FLOW permanent

Instruction Manual

Flow Measurement Transmitter NivuFlow 650

HART COMMUNICATION PROTOCOL

FIELDCOMM GROUP MEMBER

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Translation

If the device is sold to a country in the European Economic Area (EEA) this instruction manual must be translated into the language of the country in which the device is to be used.

Should the translated text be unclear, the original instruction manual (German) must be consulted or one of the legally associated companies and subsidiaries of NIVUS group contacted for clarification.

Copyright

Names

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Document modifications

Rev.	Modifications	Editor in charge	Date
01	Complete revision: many features and functions added, layout redesigned etc.	MoG	29.06.2020
00	First version based on the German document	DMR	21.12.2015

Contents

General

1 About this manual

Important note

READ CAREFULLY BEFORE USE.

KEEP IN A SAFE PLACE FOR LATER REFERENCE.

This instruction manual for the flow measurement transmitter NivuFlow 650 is for the intended use of the device only. This manual is oriented exclusively to qualified expert personnel.
Read this instruction manual carefully and completely prior to installation and connection since it contains relevant information on this product. Observe the notes and particularly follow the warning notes and safety instructions.

If you should have problems to understand information contained within this instruction manual contact one of the legally associated companies and subsidiaries of NIVUS group for further support. The companies and subsidiaries of NIVUS group cannot be held responsible for damage to persons or materials due to incorrectly understood information in this instruction manual.

1.1 Applicable documentation

For the installation and operation of the complete system extra instruction manuals or technical descriptions may be required apart from this manual.

- Technical Instructions Transit Time Sensors
- Installation Instructions Transit Time Sensors
- Technical Instructions NIVUS MODBUS TCP/RTU Application Interface for measurement transmitters of the series NivuFlow 5xx, 6xx, 7xx and Energy Saver
- Technical Instructions Extension Module NFE

These manuals are provided with the auxiliary units or sensors and/or are available as download on the NIVUS homepage.

1.2 Signs and definitions used

Image	Meaning	Remark
	(Action) Step	Action to be performed by you. Note the numbering of action steps. Observe the order of the steps.
	Cross-reference	Refers to further or detailed information.
>Text<	Parameter or Menu	Indicates a parameter or a menu that is selected or described.
	Reference to document	Refers to an accompanying documentation.
	Graphics/Table info	Additional information in the legend of a graphic or a table

Table 1-1 Structural elements within the manual

1.3 Abbreviations used

Colour code for wires and single conductors

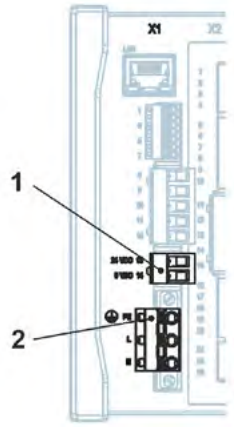
The abbreviations of colours, wire and components follow the international colour code according to IEC 60757.

BK	black	BN	brown	RD	red
OG	orange	YE	yellow	GN	green
BU	blue	VT	violet	GY	grey
WH	white	PK	pink	TQ	turquoise
GNYE	green/yellow	GD	gold	SR	silver

2 Connections and Operating Elements

2.1 Power Supply

The connection for the power supply is located on the lower part of the terminal block X1.



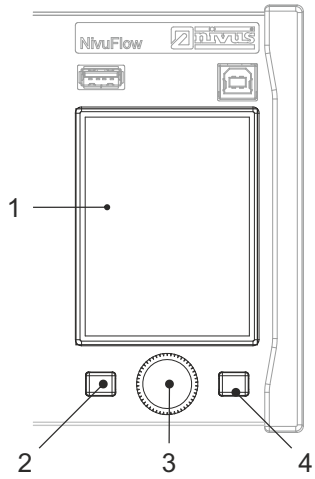
1 Power supply DC
2 Power supply AC and earth conductor

Fig. 2-1 Electrical connections of power supply

⇨ You can find a detailed connection plan in Sect. “21.2 Plans of terminal connections”.

2.2 NivuFlow Operating Elements

The NivuFlow is operated completely in dialogue mode supported by the graphs on the display. To select individual menus and submenus use the rotary pushbutton as well as both function keys.



1 Graphic display
2 Left function key
3 Rotary pushbutton
4 Right function key

Fig. 2-2 Operating elements

2.3 Tasks of control elements

Colour display

You can read all settings, when setting parameters and in diagnostics.

Left function key (Menu and/or Back)

This key (Menu) takes you from the main display to the main menu. The same key (Back) is also used to exit the main menu and the submenus.

Rotary pushbutton

Use the rotary pushbutton to enter specific submenus. The functions can be selected using the rotary pushbutton as well.

- Select the desired parameter or menus
- Navigation through the submenus and settings
- Selection of letters or numbers for parameter setting

Right function key (Input and/or Tab)

This key is used to confirm value entries (via numeric keys or letter keys).

For some parameters the right function key can be used as >Tab<. This Tab function is always available when digits are visible in the upper right corner of the display. Then the Tab function is used to switch between pages/displays. This applies to the following settings:

- Menu >Application<
  - Selecting the v-paths
  - Selecting the analog inputs / outputs
  - Selecting the digital inputs / outputs
  - Diagnostics of the v-paths

- Diagnostics of the signal analysis

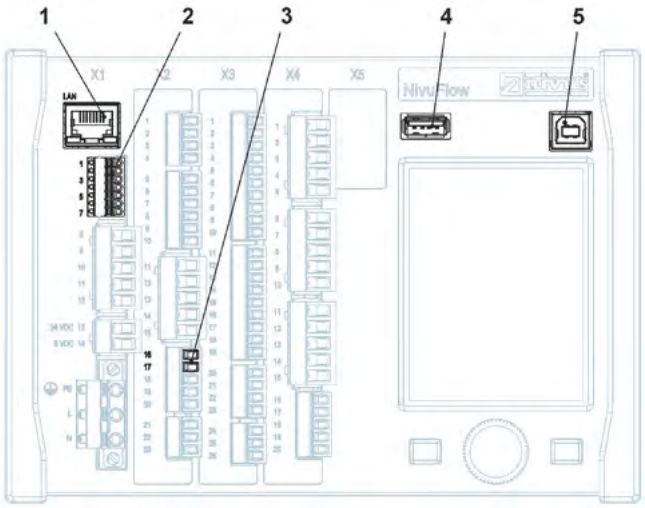
- Menu >Data<
  - Selection of Trend, Total and Day totals

Within the programming of multiple inputs/outputs or when programming several v-paths, the right function key is used to jump from one input/output or v-path to the next.

⇨ You will find a description on how to use the control elements in Sect. “26 Operation Basics”.

2.4 Interfaces

The transmitter is equipped with various interfaces on the front panel.



1 Network interface (LAN)
2 BUS interface (RS485/RS232)
3 HART interface
4 USB-A interface (data transfer, parameter backup, device update)
5 USB-B interface (service)

Fig. 2-3 Available interfaces

⇨ Descriptions of the individual interfaces see Sect. “35 Communication Parameter Menu”.

Safety Instructions

3 General: Used Symbols and Signal Words

3.1 Valuation of the accident level

The general warning symbol indicates the risk of personal injuries or death. In the text section the general warning symbol is used in conjunction with the signal words described below.

DANGER

Warnings in high degree of risk

*Indicates a high-risk, **imminently** hazardous situation which will result in death or serious injury if not avoided.*

WARNING

Warnings in medium degree of risk

*Indicates a **possible** danger with medium risk which may result in a life-threatening situation or (severe) bodily injury if it is not avoided.*

CAUTION

Warnings in low-risk or property damages

Indicates a possible danger with moderate risk which may result in minor or moderate personal injury or material damage if not avoided.

WARNING

Danger by electric voltage

Indicates a hazard with a high risk of electric shock which may result in a life-threatening situation or (severe) bodily injury if it is not avoided.

Important Note

Contains information that should be highlighted.

Indicates a potentially damaging situation which can result in damage to the product or to an object in its environment.

Note

Contains information and facts.

3.2 Warning notices on the product (option)

General warning label

This symbol is for operators to refer to this manual.

Observing the information contained therein is required in order to maintain protection measures provided by the instrument during installation procedures and operation.

Protective conductor

This symbol refers to the protective conductor of the unit.

Depending on the mode of installation the instrument shall be operated solely connected to an appropriate protective conductor according to applicable laws and regulations.

4 Safeguards and Precautions

Working with NIVUS instruments requires to observe and to follow the safety measures and precautions below generally and at any time. These notes and warnings will not be repeated for each description within the document.

WARNING ***Germ contamination***

Parts can be contaminated with dangerous germs, especially if the sensors are used in waste water applications. Therefore, appropriate precautions must be taken when contacting cables and sensors.

Wear protective clothing.

WARNING ***Observe occupational safety regulations***

Before starting and while executing installation work, observing the work safety regulations needs to be checked constantly.

Disregarding these regulations may lead to personal injury.

WARNING ***Do not disable safety devices!***

It is strictly prohibited to disable the safety devices or to change the way they work.

Disregarding this may lead to personal injury or site damage.

WARNING ***Disconnect the systems from mains***

Maintenance, cleaning and/or repairs (by qualified personnel only) may only be performed when de-energised.

Disregarding this warning may lead to electric shocks.

Putting into operation by trained experts only

The entire measurement system shall be installed and put into operation by trained expert personnel only.

Integrated buffer battery

The integrated buffer battery may only be exchanged by NIVUS staff or personnel authorised by NIVUS. Infringements lead to a limitation of the warranty (see Sect. “5 Warranty”).

5 Warranty

The device has been functionally tested before delivery. If it is used as intended (see Sect. “7 Use in accordance with the requirements”) and the operating instructions, the applicable documents (see Sect. “1.1 Applicable documentation”) and the safety notes and instructions contained therein, are observed, no functional restrictions are to be expected and perfect operation should be possible.

⇨ Please also note in this regard the next Sect. “6 Liability Disclaimer”.

Limitation of warranty

In the event of non-compliance with the safety instructions and instructions in this document, the companies of the NIVUS group of companies reserve the right to limit the warranty.

6 Liability Disclaimer

The legally associated companies and subsidiaries of NIVUS group assume no liability

- for damages owing to **a change** to this document. The legally associated companies and subsidiaries of the NIVUS group reserve the right to change the contents of this document and this disclaimer at any time and without any notice.
- for damages to persons or objects resulting from **failure to comply** with applicable **regulations**. When connecting, commissioning and operating the sensors, all available information and higher local legal regulations (in Germany e.g. VDE regulations) such as applicable Ex regulations as well as safety requirements and regulations in order to avoid accidents shall be adhered to.
- for damages to persons or objects resulting from **improper use**. For safety and warranty reasons, all internal work on the instruments beyond that involved in normal installation and connection, must be carried out only by qualified NIVUS personnel or persons or companies authorised by NIVUS.
- for damages to persons or objects resulting from the use of instruments in technically **imperfect** condition.
- for damages to persons or objects resulting from the use of instruments **not in accordance with the requirements**.
- for damages to persons or objects resulting from **failure to comply with safety information** contained within this instruction manual.
- for missing or incorrect measurement values or resulting consequential damages due to **improper installation**.

7 Use in accordance with the requirements

Note

The instrument is intended solely for the purpose described below.

Modifying or using the instruments for any other purposes without the written consent of the legally associated companies and/or subsidiaries of NIVUS group will not be considered as use in accordance with the requirements.

The legally associated companies and subsidiaries of NIVUS group cannot be held responsible for any damage resulting from improper use. The user alone bears any risk.

The NivuFlow 650 transmitter and associated sensor system is designed for continuous flow measurement of slightly contaminated to clear, pure water-based liquids in **partly or fully filled** pipes, channels or water bodies.
The measurement transmitter is designed and manufactured in accordance with the current state of the art and with the recognised safety rules and regulations applicable at the time this document is issued. Danger to persons or material damage cannot be completely ruled out, however.

The maximum permissible limit values as specified in Sect. “16 Specifications” shall be necessarily observed. Any case varying from these conditions which is not approved by NIVUS GmbH in written form is left at the owner’s risk.

8 User’s Responsibilities

Observe and comply with all guidelines and requirements

In the EEA (European Economic Area) national implementation of the framework directive 89/391/EEC and corresponding individual directives, in particular the directive 2009/104/EC concerning the minimum safety and health requirements for the use of work equipment by workers at work, as amended, are to be observed and adhered to. In Germany e.g. the Industrial Safety Ordinance must be observed.

Make sure to have a local operating permit available and observe the associated conditions. In addition to this you must observe environmental requirements and local laws on the following points:

- Personnel safety (accident prevention regulations)
- Safety of work materials and tools (safety equipment and maintenance)
- Disposal of products (laws on wastes)
- Disposal of materials (laws on wastes)
- Cleaning (cleansing agents and disposal)

Connections
Operators shall make sure prior to operating the instrument that during installation and initial start-up the local regulations (such as regulations for electrical connection) are observed.

Keep the manual
Keep this manual in a safe place and make sure it is available for the users of this product at any time.

Provide the manual
In case of selling the instrument this instruction manual shall be provided to the purchaser since it is a part of the standard delivery.

9 Personnel requirements

Installation, commissioning and maintenance shall be executed only by personnel meeting the demands as follows:

- Expert personnel with relevant training and appropriate qualification
- Personnel authorised by the plant operator

Qualified personnel

within the context of this documentation or the safety notes on the product itself are persons who are sufficiently familiar with installation, mounting, starting up and operation of the product and who have the relevant qualifications for their work; for example:

I. Training, instruction or authorisation to activate/deactivate, isolate, ground, and mark electric circuits and devices/systems according to the safety engineering standards.

II. Education and instruction according to the standards of safety engineering regarding the maintenance and use of adequate safety equipment.

III. First aid training

Delivery, Storage and Transport

10 Delivery

The standard delivery of the NivuFlow 650 basically contains:

- Transmitter type NivuFlow 650 (according to shipping documents)
- Instruction manual (incl. certificates of conformity) containing any relevant information on how to operate the NivuFlow 650

Check extra accessories depending on your order and by using the delivery note.

11 Reception inspection

Check the packaging for visible damage immediately after receipt. Any possible damage in transit shall be instantly reported to the carrier. Furthermore a written report shall be sent to NIVUS GmbH in Eppingen.

Incomplete deliveries shall be reported in writing either to your local representative or directly to the NIVUS GmbH in Eppingen within two weeks.

Important note

Objections cannot be rectified later!

12 Storage

The permissible maximum values regarding ambient conditions such as temperature and humidity according to Sect. “16 Specifications” shall be necessarily observed.

Protect the instrument from corrosive or organic solvent vapours, radioactive radiation as well as strong electromagnetic radiation.

Use the original packaging for storage.

13 Transport

Protect the instrument from heavy kicks, impacts, shocks or vibrations.

Use the original packaging for transport.

Otherwise, the same rules apply with regard to external influences as for storage (see Sect. “12 Storage”).

