 4...20 mA / 2...10 VDC The selection of current or voltage output is made on the output card.	

Display parameter	Range	Default	Comment	Your values
Output 2 Select	0...8	2	Selection of the output value for analog output 2 0 = Viscosity 1 = External input 2 = Process temperature 3 = Coil temperature 4 = Frequency 5 = Dynamic viscosity 6 = Kinematic viscosity 7 = Raw viscosity (without calculating factors) 8 = Decadic output (current viscosity within a decade) 0 – 10 10 – 100 100 – 1000 1000 – 10000 10000 – 100000	
Output 2 min. Value	-9999 ... 999999	0	Lower range setting for analog output 2 Value corresponds to 0 or 4 mA or 0 or 2 VDC respectively	
Output 2 max. Value	-9999 ... 999999	See calibration sheet	Upper range setting for analog output 2 Value corresponds to 20 mA or 10 VDC respectively	
Output 3 0/4...20 mA (nur VS-4450)	0 ... 1	1	Analog output 3 0 = 0...20 mA / 0...10 VDC 1 = 4...20 mA / 2...10 VDC The selection of current or voltage output is made on the output card	
Output 3 Select (nur VS-4450)	0...7	3	Selection of the output value for analog output 3 0 = Viscosity 1 = External input 2 = Process temperature 3 = Coil temperature 4 = Frequency 5 = Dynamic viscosity 6 = Kinematic viscosity 7 = Raw viscosity (without calculating factors)	
Output 3 min. Value (nur VS-4450)	-9999 ... 999999	0	Lower range setting for analog output 3 Value corresponds to 0 or 4 mA or 0 or 2 VDC respectively	

Display parameter	Range	Default	Comment	Your values
Output 3 max. Value (nur VS-4450)	-9999 ... 999999	See calibration sheet	Upper range setting for analog output 3 Value corresponds to 20 mA or 10 VDC respectively	
Output 4 0/4...20 mA (nur VS-4450)	0...1	1	Analog output 4 0 = 0...20 mA / 0...10 VDC 1 = 4...20 mA / 2...10 VDC The selection of current or voltage output is made on the output card.	
Output 4 Select (nur VS-4450)	0...7	4	Selection of the output value for analog output 4 0 = Viscosity 1 = External input 2 = Process temperature 3 = Coil temperature 4 = Frequency 5 = Dynamic viscosity 6 = Kinematic viscosity 7 = Raw viscosity (without calculating factors)	
Output 4 min. Value (nur VS-4450)	-9999 ... 999999	0	Lower range setting for analog output 4 Value corresponds to 0 or 4 mA or 0 or 2 VDC respectively	
Output 4 max. Value (nur VS-4450)	-9999 ... 999999	See calibration sheet	Upper range setting for analog output 4 Value corresponds to 20 mA or 10 VDC respectively	
Alarm 1 Select	0...3	0	Selection of the alarm conditions for alarm value 1: 0 = Closer - NO if value falls below .. 1 = Closer - NO if value rises above .. 2 = Opener - NC if value falls below .. 3 = Opener - NC if value rises above ... the value from alarm value 1 ("Parameter Level") for the selected parameter from Alarm 1 Configure, the Alarm 1 LED and the optional relay contact will be triggered.	

Display parameter	Range	Default	Comment	Your values
Alarm 1 Configure	0...6	0	Selection of the measurement input or the function for alarm value 1: 0 = Alarm off 1 = Alarm to viscosity 2 = Alarm to external input 3 = Alarm to process temperature 4 = Alarm to coil temperature 5 = Alarm on 6 = Alarm relay used for control	
Alarm 2 Select	0...3	0	Selection of the alarm conditions for alarm value 2: 0 = Closer - NO if value falls below .. 1 = Closer - NO if value rises above .. 2 = Opener - NC if value falls below .. 3 = Opener - NC if value rises above .. the value from alarm value 2 ("Parameter Level") for the selected parameter from Alarm 2 Configure, the Alarm 2 LED and the optional relay contact will be triggered.	
Alarm 2 Configure	0...5	0	Selection of the measurement input or the function for alarm value 2: 0 = Alarm off 1 = Alarm to viscosity 2 = Alarm to external input 3 = Alarm to process temperature 4 = Alarm to coil temperature 5 = Alarm on	