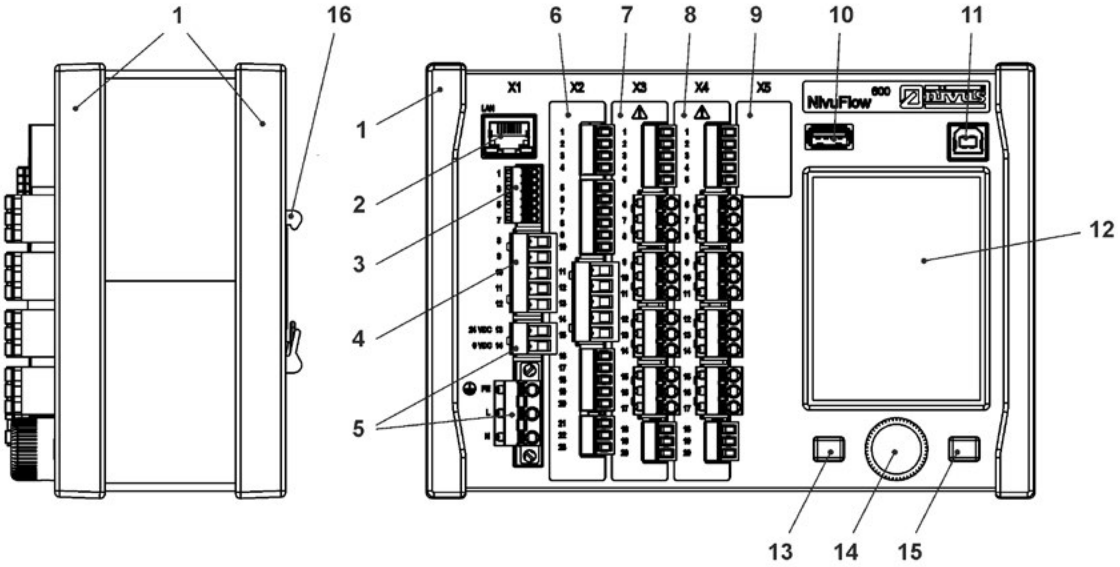
14 Return

In case of a required reshipment return the unit at customer cost to NIVUS GmbH in Eppingen using the original packaging.

Insufficiently franked shipments will not be accepted!

Product specification

15 Product Construction and Overview



1 Trims/cover strips (only for installation in control cabinets)
2 Interface (LAN)
3 Bus interface (RS485/RS232)
4 Connection air ultrasonic sensor (RS485)
5 Power supply
6 Terminal block (see Sect. “21.2 Plans of terminal connections”)
7 Terminal block (see Sect. “21.2 Plans of terminal connections”)
8 Terminal block (see Sect. “21.2 Plans of terminal connections”)
9 Terminal block (see Sect. “21.2 Plans of terminal connections”)
10 USB-A interface (data transfer, parameter backup, device update)
11 USB-B interface (service)
12 Graphics display
13 Left function key
14 Rotary pushbutton
15 Right function key
16 DIN rail fastening

Fig. 15-1 Device setup NivuFlow 650 enclosure type E0/E1

15.1 Dimensions of enclosure

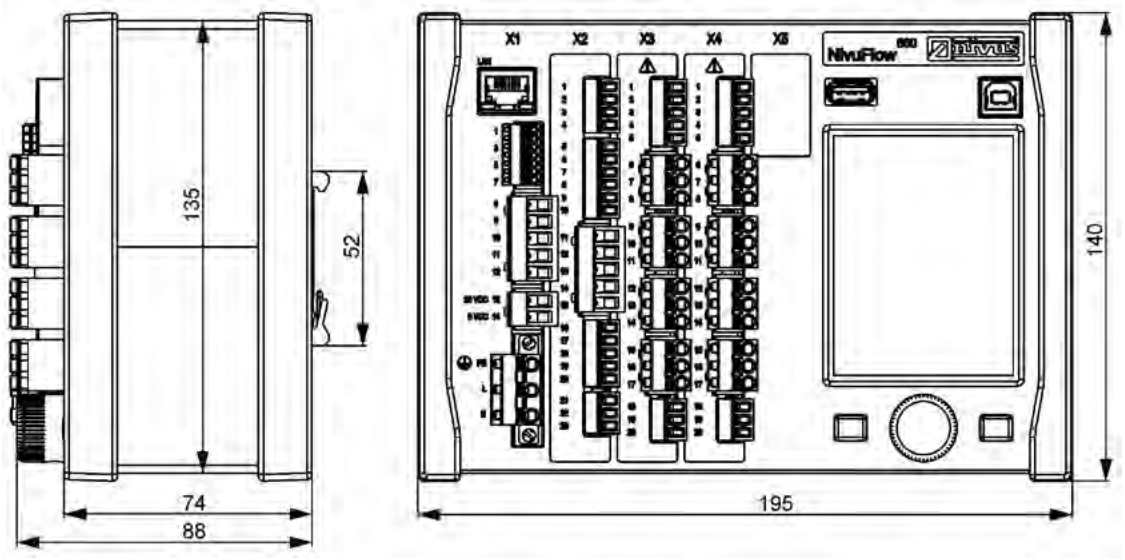


Fig. 15-2 Dimensions of NivuFlow 650 enclosure type E0

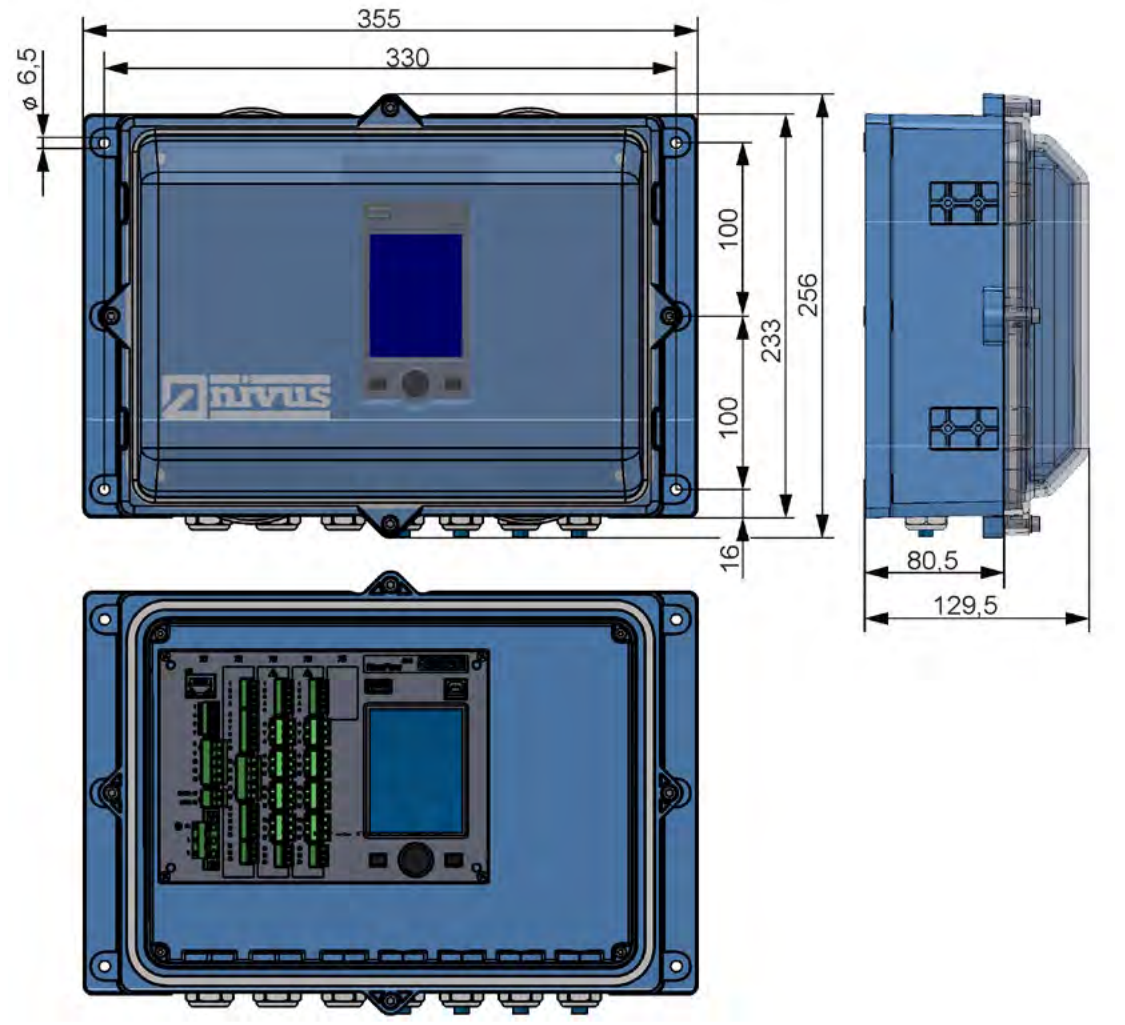


Fig. 15-3 Dimensions of field enclosure NivuFlow

15.2 Connectable sensors

You can find the connectable NIVUS sensors and their data or information on their mounting in the documents “Technical Instructions Transit Time Sensors” and “Installation Instructions Transit Time Sensors”.
These documents are delivered with the ordered sensors. Alternatively, they are available for download at www.nivus.com.

15.3 Device identification

The instructions contained within this manual are valid only for the type of device specified on the title page.

The name plate is fixed on the side of the enclosure and contains the following:

- Name and address of NIVUS GmbH
- CE label
- Information on type and series incl. article and serial number
- Year of manufacture: the first four digits of the serial number represent the year and the week number of manufacture (1950.....)
- Power supply

In case of enquiries and ordering replacement parts it is important to specify article number as well as the serial number of the respective transmitter or sensor. This ensures correct and quick processing.

Note

Check the delivered instrument for accordance with your order by identifying the nameplate.

Check the nameplate for correct specification of the power supply.

⇨ The declaration of conformity is located at the end of the manual.

Nameplates

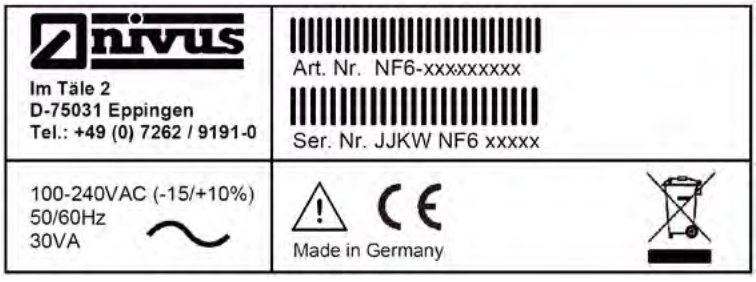


Fig. 15-4 Nameplate AC version

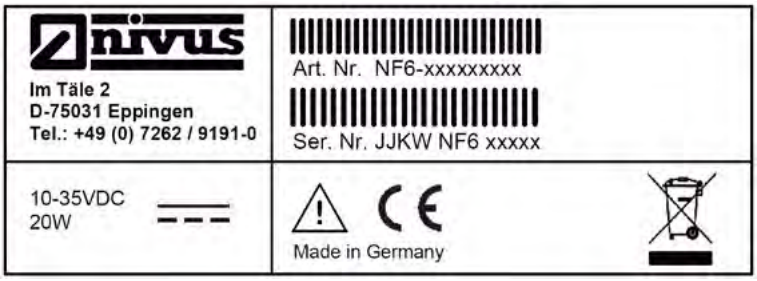


Fig. 15-5 Nameplate DC version

16 Specifications

Power supply	100...240 V AC, -15 % / +10 %, 47...63 Hz or 10...35 V DC
Supply connection	Plugged and screwed tension clamp terminal block
Max. power consumption	AC: 30 VA / DC: 20 W
Typ. power consumption	1x relay energised, 230 V AC: 14 W (rounded), up to eight transit time sensors 1 MHz
Enclosure	**DIN rail** Material: aluminium and plastic Weight: approx. 1,300 g **Field enclosure** Material: polycarbonate PC Weight: approx. 3,800 g (incl. NF 650)
Degree of protection (IEC 60529) / Shock resistance (IEC 62262)	**DIN rail** IP20 / IK08 **Field enclosure** IP67 (option: IP68) / IK08
Operating conditions	Protection class I Overvoltage category II Degree of pollution 2
Altitude	AC unit for use in altitudes up to 3000 m above MSL. At relay voltages >150 V the use is restricted to an altitude of max. 2000 m above MSL (AC and DC units)
Operating temperature	DC: -20...+70 °C AC: -20...+65 °C
Storage temperature	-30...+80 °C
Max. ambient temp. for installation and operation	+50 °C
Max. humidity	80 %, non-condensing
Display	TFT full graphic colour daylight display, 240x320 pixels, 65,536 colours
Programming	Dialog mode using rotary pushbutton and two function keys, in English, German, French, Italian, Spanish, Portuguese, Swedish, Danish, Finnish, Polish, Hungarian, Romanian, Czech and Russian
Connection	Plug with spring-cage terminal clamps
Inputs	Digital input: - electrically isolated 5...24 V nominal, input current typically < 5 mA for max. input voltage U_{in}=30 V, input current typically > 1.5 mA for min. input voltage U_{in}=3 V Analog input: - 4 mA…20 mA with 12 bit resolution for analog input values, accuracy ±0.4 % of measuring range final value (20 mA), load 91 Ohm
Outputs	Digital output: - bistable relay SPDT, maximum load 230 VAC / 2 A (cos 0.9 phi), recommended min. control signal 10 mA @ 12 V - relay SPDT, maximum load 230 VAC / 2 A (cos 0.9 phi), recommended min. control signal 10 mA @ 5 V Analog output: - 0/4 mA…20 mA, load 500 Ohm, 12 bit resolution, accuracy higher than ±0.1 % at 20 °C

Data memory	Internal 1.0 GB, for programming and readings memory; via USB stick frontside read out
Storage cycle	30 seconds to 5 minutes
Communication	- HART (Slave) via AO1 - Modbus TCP via networks (LAN/WAN, Internet) - Modbus RTU via RS485 or RS232 - Internet via Ethernet

Table 16-1 Specifications

Sensors

Observe the specifications of the associated sensors as described in the respective instruction manuals or technical descriptions.

17 Configuration

17.1 Device Types

The NivuFlow is available in different versions, which mainly vary in terms of the number of connectable paths/sensors and the number of measurement sites. The article number can be found on the nameplate (see “Nameplates” on page 24).

NF6- Flow measurement transmitter type NivuFlow

Design

5 for permanent full pipe lines

Type

T2E0 up to 2 acoustic paths, 1x air-ultrasonic sensor OCL, 2x DI, 2x DO, 2x AI, 2x AO; construction: DIN rail/panel mounting (cabinet)

T2E1 up to 2 acoustic paths, 1x air-ultrasonic sensor OCL, 2x DI, 2x DO, 2x AI, 2x AO; DIN rail, prepared for mounting into NIVUS field enclosure, Type *ZUB0 NFW0*

TRE0 up to 2 acoustic paths, 1x air-ultrasonic sensor OCL, 7x DI, 5x DO, 5x AI, 4x AO; multiple I/Os for communication and control jobs available by purchase of additional licences; construction: DIN rail/panel mounting (cabinet)

TRE1 up to 2 acoustic paths, 1x air-ultrasonic sensor OCL, 7x DI, 5x DO, 5x AI, 4x AO; multiple I/Os for communication and control jobs available by purchase of additional licences; DIN rail, prepared for mounting into NIVUS field enclosure, Type *ZUB0 NFW0*

T4E0 up to 4 acoustic paths, 1x air-ultrasonic sensor OCL, 2x DI, 2x DO, 2x AI, 2x AO; construction: DIN rail/panel mounting (cabinet)

T4E1 up to 4 acoustic paths, 1x air-ultrasonic sensor OCL, 2x DI, 2x DO, 2x AI, 2x AO; DIN rail, prepared for mounting into NIVUS field enclosure, Type *ZUB0 NFW0*

TME0 Measurement transmitter to connect NFE extension modules (up to 32 paths), 1x air-ultrasonic sensor OCL, 2x DI, 2x DO, 2x AI, 2x AO; construction: DIN rail/panel mounting (cabinet)

TME1 Measurement transmitter to connect NFE extension modules (up to 32 paths), 1x air-ultrasonic sensor OCL, 2x DI, 2x DO, 2x AI, 2x AO; DIN rail, prepared for mounting into NIVUS field enclosure, Type *ZUB0 NFW0*

		TZE0				Measurement transmitter to connect NFE extension modules (up to 32 paths), 1x air-ultrasonic sensor OCL, 7x DI, 5x DO, 5x AI, 4x AO; multiple I/Os for communication and control jobs available by purchase of additional licences; construction: DIN rail/panel mounting (cabinet)
		TZE1				Measurement transmitter to connect NFE extension modules (up to 32 paths), 1x air-ultrasonic sensor OCL, 7x DI, 5x DO, 5x AI, 4x AO; multiple I/Os for communication and control jobs available by purchase of additional licences; DIN rail, prepared for mounting into NIVUS field enclosure, Type *ZUB0 NFW0*
			Power supply			
			A0			100...240 V AC
			D1			10...35 V DC
				Firmware extensions		
				0		All types
					Number of measurement sites	
					1	one measurement site
					2	two measurement sites (for types T4/TM)
NF6-	**5**			**0**		

Table 17-1 Product structuring

17.2 Additionally bookable Function Licences

The transmitters can be equipped with additional functions for an extra charge. Currently the functional extensions below are available as (software) licences:

- HART (Slave) protocol to analog output (AO1)
- Q-controller functionality (for Types TR and TZ)

⇨ The functions can be activated according to sect. “34.5.3 Feature unlock”.

Functional Description

18 Operating Ranges

The NivuFlow 650 is a permanent measurement system for flow measurement. It is primarily designed for measuring slightly contaminated to clear, pure water-based liquids of various compositions.

The NivuFlow 650 is used in partly and fully filled pipes, channels and water bodies of various geometries and dimensions.

The device types TR and TZ can be equipped with controller functions in the form of a 3-step controller to drive slide valves or other actuators at extra charge.

Both measurement points of the device types T4 and TM can be used to measure at two spots within a channel or to measure both branches of a parting channel. The associated combined measurement point (Combi) calculates the common measurement, depending on the parameterisation.

Alternatively, the two measurement points can also carry out measurements on two different channels. The combined measurement point is then usually not used.

You can find the connectable NIVUS sensors and their data or information on their mounting in the documents “Technical Instructions Transit Time Sensors” and “Installation Instructions Transit Time Sensors”.
These documents are delivered with the ordered sensors. Alternatively, they are available for download at www.nivus.com.

Several sensor pairs are used for a more accurate recording of the flow speed at a common point of measurement.

Note on the measurement place

The flow velocity is measured by means of the ultrasound transit time principle. This measurement methodology requires that the solid content (dirt particles, gas bubbles or similar) is not too high to enable ultrasonic signal transmission between both sensors due to reflections and hence damping.

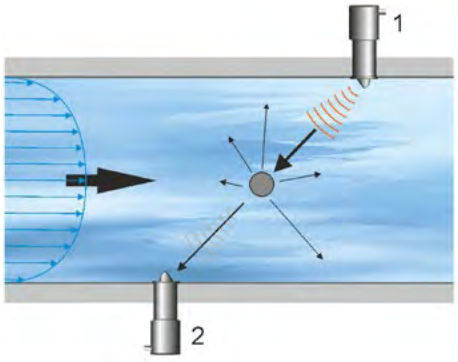
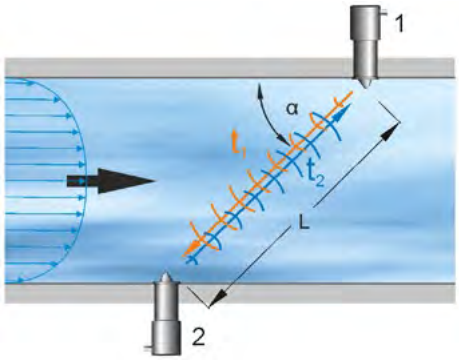


Fig. 18-1 Signal damping by interfering particles

19 Functional Principle

19.1 Flow velocity detection

The flow velocity is determined by using the ultrasonic transit time principle.



1 Sensor 1
2 Sensor 2
α Defined angle
t_1 Time of the impulse **towards** direction of flow
t_2 Time of the impulse **with** direction of flow
L Path length

Fig. 19-1 One-path transit time measurement principle

This measurement principle is based on directly measuring the transit time of acoustic signals between two ultrasonic sensors, the so-called hydro-acoustic converters.

The transit time difference method does not determine the average path velocity, but the effective velocity of sound propagation upstream (decelerated due to flow) and downstream (accelerated due to flow).

Two sound impulses are transmitted consecutively and the different transit times between transmitter and receiver are measured.

- The upstream impulse needs a time t_1.
- The downstream impulse needs a shorter time t_2.

Sound heading downstream will reach the receiver within a shorter period than sound heading upstream. The difference between the transit times is proportional to the average flow velocity within the measurement path.

There is no transit time difference when both sensors receive the transmitted ultrasonic impulses simultaneously. There is no measurable flow available.

The NivuFlow 650 works with both clamp-on sensors and wetted sensors. The clamp-on sensors are installed on the outside of the pipe. In this case the transit time through the pipe wall is calculated and considered.

In order to determine the flow rate, the cross section as well as the flow geometry of the pipe, the canal or the water body must be known.

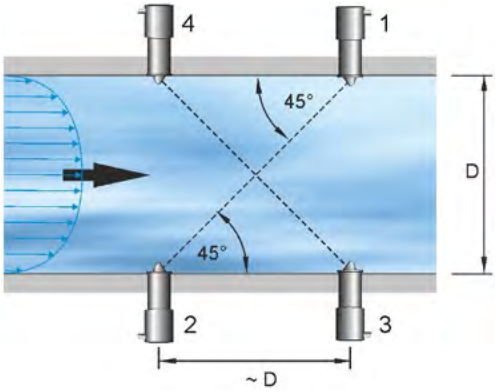
Here the formula below is used:

$$v = \frac{L}{2} \cdot \left[\frac{1}{t_2} - \frac{1}{t_1} \right]$$

given:

- L = length of acoustic measurement path between sensors 1 and 2
- v = average flow velocity between sensors 1 and 2 along the measurement path

The more paths are used in the asymmetrical or disturbed profile and distributed in the flow cross-section, the more accurately the flow can be determined.



1 Sensor 1, path 1
2 Sensor 2, path 1
3 Sensor 1, path 2
4 Sensor 2, path 2
D Pipe diameter (at sensor installation in an angle of 45°)

Fig. 19-2 Two-path transit time measurement principle

If the sensors are installed in an angle of 45°, the distance between sensors 1 and 2 or sensors 3 and 4 is equal to the inside pipe diameter.

19.2 Flow Calculation

In the case of using single-path or multi-path installations in one level under the condition

$Q = v_{average} \cdot A$

and given

- $v_{average}$ = average flow velocity and
- A = cross-sectional flow area,

a velocity coefficient “k” is introduced to compensate for the difference between the measured velocity v_g and the average velocity $v_{average}$ within the cross-sectional area.

The velocity coefficient “k” depends on the Reynolds number and is therefore not a constant. Reynolds number and velocity coefficient are not visible or changeable, they are integrated in the software and are included in the background calculations.

The flow rate can then be calculated by using the signal transit time as follows:

$$Q = k \cdot A \cdot v_g = k \cdot A \cdot \frac{L}{2 \cdot \cos \alpha} \cdot \left[\frac{1}{t_2} - \frac{1}{t_1} \right]$$

Installation and Connection

20 General Installation Instructions

Ensure that the following instructions regarding “Electrostatic discharge” (ESD) and installation place are followed during installation.

➲ Follow applicable legal or operational guidelines.

Improper handling can result in injury and/or damage to the equipment.

20.1 Avoidance of electrostatic discharge (ESD)

ESD risks

Maintenance procedures which do not require power supplied to the instrument shall not be carried out before the unit has been disconnected from mains power in order to minimise danger and ESD risks.

Disconnect the NivuFlow from mains power.

The sensitive electronic components inside the unit may get damaged by static electricity. NIVUS GmbH recommend the following steps to prevent the device from getting damaged due to electrostatic discharge:

➲ Discharge static electricity from your body before touching the instrument’s electronic components.

➲ Avoid unnecessary movements to reduce the risk of building up static electricity.

20.2 Installation and Mounting versions

The transmitter is available in two different mounting versions:

- Type E0 - for direct DIN rail mounting in control cabinets or similar enclosures
- Type E1 - special DIN rail mounting enclosure without cover stripe, with extended DIN rail fastening
  - Installation in NIVUS field enclosure *ZUB0 NFWx*

Pre-assembled units with simultaneous order

As soon as NivuFlow 650 Type E1 and the field enclosure are ordered simultaneously the units are shipped in pre-assembled condition.

CAUTION

NivuFlow 650 Type E0 not suitable for installation in NIVUS field enclosure

*It is not possible to install a NivuFlow 650 Type E0 in a NIVUS field enclosure unless the transmitter is **converted** to a Type E1 unit. The conversion and the modification of connections can be carried out by NIVUS.*

20.3 Choosing the installation place

The NivuFlow with DIN rail fastening is conceived for installation in control cabinets.

➲ Make sure there is adequate ventilation at the installation place, such as fans or air slits.

➲ Make sure that any existing disconnectors (power switch) remain easily accessible during installation.

The measurement transmitter can also be installed in field enclosures or similar. NivuFlow 650 is not suitable to be installed directly on site without protective measures due to protection degree. To do so, use the optionally available field enclosure by NIVUS.

The following precautions should be taken to ensure safe installation at the installation site:

➲ Protect the transmitter from direct sunlight. Install a sun shade if required.

➲ Avoid mounting the transmitter close to objects with strong electromagnetic fields (frequency converters, high voltage powerlines or similar).

➲ Observe the permissible ambient temperature (see Sect. “16 Specifications”).

➲ Do not expose the transmitter to strong vibrations or mechanical shock.

At the mounting place always avoid:

- Corrosive chemicals or gases
- Radioactive radiation

20.4 Transmitter fastening on DIN rail in control cabinets

Assemble required materials beforehand

*Mounting materials and tools are **not** part of the standard delivery.*

➲ For fastening use a DIN rail type TS35 according to EN 50022 with a minimum length of 140 mm.

1. Fasten the rail horizontally in the intended enclosure/control cabinet by using at least two screws.
2. Hook the transmitter into the DIN rail from below. The unit will snap in as soon as you exert slight pressure in the direction of the DIN rail.

Now you can begin to install the electrical components and to connect the sensors.

20.5 Field enclosure fastening and preparing electric installation

Assemble required materials beforehand

*The fastening material is **not** part of the standard delivery but should be specified and chosen individually depending on the place of installation.*

The NIVUS field enclosure can be installed permanently once the appropriate place of installation has been chosen. A basic condition is safe, durable and stable installation.

Required materials and auxiliary tools

- 6x screws M5, M6 or other screws sufficient for 6.5 mm diameter for proper fastening on surfaces (type and lengths of screws depending on material and quality of the surface)
- 6x dowels may be required (depending on material and quality of the surface as well as the screws used)

Preliminaries

➲ Procedure:

1. Select fastening screws (type and length of screw) and accessories considering:
   - conditions and load capacity of the mounting surface (wood, metal, concrete, brickwork or similar)
   - required dowels or other auxiliary material

   Tip:
   When determining the length of the screws necessarily include the material thickness of approx. 17 mm of the mounting brackets.
2. If required drill dowel holes and insert the dowels.

Fastening the field enclosure

➲ Procedure:

1. Fasten the field enclosure (Fig. 20-1 no. 3) on both lateral brackets by using the six previously selected screws through the fastening holes (6.5 mm diameter, Fig. 20-1 no. 6).

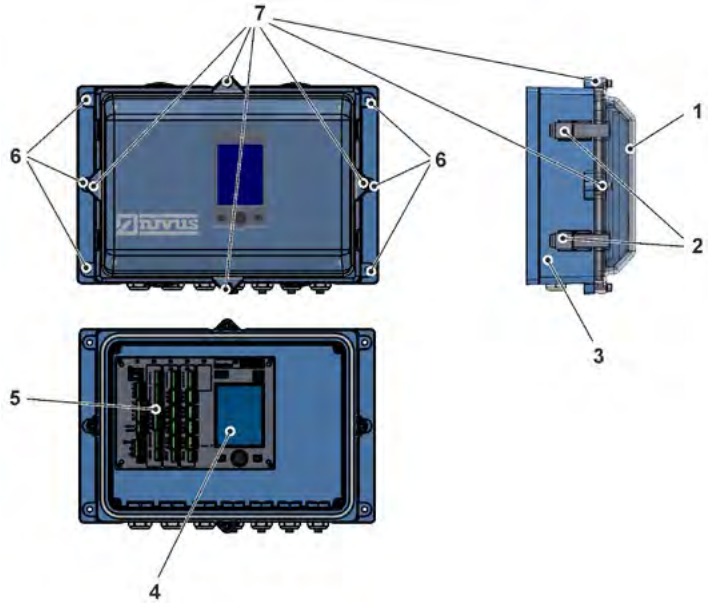


Fig. 20-1 Fastening the field enclosure

2. Remove the transport protection film from the clear view cover (Fig. 20-1 no. 1) if available.

   Tip:
   The protective film will harden upon exposure to UV radiation and possibly cannot be removed later without leaving some residue. Readability may be strongly impaired due to the changes to the protective film.
   New clear view covers can be purchased from NIVUS for an extra charge and can be easily replaced by the user.

3. Install the weatherproof cover if available.

Preparing the field enclosure for electric installation

➲ Procedure:

1. To remove the clear view cover (Fig. 20-1 no. 1) from

   - enclosure type *ZUB0 NFW0* (protection IP67):
   Open the four lateral release clamps (Fig. 20-1 no. 2) and remove the enclosure cover.

   - enclosure type *ZUB0 NFW0 IP68* / *ZUB0 NFW10 4PFAD* (protection IP68):
   Remove the four cylinder head screws M4x25 (Fig. 20-1 no. 7) and the washers, open the four lateral release clamps (Fig. 20-1 no. 2) and remove the enclosure cover.

2. To remove the blue inside cover loosen the four round head screws 3.5x25 in the corners and remove the cover. Now the transmitter including the display (Fig. 20-1 no. 4) and the terminal clamps (Fig. 20-1 no. 5) are fully accessible.