Display Parameter	Range	Default	Comment	Your values
Display Line x Seite 1 = Line 1 to 4 Seite 2 = Line 5 to 8	0...10	Z. 1 = 1 Z. 2 = 2 the other lines according to the applica- tion	Display configuration for the LCD Display. 0 = No display 1 = Viscosity 2 = Process temperature 3 = Coil temperature 4 = External input 5 = Dynamic viscosity 6 = Kinematic viscosity 7 = Frequency 8 = Phase (service) 9 = CPU temperature 10 = Raw viscosity (original value) 11 = Dry Substance (see separate manual "Parameter examples" for applications, e.g. in sugar)	
Modbus Address	1 ... 99	1	Address of the serial interface	
Baud – Rate	0...1	1	Baud rate for the serial interface 0 = 4800 Baud 1 = 9600 Baud	
Modbus - Mode	0 ... 1	1	Activation of the Modbus RTU protocol 0 = Passive, no reply 1 = Active, replies to request	
Code Configuration	0...9999	88	Default access code for the „ Configuration Level ”	
Code Alarm Parameter	0...9999	44	Default access code for the „ Parameter Level ”	
Code PID-Control	0...9999	33	Default access code for the „ PID Control Level ”	
Code Linearization	0...9999	See calibration sheet	Default access code for the „ Linearization Level ”	
Code Zero Adjust	0...9999	22	Default access code for the „ Zero Adjust Level ”	
Code Temp. Comp.	0...9999	55	Default access code for the ASTM „ Temperature Compensation Level ”	
Code Sugar Lin.	0...9999	111	See separate manual "Parameter examples" for applications, e.g., in sugar	

Display Parameter	Range	Default	Comment	Your values
Compensation (Density)	0...2	0	Selection of density compensation 0 = No function 1 = Manual, fixed density value 2 = Dynamic density value through external input	
Compensation Manual	0.0000...19.9999	0.1000	Manual density value in g/cm ³	
Compensation min.	-0.9999 ... 19.9999	0.0000	Density value that corresponds to the 4 mA signal	
Compensation max.	-0.9999 ... 19.9999	0.1000	Density value that corresponds to the 20 mA signal	
TempComp Mode	0...2	0	Selection of the temperature compensation method 0 = No function 1 = Equal percentage temperature compensation 2 = ASTM D341 temperature compensation	
TempComp Temperature	-40.0 ... 450.0	0.0	Temperature at which the viscosity is to be compensated (reference temperature)	
TempComp Factor	0.0000 ... 2.0000	0.0001	Factor per °C for the equal percentage temperature compensation	
ASTM Select 1	1 ... 10	1	Selection of a double pair of ASTM values from the ASTM temperature compensation table (Code 55)	
ASTM Select 2	1...10	1	Selection of the second double pair of ASTM values from the ASTM temperature compensation table (Code 55)	
Temp. Switch Value	-40.0 ... 450.0	0.0	Sets a temperature switch value at which the temperature compensation is switched to another double pair	
Temp. Switch Hyst.	0.0...50.0	0.0	Hysteresis setting for the temperature switch value	
Visc. Switch Value	0...999999	0	Sets a viscosity switch value at which the temperature compensation is switched to another double pair (ASTM)	
Visc. Switch Hyst.	0...999999	0	Hysteresis setting for the viscosity switch value	

Display Parameter	Range	Default	Comment	Your values
Function Check <i>Function no longer available</i>	0...2	0	Selection of this parameter launches an automatic inspection of the internal functions of the viscometer system. 0 > Normal measurement function, no check 1 > Function check on, the check must be performed for approx. 2.5 minutes 2 > Function check off, similar to 0 but function is switched off after 2.5 minutes	
Sugar Quality	0 ... 100	90.0	<i>See separate manual "Parameter examples" for applications, e.g. in sugar</i>	
End	None	0	This setting returns you to the " Operator Mode " user level	