3. The unit is reassembled in reverse order after being wired. Check as well that
   - the gaskets are undamaged and free of dirt,
   - the screws are firmly tightened.
   Otherwise the IP67/IP68 protection degree **cannot be guaranteed**.

21 Electrical Installation

DANGER

Danger from electrical current

Disconnect the unit from mains power.

Working on electric wiring may cause electric shock. Observe electric information provided on the nameplate.

Non-observance may result in personal injuries.

Note

Observe the national installation regulations.

➲ Be sure to take the following precautions:

1. Installation work should be carried out by qualified personnel only.
2. For electrical installation the local regulations in the respective countries (in Germany e.g. VDE 0100) shall be referred to.
3. Further statutory standards (local), regulations and technical rulings have to be taken into account.
4. For installation in wet environments or in areas subject to flooding risk, extra protection such as by using a residual-current-operated protective device (RCD) is necessary if required.
5. Regarding Ex protection check whether the instrument's power supply needs to be integrated into the facility's emergency shut-down concept.
6. Before feeding the rated voltage, transmitter and sensor installation must be correctly completed. Check that the installation is correct.

How to connect the sensors can be found starting at page 46, connecting the power supply is described on page 42.

21.1 Wiring to the Terminal Blocks

All NivuFlow transmitters are equipped with push-in tension clamp terminals. The use of these push-in tension clamp terminals enables an easy pre-installation of the transmitter. This allows verifying individual sensors, input and output signals etc. as well as easy transmitter replacement if required.

The tension clamp terminal blocks are suitable for connecting single-wire and multiple wire copper cables. These cables are vibration-proof.

➲ To open the contacts on the tension clamp terminal blocks, use gentle pressure with a slot screwdriver on the front-side orange elements.

To connect the power supply, push-in and screw-type tension clamp terminal blocks are used.

To connect the power supply, use a slot screwdriver with a blade width of 3.0...3.5 mm.

Important note

Unplug and connect the tension clamp terminal blocks only in de-energised condition disconnected from mains power.

DANGER

Danger from electrical current

Multiple wire cables (strands) of the AC power supply circuit as well as of relay connections shall be equipped with ferrules featuring an isolated protective collar (plastic ferrule) to avoid danger due to several protruding wires.

Non-observance may result in personal injuries.

Tension clamp terminal block	Power supply	Bus/ Network	Terminals O/I etc.
Wire cross-section, rigid cables in [mm²]	0.2...2.5	0.2...0.5	0.14...1.5
Wire cross-section, flexible cable in [mm²]	DC only: 0.2...2.5	0.2...0.5	0.14...1.5
Wire cross-section (flexible) with ferrule blank in [mm²]	DC only: 0.25...2.5	0.25...0.5	0.25...1.5
Wire cross-section (flexible) with ferrule with plastic sleeve in [mm²]	0.25...2.5	Undefined	0.25...0.5

Table 21-1 Wire cross-section

The measurement transmitter NivuFlow 650 is available in different **Types**:

- Type T2
- Type TR
- Type T4
- Type TM
- Type TZ

⇨ See also Sect. “17.1 Device Types”

All types have identical terminal designations. These blocks are functionally assigned to the different connection areas. Types T4, TM and TZ have additional terminal blocks.

21.2 Plans of terminal connections

DANGER ***Risk of electric shock***

Do not remove the tension clamp terminal block from terminal block X1 (terminals 15...17).

This tension clamp terminal block is to connect the protective conductor as well as the AC power supply and is an integral part of the instrument. Operate the instrument with the tension clamp terminal block screwed on only.

Non-observance may result in personal injuries.