„Temperature Compensation Level“ (Default access code 55)

Display Parameter	Range	Default	Comment	Your values
Visco Low 1	0 ... 999999	0	Low viscosity of the 1st ASTM double pair	
Temp (V-Low) 1	0.0 ... 600.0	0	Temperature of the low viscosity of the 1st ASTM double pair	
Visco High 1	0 ... 999999	0	High viscosity of the 1st ASTM double pair	
Temp (V-High) 1	0.0 ... 600.0	0.0	Temperature of the high viscosity of The 1st ASTM double pair	
Visco Low 2...10	0 ... 999999	0	As in Visco Low 1	
Temp (V-Low) 2...10	0.0...600.0	0.0	As in Temp (V-Low) 1	
Visco High 2...10	0 ... 999999	0	As in Visco High 1	
Temp (V-High) 2...10	0.0 ... 600.0	0.0	As in Temp (V-High) 1	
End	none	0	This setting returns you to the " Operator Mode " user level	

„PID Control Level“ (Default access code 33)

These control functions are not available in the VS-D250.

These control functions can only be used in the VS-4450 if the optional relay card has been installed and the control parameter in "Alarm Configure 1" is set to 6 ("**Configuration Level**").

Display Parameter	Range	Default	Comment	Your values
Control - Range Low	-9999 ... 999999	0	Lower value of the control range	
Control - Range High	-9999 ... 999999	1000	Upper value of the control range	
Proportional Band	0.0 ... 20.0	0.1	Proportional band adjustment for the control function	
Integral Band	0 ... 200	0	Integral band adjustment for the control function	
Differential Band	0.0 ... 999.9	0:0	Differential band adjustment for the control function	
Control Direction	0 ... 1	0	Selection of the control direction 0 = larger / larger 1 = larger / smaller	
Pulse - Time	0 ... 9999	0	Selection of the pulse length in seconds	
End	none	0	This setting returns you to the "Operator Mode" user level	

„Linearization Level“ (Default access code, see calibration sheet)

Display Parameter	Range	Default	Comment
Lin. A/D Value 0 (analog / digital converter value)	0 ... 65535	The A/D value is set during factory calibration and cannot be changed	Use a separate sheet if you make any changes
Lin. Display 0	0 ... 999999	Viscosity value for the associated A/D value, can be changed	
Lin. A/D Value 1...20	0 ... 65535	As for Lin. A/D Value 0	
Lin. Display 1...20	0 ... 999999	As for Lin. Display 0	
End	none	This setting returns you to the "Operator Mode" user level	

„Sugar Linearization Level“ (Default access code 111)

See separate manual "Parameter examples" for applications , e.g. in sugar

Display Parameter	Range	Default	Comment
Lin. Viscosity 0 (Viscosity value from linearization)	0 ... 65535		Use a separate sheet if you make any changes
Lin. Display 0	0 ... 999999		
Lin. Viscosity 1...20	0 ... 65535	As for Lin. A/D Value 0	
Lin. Display 1...20	0 ... 999999	As for Lin. Display 0	
End	none	This setting returns you to the "Operator Mode" user level	

Troubleshooting

Check the transmitter and the process control system displays to ensure that both are showing the same values. This may help you to locate the problem more effectively. In some cases, a multimeter may be required to measure resistance and flow.

Error	Cause	Solution
Viscosity display does not change during the process	Sensor not active	Check all wiring at Pin 1, 2, 4 and 5
	Coil defect	Measure resistance: Pin 1 + 2 and 4 + 5 (must have approx. the same values)
	Transmitter defect (frequency and phase are plausible)	Check and repair transmitter
Viscosity display appears to be "frozen" in the upper range	Viscosity has reached its maximum calibration range, sensor still active	Reduce viscosity, extend calibration range (can only be performed at Marimex®)
	Viscosity has reached the maximum setting of the analog output	Extend the range of the analog output
Viscosity display falls sharply to 0	Viscosity too high, sensor no longer active	Reduce viscosity, extend calibration range (can only be performed at Marimex®)
Viscosity fluctuates very strongly	Strong external vibrations	Anchor the pipe more firmly. Raise the filter "Moving Average"
	When an additional power unit is switched on	Check the grounding shield of the transmission cable, Pin 3 (must not be connected to the sensor)
Sensor LED illuminated (sensor is outside the preset frequency range)	Set range too small	Contact Marimex®
	Coating on the sensor probe	Clean sensor probe
	Bent sensor probe	Repair (can only be performed at Marimex®)
Process temperature shown in display approx. -273	Process Pt100 is not connected	Check wiring at Pin 6, 7 and 8
	Process Pt100 is faulty	Check electrical resistance at Pin 6, 7 and 8 on the sensor. Pin 6 + 7 and 6 + 8 must have identical values (± 0.5 Ohm), Pin 7 + 8 a much lower value
Coil temperature shown in the display has a negative value	Coil Pt100 is not connected	Check wiring at Pin 9, 10 and 11
	Coil Pt100 is faulty	Check electrical resistance at Pin 9, 10 and 11 on the sensor. Pin 9 + 10 and 9 + 11 must have identical values (± 0.5 Ohm), Pin 10 + 11 a much lower value

Error	Cause	Solution
"Temperature Warning" shown in the display	Message based on a preset value in the transmitter for the process temperature. This has been exceeded.	Reduce the process temperature. As it falls, the message should vanish. Otherwise contact Marimex®
"Temperature Shutdown" shown in the display	Message based on a preset value in the transmitter for the coil temperature. This is intended to protect the coils in the sensor against overheating.	This message can only be removed by entering the code 173 and 21, as long as the coil temperature is not above a preset value. If the fault has not been solved, the current coil temperature will be shown in the display for approx. 2 seconds. Please note this temperature and inform Marimex® who will recommend a further course of action.

General instrument specifications

The ViscoScope® viscometer system comprises two sensor models and two transmitter models. The specifications stated in the following tables "Sensors" and "Transmitters" are valid for the entire range of ViscoScope® viscometers.

Sensors

Versions	Standard and customized designs
Total measurement range	0,1 to 2.500.000 mPa·s x g/cm ³
Material	1.4404 (316L) / 1.4571 (316Ti), Hastelloy, Duplex, Teflon coating, ceramic coating, powder coating
Protection	IP65
Temperature measurement	Integrated in the sensor probe
Temperature range	-40°C to +1.700°C
Pressure range	Vacuum to 450 bar
Resonance frequency	approx. 400 to 700 Hz
Process connection (flange, fitting, thread)	DIN, ANSI, JIS, Varivent®, Tri Clover, NPT, special flanges
Flow speed	In any position in reactors, vessels, tanks, pipes, flow through cells
Fliessgeschwindigkeit	Up to 10 m / s – depending on installation
Reproducibility	± 0.3% to ± 0.5% or ± 1 digit of the display value – depending on the sensor type and viscosity range
Accuracy	± 2% of the display value
Certificates	ATEX, IECEx, EHEDG

Transmitters

Display	2 pages each with up to 4 lines, alphanumerical
Measurement parameters	Viscosity, temperature, external input, resonance frequency
Calculable parameters	Dynamic and kinematic viscosity, temperature compensation, user viscosity
Outputs	Analog 0/4...20 mA or 0/2...10 V – active serial RS232 or RS485 2 SPDT relays – depending on transmitter type
Alarms	Via LEDs and relays
Power supply	Depending on transmitter type 24 VDC, 24 VDC/AC, 95...250 VAC, 15W
Housing	Depending on transmitter type DIN top-hat rail housing, control panel or wall-mounted housing, 19" rack
Ambient conditions	0 to +50°C, up to 70% rel. humidity

Electrical specifications

The sensor model S-3***-** / VA-300*-** contains two split pair coils connected in series. The sensor model S-1***-** / VA-100*-** contains two coils.