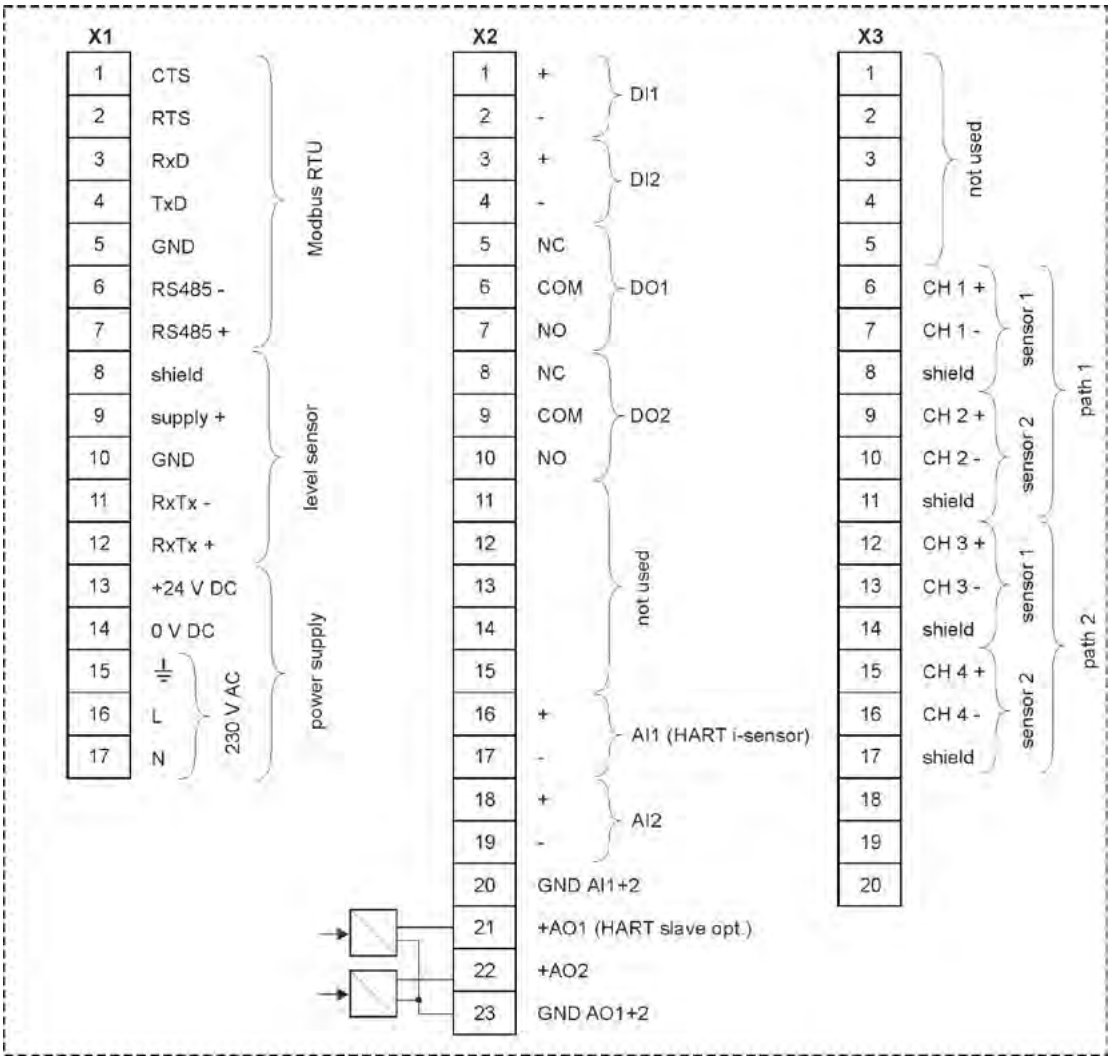


Fig. 21-2 Terminal connections NivuFlow 650 Type T2

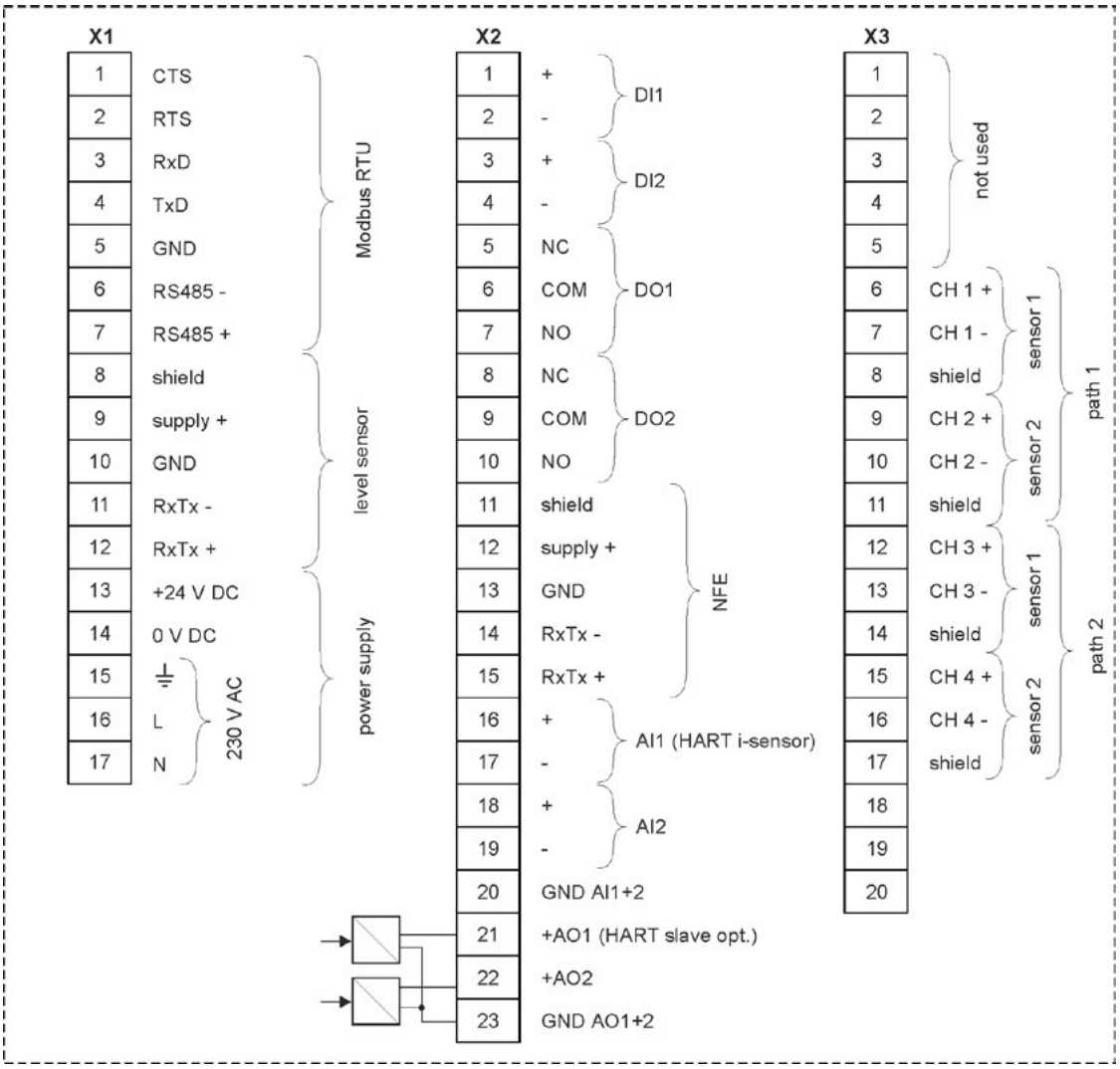


Fig. 21-3 Terminal connections NivuFlow 650 Type TM

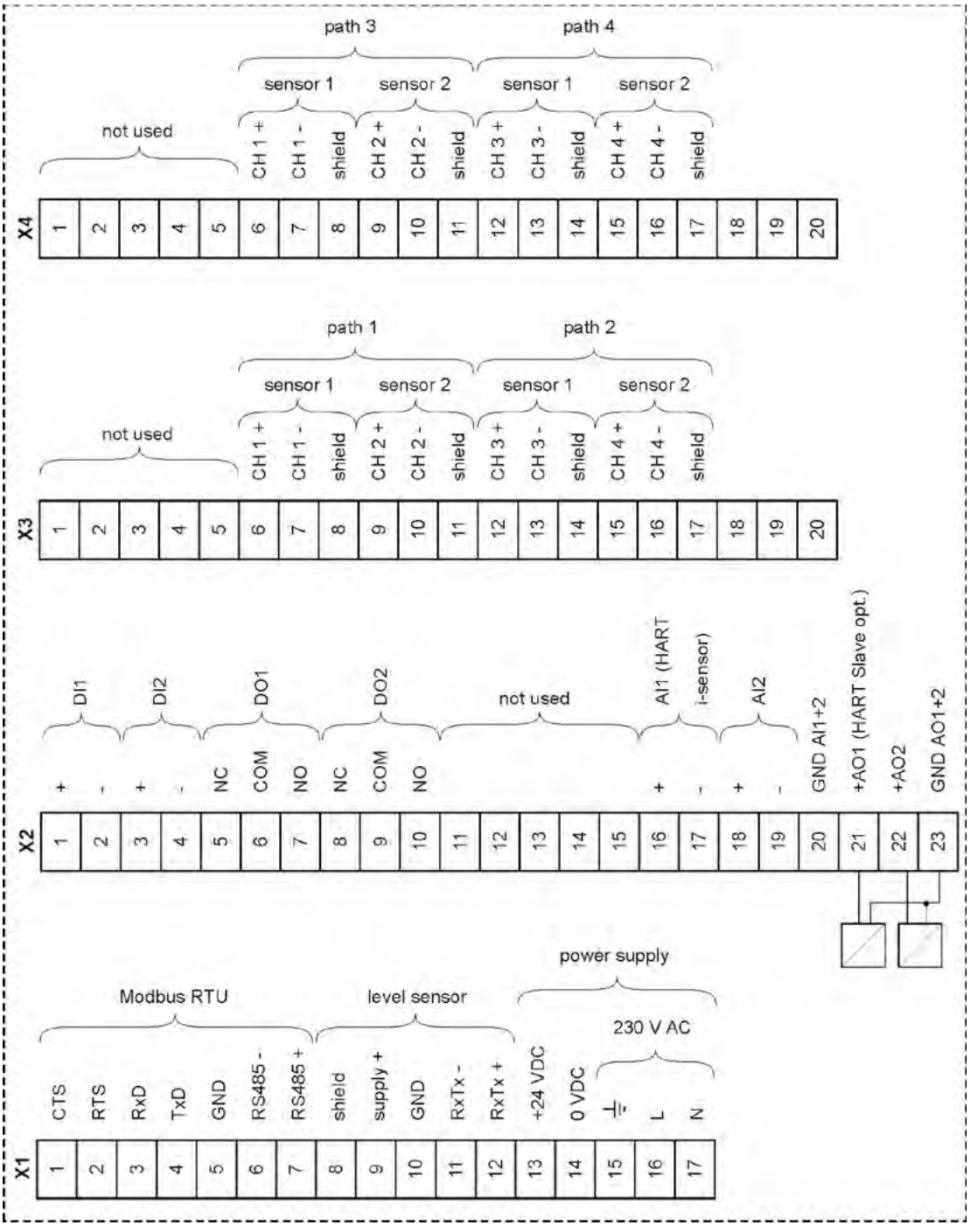


Fig. 21-4 Terminal connections NivuFlow 650 Type T4

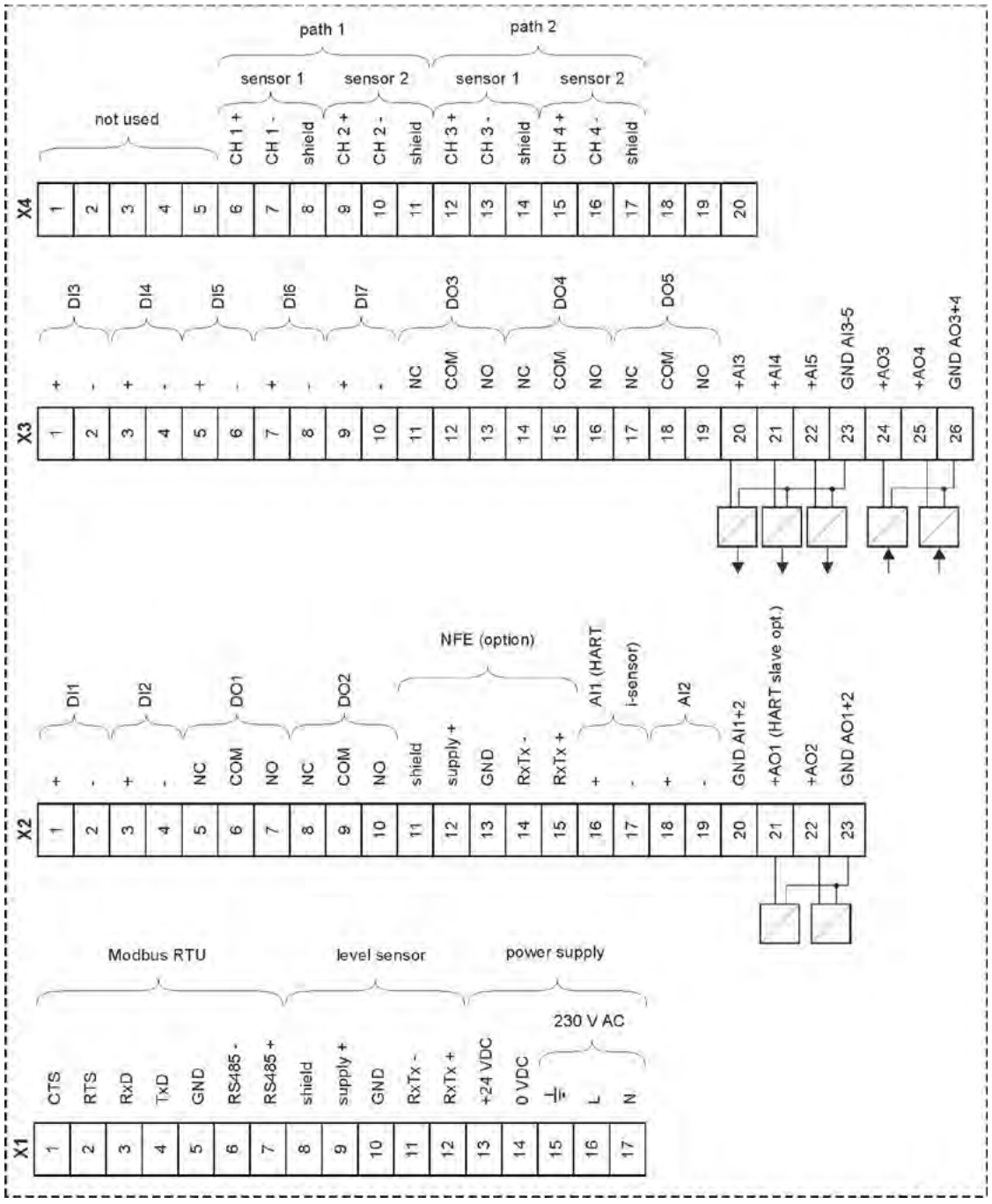


Fig. 21-5 Terminal connections NivuFlow 650 Type TR

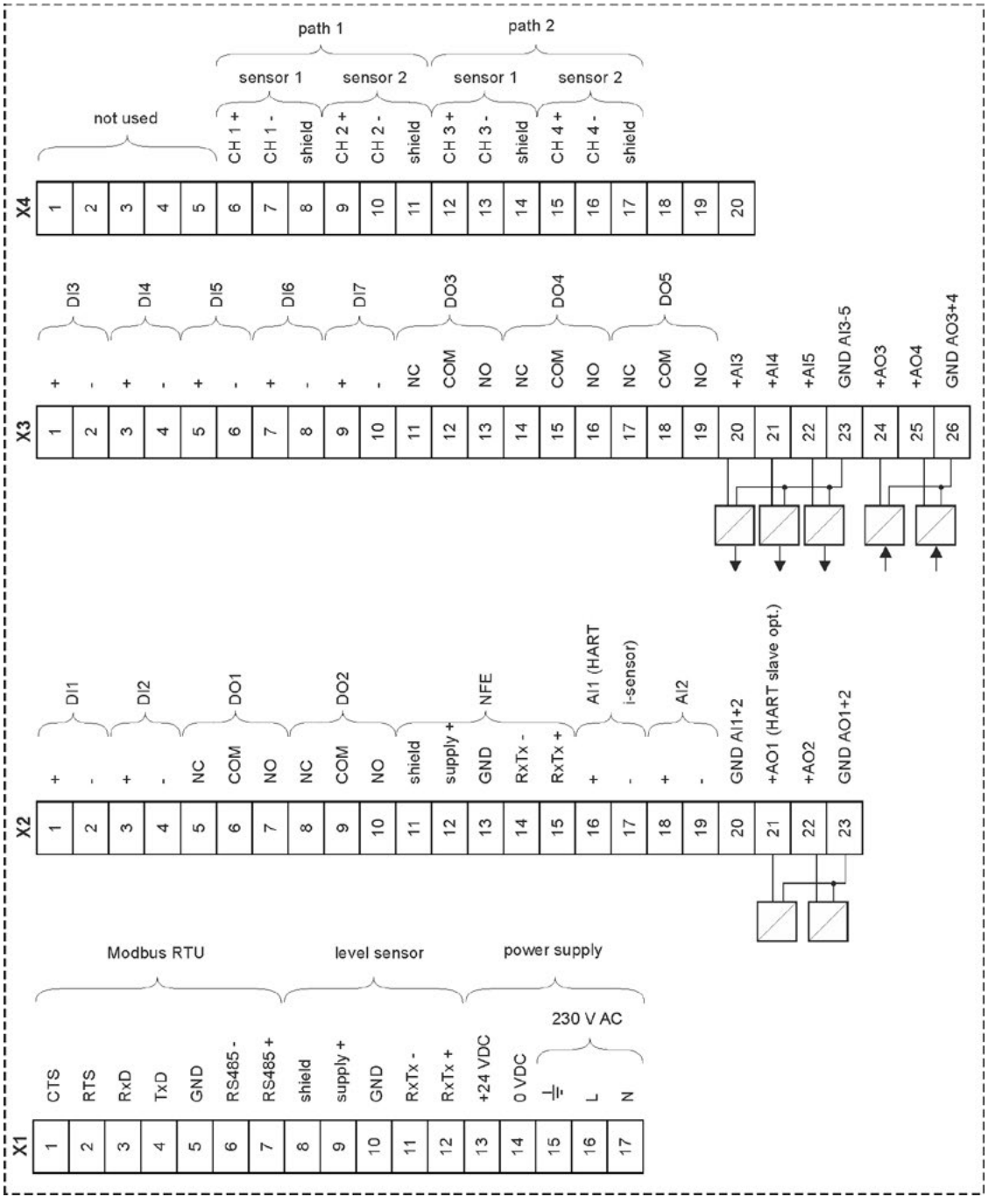
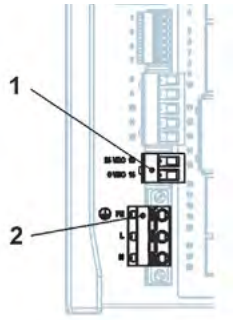


Fig. 21-6 Terminal connections NivuFlow 650 Type TZ

21.3 Switching on voltage supply

Depending on the type of NivuFlow used the unit can be powered with 100...240 V AC (-15 / +10 %) or with 10...35 V DC.



1 24 V DC connection
2 230 V AC connection

Fig. 21-7 Electrical connections of power supply NivuFlow

DANGER ***Risk of electric shock***

Do not remove the tension clamp terminal block from terminal block X1 (terminals 15...17).

This tension clamp terminal block is to connect the protective conductor as well as the AC power supply and is an integral part of the instrument. Operate the instrument with the tension clamp terminal block screwed on only.

Non-observance may result in personal injuries.

Operation with alternating current - direct current

*A transmitter with 24 V **DC cannot** be operated with **alternating current** (AC). Further, it is **not** possible to operate a 230 V **AC** transmitter with 24 V **direct current** (DC).*

21.3.1 Power supply DC

The DC version can be directly operated from the 24 V direct current network of a control cabinet.

Requirements

- Input voltage available at the input clamps:
  - At maximum load (20 W) minimum 10 V
- Clamp voltage:
  - At no-load operation maximum 35 V

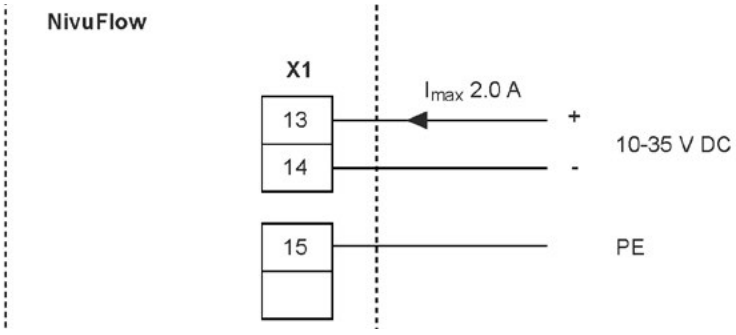


Fig. 21-8 DC connections of power supply

21.3.2 Power supply AC

DANGER ***Danger from electrical current***

Do not operate the unit if the terminal clamp blocks above the screw flange are not tightly screwed.

The terminal block X1 (terminals 15...17) for connecting the earth conductor and AC power supply is an integral part of the device. It is a non-plug connection.

Non-observance may result in personal injuries.

DANGER ***Danger from electrical current***

The power supply must be separately protected by a 6 A slow-blow fuse and has to be isolated from other facility parts by a separate turn-off, e.g. by using an automatic cut-out with >B< characteristics). This separator should be visibly marked.

Non-observance may result in personal injuries.

The AC version of NivuFlow can be directly operated from the low-voltage network.

⇨ The AC power supply requirements are described in Sect. “16 Specifications”.

Requirements

- Cross-sectional dimension of the power supply wires:
  - Minimum 0.75 mm²
  - According to IEC 227 or IEC 245

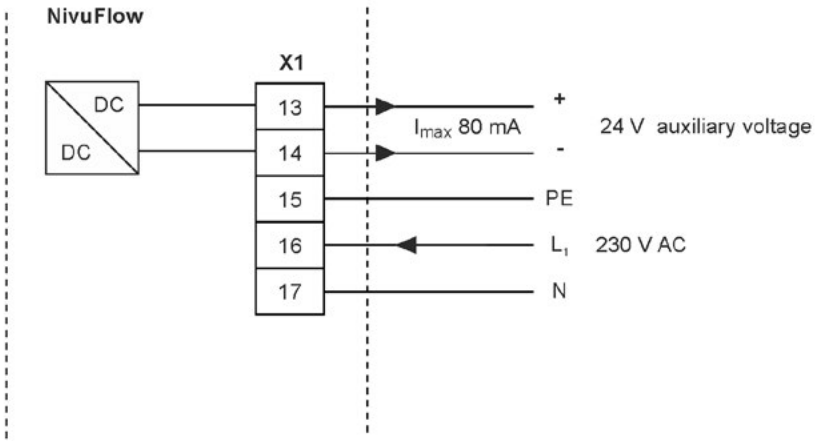


Fig. 21-9 AC power supply wiring

21.4 Relays

Contact reliability deteriorates if the minimum make/break current is lower than specified.

⇨ Observe the wiring and switching specifications of the relays in Sect. “16 Specifications”.

DANGER ***Danger from electrical current – Measures to prevent accidental contacts***

Contact protection according to the requirements as specified in EN 61010-1:2010 is not guaranteed in the event of relay voltages >150 V due to the testing pin terminal of the relay clamp blocks.

Take all necessary precautions against electrical shock according to the laws and regulations! For example: Open the cabinet/field enclosure only by the use of a tool or key, or use a fault-current circuit breaker or similar.

Non-observance may result in personal injuries.

DANGER ***Danger from electrical current – Protect Relay Contacts***

The relay contacts of the instrument shall be protected using 6 A slow-blow fuses if voltages in the low voltage range (such as AC supply voltages) are to be switched via the instrument’s relay contacts. Moreover these contacts shall be designed so as to be switched off independent of other circuit parts.

DC units shall be equipped with an appropriate protective earth conductor in order to avoid dangerous voltages or currents.

Non-observance may result in personal injuries.

22 Installation and Connection of Sensors

You can find detailed installation instructions for the individual sensor types in the according Installation Instructions Manual.

Note

Always ensure compliance with the safety regulations during installation works.

22.1 Sensor Installation Principles

The placing of sensors is vital for the reliability and accuracy of measurements. Therefore ensure proper hydraulic conditions and appropriate calming sections at the installation site. Sensor types as well as the respective fastening methods shall be determined individually depending on the place of measurement.

Conditions on how to select calming sections and the installation of sensors are described in the “Installation Instructions Transit Time Sensors”.

Operational parameters need to be assigned to the point of measurement before or during installation. Please refer to the documentation for the respective system for details on how to prepare the point of measurement and its dimensions.

⇨ The parameterization of the measurement points is described in the Sect. “Setting Parameters” starting on page 74.

22.2 Installation of Clamp-On Sensors

Clamp-on sensors allow for contactless measurement in closed and full pipelines. Here the sensors are clamped from the outside onto pipes. The instrumentation will not impact the liquid and will not change the medium's flow profile.

A detailed description of the sensors and their installation can be found in the "Technical Instructions Transit Time Sensors" and/or "Installation Instruction Transit Time Sensors" .

22.3 Installation of Wet Sensors

Engage pipeline experts

Wet sensors shall be installed only by a pipeline company or a plumber. The tightness of pipes must be guaranteed at all times.

The wetted sensors are installed through the pipe walls (pipe sensors) or inside the pipe (wedge sensors). They are in contact with the medium during the measurement in closed and fully filled pipes.

A detailed description of the sensors and their installation can be found in the "Technical Instructions Transit Time Sensors" and/or "Installation Instruction Transit Time Sensors".

22.4 Path arrangements

In the arrangement of the measurement paths, a basic distinction is made between "Diametral" and "Chordal".

A "diametral" arrangement of the measurement paths always goes through the centre of the pipe. A "chordal" arrangement crosses the pipe at any point and is preferably used if the measurement paths are to be installed on several (parallel) planes in the pipe.

Here are some examples of "diametral" path arrangements:

- "Diametral \" mode
- "Diametral V" mode
- "Diametral W" mode

All arrangements are not always available depending on the presetting and pipe diameter.

The mounting distance between both sensors is the "clear distance".

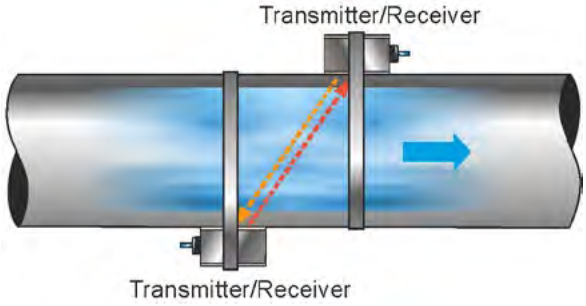


Fig. 22-1 Example "Diametral \" mode

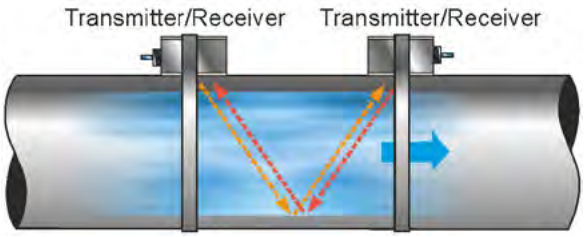


Fig. 22-2 Example “Diametral V” mode

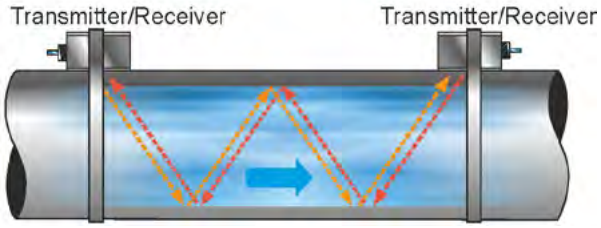


Fig. 22-3 Example “Diametral W” mode

22.5 Cable and Cable length for connecting the sensors

Between sensor and transmitter

The cables connected to the sensors at the factory must be used for the total distance between the NIVUS sensors and the NivuFlow transmitter.

The signal cable is not intended for laying directly in the ground. If the signal cable is to be laid in soil, concrete, etc., it must be laid in protective pipes or protective hoses with a sufficiently dimensioned inner diameter.

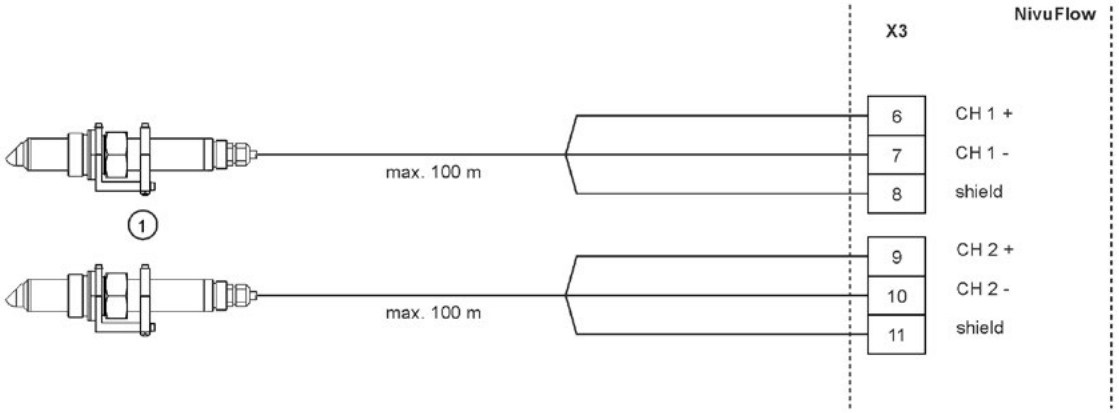
The sensors for **a measurement path** basically have the same cable length. It is not permissible to extend or shorten the sensor cable.

22.6 Sensor Connection to NivuFlow

⇨ Connectable sensors see Sect. “15.2 Connectable sensors”.

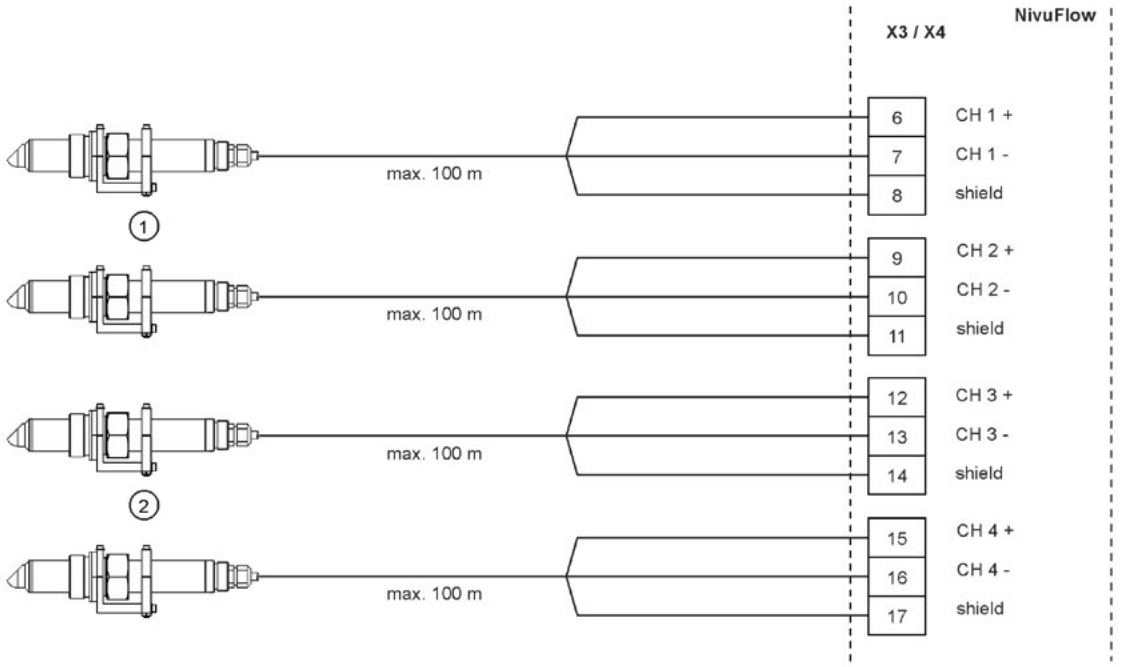
The connected sensors are used to determine the flow velocity.

22.6.1 Sensor connection 1-path measurement / 2-path measurement



1 Connectable flow velocity sensors

Fig. 22-4 Connecting 1 pair of flow velocity sensors



1 Connectable flow velocity sensors path 1
2 Connectable flow velocity sensors path 2

Fig. 22-5 Connecting 2 pairs of flow velocity sensors

22.7 Connection to/via Extension module NFE

Connecting the transmitter and the sensors to an extension module or connecting the extension modules to each other is explained in the "Technical Instructions for Extension module NFE".

The technical description is shipped with the expansion module and is available for download at www.nivus.com.

23 Controller operation (function additionally bookable as licence)

23.1 General

Special knowledge required

To set the controller function correctly and safely it is essential to have general basic knowledge about control technology as well as about parameters and setting procedures used in the control technology.

To implement volume regulation it is necessary to have a NivuFlow 650 Type TR or TZ transmitter available. Other types are not suitable since they do not have enough inputs and outputs to drive control slide valves or are not equipped with the corresponding software for controller functions.

If the Types T2, T4 and TM are still to be used for volume regulation it is necessary to use an appropriate external controller which then needs to be programmed according to manufacturer specifications.

Only 1 control possible for multiple measurement places

*The NF650 Type T4 or TM can be used to set up **only one** regulation.*

*This regulation is **permanently assigned to measurement place 1** and cannot be assigned to the (optionally available) measurement place 2.*

Interconnection of inputs/outputs and control slide valve drive

- 2x DO to drive the control slide valve
  - >OPEN<
  - >CLOSE<
- 3x DI for slide valve monitoring
  - >Slide OPEN<
  - >Slide CLOSED<
  - >Torque CLOSED<

It is possible to additionally use an external setpoint instead of the internal setpoint which needs to be programmed as fixed setting. This external setpoint is connected to analog input 5 as 4...20 mA input signal and hence enables e.g. remote control of discharge volumes or automated basin management using appropriate telecontrol devices with 4...20 mA output signal.

Moreover, it is possible to apply an external signal (e.g. using a key switch) to a digital input to switch the transmitter's regulator functions to OFF mode (MANUAL operation) for maintenance and repair works.

Use a knife gate valve or a pipe slide valve electric control actuator and 3-step control as control element.

Slides with analog control signals cannot be driven.

NIVUS recommend the following **actuating times** (runtime between fully opened and completely closed slide valve) for the slide valve selection:

- ≤ DN300: min. 60 seconds
- ≤ DN500: min. 120 seconds
- ≤ DN800: min. 240 seconds
- ≤ DN1000: min. 300 seconds

There may be other settings required depending on the application, however.

For slide valve drive and error monitoring the availability of the limit switches >OPEN< and >CLOSED< and the torque switch >CLOSED< is absolutely necessary. Apply these signals to the digital inputs of the transmitter.

Make sure to use gold-plated signal contacts for the input signals if possible which ensure reliable contact.

Insert a signal relay if standard contacts should be used. This signal relay shall be designed so as to guarantee the reliable transmission of the 5 mA input current to the digital input of the transmitter.

Analog position feedback of the slide valve to the transmitter is not supported.

The transmitter operates as 3-step controller with surge detection, quick-close function and slide valve monitoring.

Digital outputs 4 and 5 are predefined for actuator control:

- DO4: >Close slide valve<
- DO5: >Open slide valve<

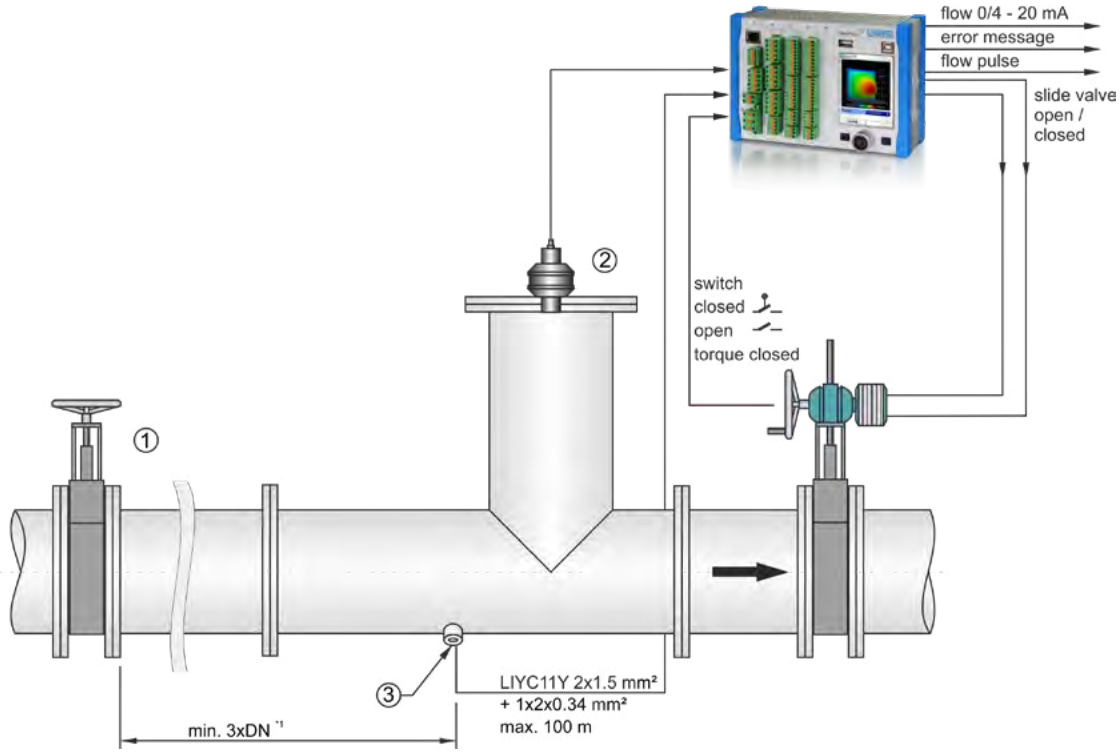
Analog input AI5 is predefined for input of an external setpoint.

Assignment of inputs/outputs to regulator defined

The assignment of inputs and outputs to the regulator is fixed and cannot be changed.

Guarantee reliable contacting of limit switches by choosing the suitable contact material of the limit switches on the control slide valve.

23.2 Control Section Setup



1 Manual slide valve

2 i-Sensor i-03/i-06

3 Installation position for flow velocity pipe sensor

*1 Distance between manual slide valve and sensor of 3x DN not for all applications possible; observe the usual distances for calming sections, if possible

Fig. 23-1 Setup of a control section, example discharge control

23.3 Regulator Mode Wiring Diagram

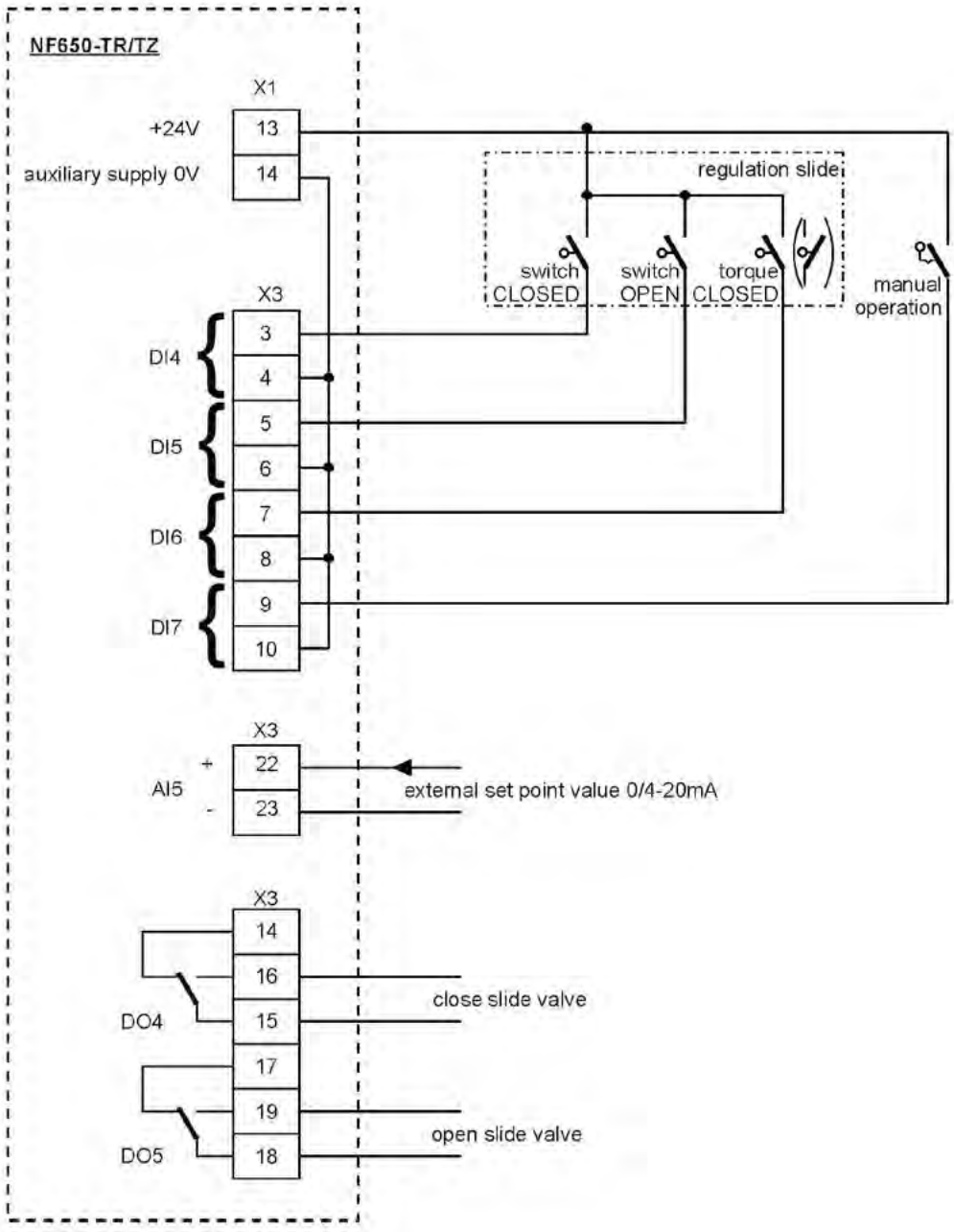


Fig. 23-2 Wiring diagram regulator mode NF650 Type TZ/TR

23.4 Control Algorithm

Activate all messages

For slide valve control via digital inputs always use all three messages.