One split pair coil / coil is the driver coil. The other split pair coil / coil is the receiver coil. The electrical specifications for coils and electrical circuits are stated below.

Coils

Resistance	41 Ohm	±10%
Inductance	16 mH	± 10%
Gauss strength	350	± 10%

Circuits

Receiver coil(s)

Pin 1 + 2	Power	10 mW
Und	Current	40 mA
Treiberspule(n)	Voltage	10 V

Pin 4 + 5

Prozess-Pt100

Pin 6, 7 + 8	Power	275 Mw
and	Current	310 mA

Coil-Pt100 Voltage 3,5 V

Pin 9, 10 + 11

Warranty

Instrument warranty

All instruments manufactured and sold by Fluid.iO Sensor + Control GmbH & Co. KG have a two year warranty beginning from the date of delivery. Faulty or defective instruments that have been used normally for the intended measurement purpose will be repaired or replaced by Fluid.iO Sensor + Control GmbH & Co. KG free of charge during this 2-year warranty period.

As virtually all liquids are shear-rate-dependent, any viscosity level measured in a process is a relative measurement, not an absolute measurement. Fluid.iO Sensor + Control GmbH & Co. KG therefore guarantees the reproducibility of the ViscoScope® viscometer not its accuracy.

We guarantee that the ViscoScope® viscometer from Fluid.iO Sensor + Control GmbH & Co. KG will maintain its reproducibility for one year if it is installed and operated in accordance with the instructions contained in the manual (installation and operation) and the agreed process conditions. The calibration data are added individually to every operating manual. Every instrument that does not maintain its reproducibility in the first year after the delivery under the conditions specified above will be re-calibrated free of charge.

Failure to comply with the installation instructions and / or agreed process conditions renders this instrument warranty and performance guarantee void.

The following conditions apply to claims under the warranty::

- Fluid.iO Sensor + Control GmbH & Co. KG must be informed immediately in writing when a defect or discrepancy from the specifications is identified
- After Fluid.iO Sensor + Control GmbH & Co. KG has issued an authorization, the instrument must be returned to Fluid.iO Sensor + Control GmbH & Co. KG carriage paid in its original packaging. Fluid.iO Sensor + Control GmbH & Co. KG will accept no liability and provide no guarantee if other packaging materials are used
- The inspection of the instrument by Fluid.iO Sensor + Control GmbH & Co. KG must show that any defect or divergence from the specifications is not due to negligence, operating conditions that have not been specified or approved in writing, incorrect installation, accidents, unauthorized repairs or modifications
- Opening the sensor housing without the authorization of Fluid.iO Sensor + Control GmbH & Co. KG renders the instrument warranty and performance guarantee void
- Mechanical damage to the sensor probe, transmitter, transmission cable or safety barriers caused by external influences are not covered by the warranty

Performance guarantee

Taking into account the agreed process conditions and correct installation, Fluid.iO Sensor + Control GmbH & Co. KG guarantees that the ViscoScope® viscometer is able to detect differences in viscosity in the process if differences in viscosity are present in the process. Reproducible values can only be guaranteed under reproducible, constant conditions.

Limitation of liability

The instrument warranty and performance guarantee are limited to the following:

- Repair of the instrument if it is faulty
- Replacement of the instrument with an equivalent, functioning instrument from Fluid.iO Sensor + Control GmbH & Co. KG if the instrument is faulty
- Return of the instrument to Fluid.iO Sensor + Control GmbH & Co. KG for a refund if the said instrument fails to provide reproducible viscosity values under constant process conditions. Refund not to exceed the sale price of the instrument (takes account of traces of usage etc.).

Fluid.iO Sensor + Control GmbH & Co. KG shall not be liable for indirect and other damages or consequential damages and costs.