Activating only one message may lead to disturbances during regulator operation.

In regulator mode relay 4 is activated for the >Close slide valve< function and relay 5 is used for >Open slide valve<. This assignment **cannot** be changed.

The digital inputs for position feedbacks are free programmable.

For correct and error-monitored slide valve control necessarily use the messages >Slide closed<, >Slide open< and >Torque closed< of the slide valve drive.

The regulator can be operated either with an external or an internal setpoint. **Always** connect an external setpoint to AI5.

Should a 4...20 mA signal be used as external setpoint it is possible to monitor the signal for cable breaks and short circuits. In case of an error the transmitter then will use an internal setpoint. This the reason why **always** the internal setpoint must be set additionally even when an external setpoint of 4...20 mA is used.

The following connection applies for the internal calculation of the **slide valve actuating time**:

$$\text{Actuating Time} = (\text{Setpoint} - \text{Flow Rate}_{\text{actual value}}) \cdot \text{P\_Factor} \cdot \frac{\text{max. Slide Valve Runtime}}{\text{max. Flow Rate}}$$

No detailed explanations here

Since comprehensive knowledge in control technology is required to correctly program the regulator, more detailed explanations are not needed here.

In case of doubt contact the NIVUS commissioning service.

24 Overvoltage Protection Measures

Transmitters and their terminal connections should, where the risk demands it, be protected against potential voltages surges (such as lightning strikes in transmission lines) by additional overvoltage protection measures.

Suitable measures need to be taken for the individual system parts (power supply, mA-inputs/ outputs, communication interfaces and sensor connections).

➲ If an overvoltage event has occurred, it is essential to check the functionality of the overvoltage protection components and replace them if necessary.

Adequate overvoltage protection measures required

Protective measures which are inadequately carried out or omitted in the specific installation and which result in damage to or destruction of the device or the sensors result in a limitation of the warranty (see Sect. “5 Warranty”).

Consequently, overvoltage risks and measures should be considered in the design of the instrument installations. Laying cables underground or intercepting mains faults outside the instrument installation are among the measures that can be taken on site. These measures reduce the probability of an overvoltage event.
The transmitter earthing connection is used to discharge high-frequency interference voltages from sensor shields (“functional earth”) and at the same time to be the touch protection (“protective earth”) in the case of low voltage.

If interference voltages are not properly discharged, noise levels can rise, resulting in corrupted or **faulty measurements**; **nearby electrical devices may be disturbed** by the transmitter in special cases, as well.

If necessary, install appropriate **RF interference suppression capacitors** (10…100 nF) to discharge interference from the transmitter enclosure (top hat rail (DIN) / mounting rail) or directly from the sensor shields. The currents and voltages occurring in the event of an overvoltage need to be taken into account as well in this context.

Depending on the instrumentation design, directly earthing the sensor shields can also be beneficial.

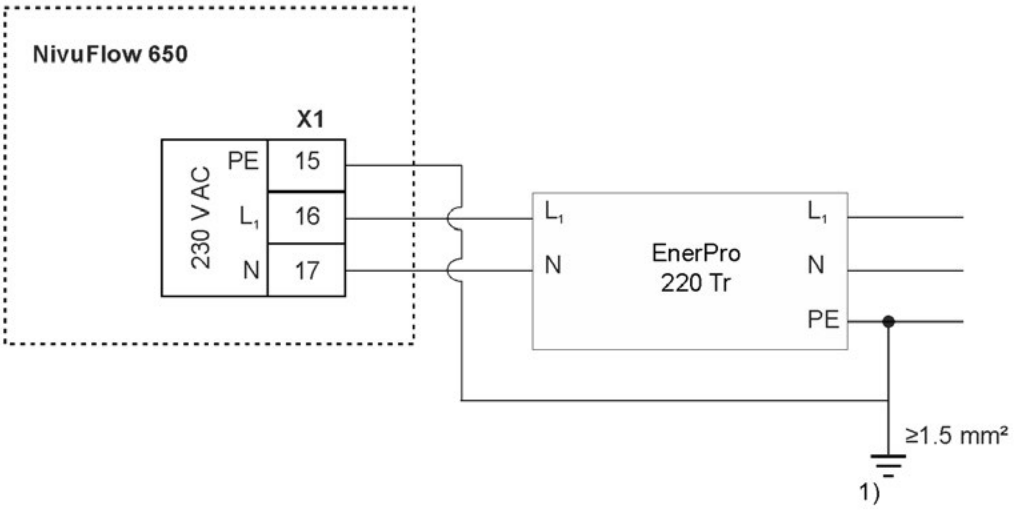
24.1 Overvoltage Protection for Power Supply

NIVUS recommends type EnerPro 220Tr surge arrestors (for a 100-240 V AC power system) and EnerPro 24Tr (for 24 V DC power supply) for the mains supply.

Observe the connection direction

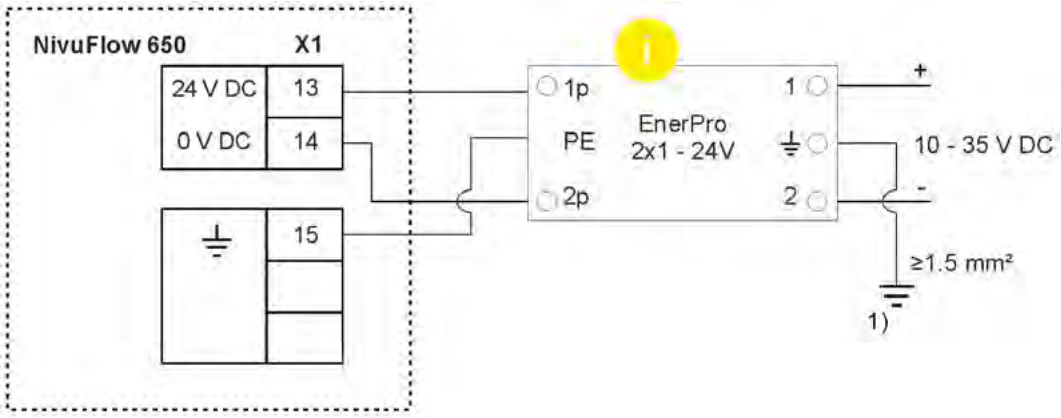
Observe the non-reversed connection (p-side to transmitter) as well as a correct, straight wiring supply. Ground (earth) must lead to the unprotected side.

The overvoltage protection devices are ineffective if wired incorrectly.



1) Low impulse earthing resistance required

Fig. 24-1 Overvoltage protection for power supply AC



1) Low impulse earthing resistance required

i Do not reverse protected (p) and unprotected sides of overvoltage protection

Fig. 24-2 Overvoltage protection for power supply DC

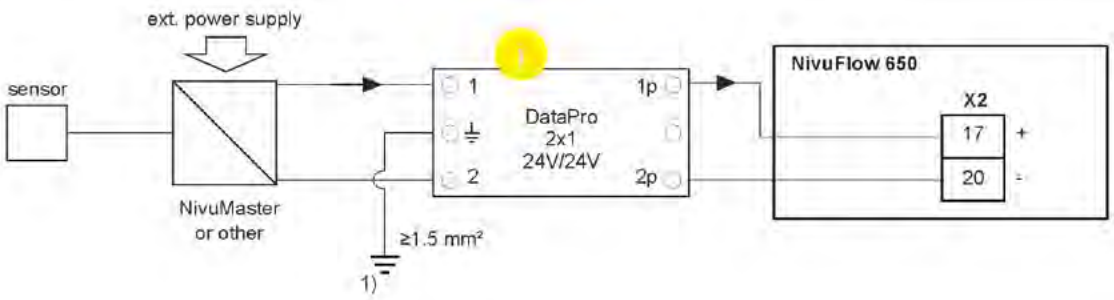
24.2 Overvoltage Protection for mA-Inputs/Outputs

NIVUS recommends type DataPro 2x1 24/24 Tr surge arrestors for mA-inputs and mA-outputs.

Observe the connection direction

Observe the non-reversed connection (p-side to transmitter) as well as a correct, straight wiring supply. Ground (earth) must lead to the unprotected side.

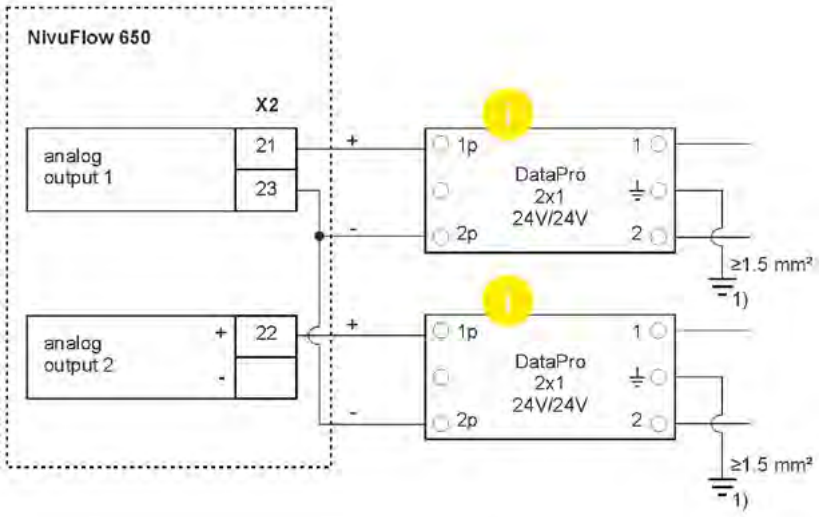
The overvoltage protection devices are ineffective if wired incorrectly.



1) Low impulse earthing resistance required

Do not reverse protected (p) and unprotected sides of overvoltage protection

Fig. 24-3 Overvoltage protection of input from external transmitter



1) Low impulse earthing resistance required

Do not reverse protected (p) and unprotected sides of overvoltage protection

Fig. 24-4 Overvoltage protection for analog outputs

24.3 Overvoltage protection for communication interfaces

The communication interfaces along with the connected system need to be protected and the surge protection should be designed according to the technical parameters of the system used.

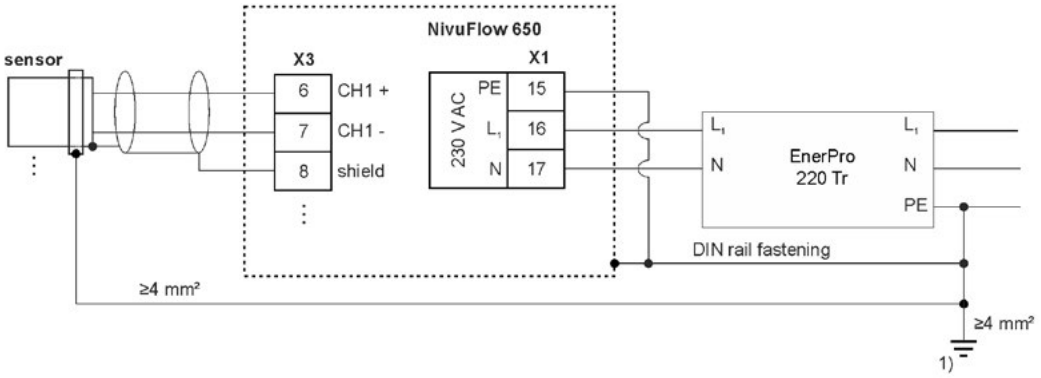
24.4 Overvoltage protection for (transit time) sensor connectors

24.4.1 Basic protection - equipotential bonding cable

NIVUS recommends that an equipotential bonding cable is used to connect the sensor enclosure to the control cabinet/transmitter ground as a basic protection measure for the transit time sensors' interfaces. The equipotential bonding cable prevents the flow of a transient equalizing current through the transmitter and the cable shields.

The equipotential bonding cable needs to be at least 4 mm² in diameter and it should run parallel to the sensor cables.

The following is an example of the use of an equipotential bonding cable.



1) Low impulse earthing resistance required

Fig. 24-5 Equipotential bonding cable betw. sensor encl. and control panel earth

24.4.2 Extended protection - overvoltage protection "SonicPro T"

"SonicPro T" surge protectors are required for the transit time sensors in non-standard applications.

Special cases are:

- **Potential differences** that cannot be avoided **can occur** between the sensor enclosure and the control panel/transmitter earthing. These potential differences may be transient.
  This can be caused by
  - The grounding resistance of the grounding electrode is too high.
    This typically means that the leakage current of the mains supply overvoltage protection device cannot be discharged to the required extent via the earth connection of the control cabinet installation, resulting in a potential difference.
  - Or the equipotential bonding cable to the transit time sensors may be undersized or too long; or it is incorrectly connected or missing.
  - Or a combination of these conditions.
- **Overvoltages may affect** the transit time sensor's enclosure **directly**. This effect can occur via the mounting device, the sensor cable or the medium (water-based liquids).

Install overvoltage protection on each sensor individually

*"SonicPro T" overvoltage protectors need to be **individually installed for each** connected **transit time sensor**.*

Use of "SonicPro T" surge protectors

The transmitter sensor signal terminals are electrically isolated from the sensor cables by the "SonicPro T" overvoltage protectors. The modules thus guard the transmitter from impulse voltages injected from the sensor; they can also limit a compensating current flowing to the

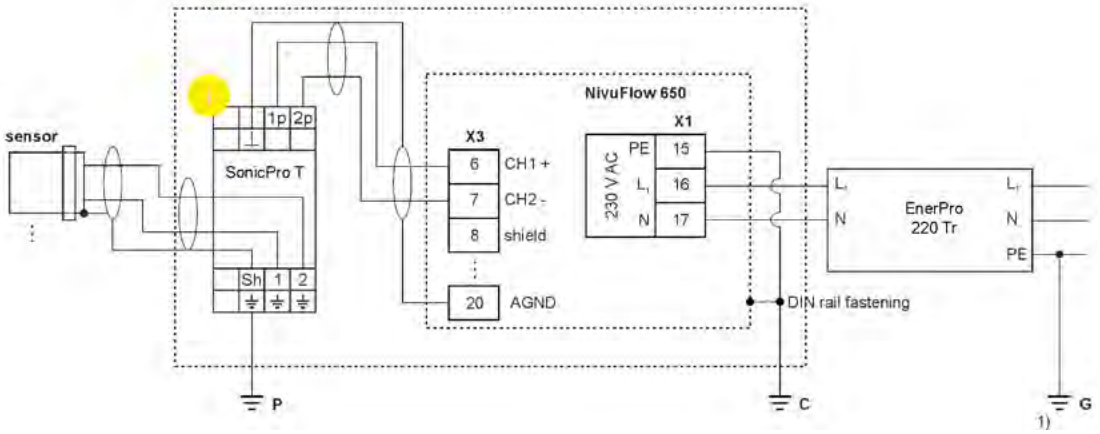
sensors to a low level in a supply-side overvoltage event.

Observe the connection direction

Observe the non-reversed connection (p-side to transmitter) as well as a correct, straight wiring supply. Ground (earth) must lead to the unprotected side.

The overvoltage protection devices are ineffective if wired incorrectly.

The following figure shows an example of an installation powered by the AC mains with overvoltage protectors “EnerPro” (to the mains) and “SonicPro T” (to the transit time sensors). The “EnerPro” overvoltage protector may also be installed inside the control cabinet, but the separate earth connector “G” must be retained. The combination with “P” or “C” is very risky in the event of overvoltage. NIVUS recommends that the earth connectors are separated to guard against overvoltages.



P Earth connection for the “SonicPro T” overvoltage protectors on the sensor side

C Ground connection for transmitter installation

G Ground connection for AC mains overvoltage protection

1) Low impulse earthing resistance required

i Do not reverse protected (p) and unprotected sides of overvoltage protection

Fig. 24-6 Typical installation with “SonicPro T” overvoltage protection

Three different earthing connections are shown in the drawing:

- P, C and G

It is important that all three earth terminals in the installation, in particular the earth terminal “G”, have a **low surge earth resistance**, as high surge leakage currents may flow.

If the impact earthing resistance of a bad earth electrode is 1 Ω, a leakage current of 5 kA will cause a peak voltage of 5000 V.

If this leakage current is routed to the control cabinet earthing via the DIN rail contact of an overvoltage element, for example, the potential of the transmitter earthing increases and a compensating current can flow through the sensor cables. There is a risk that the sensor lines, the cables or the transmitter could be destroyed.

A deep earthing system can be used, for example, to achieve low resistance earthing. If this cannot be realized at the installation site, the mutual interaction of different earth electrodes should be reduced by routing the leakage currents to different independent earth electrodes. Here, the leakage currents should be routed through conductors as widely separated as possible from one another.

If it can be assumed in applications that no overvoltages can be induced from the sensor side, there will be no leakage currents through the earth connection “P”. This can then be tied directly to the transmitter grounding “C”.

All other **input/output signals** and **input/output voltages** leaving the control cabinet must also be considered in relation to overvoltages. In most cases, there is no galvanic isolation and compensating currents can flow.

In applications particularly at risk of overvoltage, an additional **low-capacitance isolating transformer** can further reduce the sensitivity to overvoltage events. However, this measure is only useful if no overvoltages are injected into the control cabinet via the earth connection.

CAUTION

Protect connected extension modules by using "SonicPro T" overvoltage protection

Protect possibly used extension modules accordingly by using suitable overvoltage protection.

The procedure is described in the "Technical Description NFE Extension Module".

Disregarding may damage plants and facilities.

Modify SonicPro T overvoltage protection

Depending on the situation on site it may be necessary to modify the overvoltage protection one time during installation to adapt the unit to the conditions on site.

Parameter setting preparations

This modification is not possible before the measurement place parameters have been (partially) set (determination of the number of paths and ticking the checkbox for using a SonicPro T overvoltage protection).

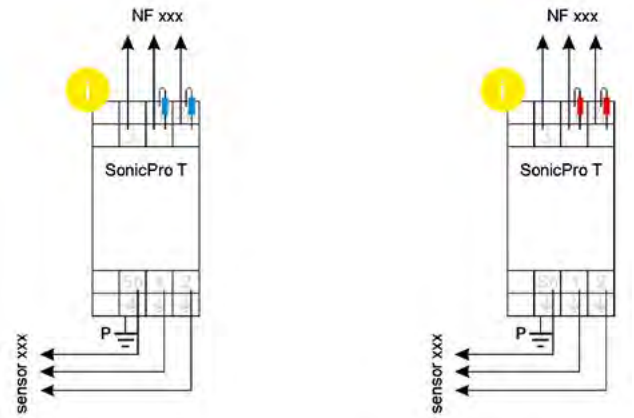
The measurement place parameters are set under >Application< / >Measure place<; see Sect. “32.1 Setting parameters in Measurement place Menu” and “32.2 Setting parameters in Measurement place Combi Menu”.

The transmitter defines in >Application< / >Diagnostics< / >v-Paths< (Fig. 24-7) whether two red (150 Ω) or two blue (50 Ω) resistors must be connected additionally.

Fig. 24-7 Menu Application / Diagnostics / v-Paths

➲ Procedure:

1. Check under >Application< / >Diagnostics< / >v-Paths< (Fig. 24-7) which extra resistors need to be connected to the SonicPro T overvoltage protection module: red or blue.
2. Insert one resistor in the predetermined colour between the bottom and top terminal each at 1p and 2p on the protected side as shown in Fig. 24-8.



Do not reverse protected (p) and unprotected sides of overvoltage protection

Fig. 24-8 Modified overvoltage protection

3. Proceed with the overvoltage protection as described in Sect. “24.4.2 Extended protection - overvoltage protection “SonicPro T”” where the top terminals are used for further connection to the transmitter.
   If no extra resistors should be required use the bottom terminals for connection to the transmitter.

Operation start-up

25 Notes to users

Before connecting and operating the NivuFlow the instructions below shall be followed.

This instruction manual contains all information required for the setting of parameters and for the use of the instrument. The manual is intended for qualified personnel. Appropriate knowledge in the areas of measurement systems, automation technology, control engineering, information technology and (waste) water hydraulics are preconditions for putting the NivuFlow into operation.

Read this instruction manual carefully in order to guarantee proper operation of the NivuFlow.

The NivuFlow shall be wired according to the wiring diagrams in Sect. “21.2 Plans of terminal connections”.

In case of doubt regarding installation, connection or the setting of parameters contact our hotline:

- +49 (0) 7262 9191-955

General principles

The system shall not be put into operation before the installation has been finished and checked.

Follow the hints in the instruction manual to eliminate the risk of faulty or incorrect setting of parameters. Before you begin to set parameters, get familiar with the transmitter operation using rotary pushbutton, function keys and display.

The connection of transmitters and sensors (according to Sect. “21.1 Wiring to the Terminal Blocks”, “22.6 Sensor Connection to NivuFlow” and “22.7 Connection to/via Extension module NFE”) followed by the setting of the measurement place parameters.

In most cases it is sufficient to set:

- Shapes and dimensions of the measurement place
- Sensors used and the according positions in the application
- Display units and language
- Span and function of analog and digital outputs

The user interface of the NivuFlow is easy to understand. Users can make all required **basic settings** themselves.

In the case of the following requirements let either one of the legally associated companies or subsidiaries of NIVUS group or an expert company authorised by NIVUS set the parameters:

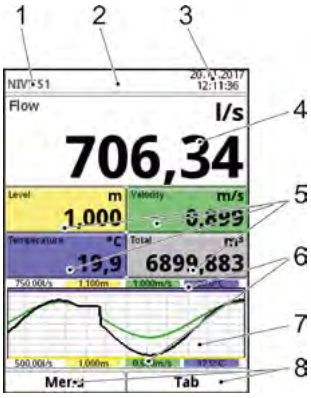
- Extensive programming tasks
- Difficult hydraulic conditions
- Special channel shapes
- Regulator settings
- If the service specification requires a protocol on settings and errors
- Not specially trained qualified personnel or little experience in measurement systems

26 Operation Basics

The complete operation of the NivuFlow is handled via control elements (see Sect. “2.2 NivuFlow Operating Elements”). Two control buttons and one rotary pushbutton are available for the setting of parameters and to input required data.

The display at any time provides information on where you currently are within the menu structure and which entries you are about to modify.

26.1 Display Overview



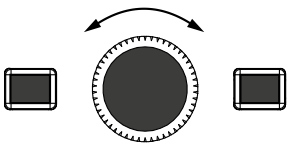
1 Name of measurement place
2 Error message sent, information or display for active service mode
3 Date/time
4 Display range 1 (Output field 1 for flow rate; default setting)
5 Display range 2 (Output field 2...5 for level, average flow velocity, medium temperature and total; default setting)
6 Automatic scaling for display range 3
7 Display range 3 (trend graph on level, velocity, medium temperature and amount)
8 Operating display for the assignment of the function keys

Fig. 26-1 Main menu

26.2 Using the Control elements

➲ Select the >Main menu< by pressing the left hand function key.

1. Turn the rotary pushbutton to scroll through the menu. A submenu or parameter can be selected, as soon as it is highlighted blue.
2. Press the head of the rotary pushbutton - you will get to the next parameter level or you can enter parameter settings.



3. Repeat this process until you have arrived at the desired menu or parameter.

Here you can enter names or numbers in parameters.

⇨ See Sect. “26.3 Use/Entry using the letter block” and “26.4 Use/Entry using the numeric keypad”.

Press the left hand function key to exit the menus step by step.

The transmitter in the background operates with the settings which have been entered at the beginning of the parameter setting.

The following request is prompted on the display not before the current parameter setting has been finished and confirmed.

Fig. 26-2 Confirmation after parameter setting

➲ Confirm the entry with >YES<.

The password query for the parameter settings appears:

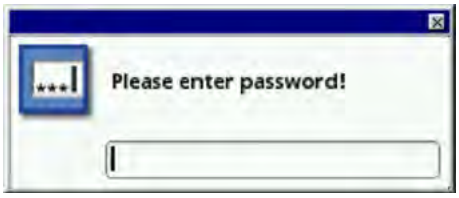


Fig. 26-3 Password query for parameter settings

➲ Enter the password (default setting “2718”).

After accepting the new parameters the NivuFlow continues to operate using these data.

26.3 Use/Entry using the letter block

Certain parameters can be labelled with names or designations. A virtual keypad is indicated in the bottom section of the display if such a parameter has been selected.

1 Selected character
2 Dual function character (highlighted blue)
3 Shift (upper/lower case)
4 Space
5 Back or delete button

Fig. 26-4 Keypad

Note

The use of the key pad is explained here once. Later in the manual you will be prompted to enter designations or names following this explanation.

A shift key can be found at the bottom left of the keypad (Fig. 26-4 no. 3).

- The functions of the shift key are:
  - Upper case
  - Lower case
  - Special characters
  - Digits
- These settings allow individual names (e.g. of the measurement place).
- To **activate** this shift key rotate the rotary pushbutton until the shift key is highlighted black.

➲ To **enter** designations such as the measurement place name proceed as follows:

1. Press the rotary pushbutton - on the lower half of the display a virtual keypad featuring individually selectable letters is indicated.
2. Turn the rotary pushbutton to navigate through the virtual keypad. Characters highlighted blue (Fig. 26-4 no. 2) feature dual functions. Holding the button depressed for approx. 1 sec. switches over to alternative function.
3. Press the rotary pushbutton until the desired character is highlighted black. By pressing the character is applied to the text box automatically.
4. Repeat this process until the complete text (e.g. name of the measurement place) is on the display.

26.4 Use/Entry using the numeric keypad

In certain parameters it is possible to enter dimensions or other numeric values. A number field (analogous to letter block) is indicated in the bottom section of the display if such a parameter has been selected.

Note

The use of the numeric key pad is explained here once. Later in the manual you will be prompted to enter dimensions or numerical values following this explanation.

➲ Press the rotary pushbutton - a numeric field will appear:

1. Enter the values digit by digit. Proceed the same way as described before in the keypad section.
   When entering the dimensions observe the correct decimal places. The channel profile dimension e.g. is set to METER per default.

If **multiple dimensions shall be entered** consecutively (e.g. for rectangular profiles), you can get to the next dimension by rotating the rotary pushbutton after your former entry has been confirmed. For the next entry proceed right as described before.

26.5 Revision of parameters

➲ Incorrect entry can be deleted letter by letter or digit by digit by pressing the back button:

1. Open the keypad.
2. Turn the rotary pushbutton until you get to the >back arrow< (back button).
3. Press the rotary pushbutton - this will erase the wrong letter or number.

➲ Write subsequently until the complete name or dimension appears in the display and confirm the entry with the right hand function key.
The name of measurement or the numerical value is taken to the main menu and is displayed there.

26.6 Menus

All menus are described in a logical programming order in Sect. “Setting Parameters”.

There are up to eight basic menus available (depending on the transmitter type).
The basic menus can be viewed and selected by pressing the right hand function key.

The menus are:

Application (MP1/ MP2/Combi)	It guides the commissioning personnel through the entire setting of parameters for the dimensions of measurement places, selection of sensors and analog and digital inputs and outputs, controller functions and diagnoses.
Data	• Visually indicate charts on flow rate, level and (average) flow velocity • Visually indicate tables on 24-hour day totals • Save data • Save and load parameters • Format USB stick • Modify storage cycles and totals
System	• Recall basic information on the transmitter and the connected sensors such as serial no., version, article no. and many more (needed in the event of queries from NIVUS) • Settings such as language, time and data format and units can be modified in the >country settings< • System time and time zones can be found in the >Time/Date< submenu • Error messages are available in the according submenu • Service level
Communication	This menu contains parameters for all communication interfaces available on the NivuFlow.
Display	• Basic parameters such as contrast, backlight and display dimming can be adjusted here • Format of the output fields (text, decimal places etc.) can be set
Connections	The terminal strips for the inputs and outputs are assigned to the measurement points here for transmitters with multiple measurement points. Transmitters for only one measurement point do not have this menu at all.

27 Information for the measurement with wet sensors

Prior to the installation of clamp-on sensors the measuring section shall be prepared.

Observe the instructions on how to prepare the measurement section in the “Installation Instruction Transit Time Sensors”.

The wetted sensors are installed during the parameterization of the measurement point.

Engage pipeline experts

Wet sensors shall be installed only by a pipeline company or a plumber. The tightness of pipes and the compressive strength of the installation must be guaranteed at any time.

For the measurement place basically the parameters below must be set:

- Path arrangement and number of paths
- Specification whether SonicPro T overvoltage protection is used
- Medium to measure / medium temperature
- Channel profile / profile dimensions

Moreover, the parameters >Channel profile Offset<, >Sludge level<, >Velocity evaluation<, >v-determination low levels<, >Low-flow suppression<, >Damping< and >Stability< can be selected and set. A 3D overview provides a visual verification of the profile set.

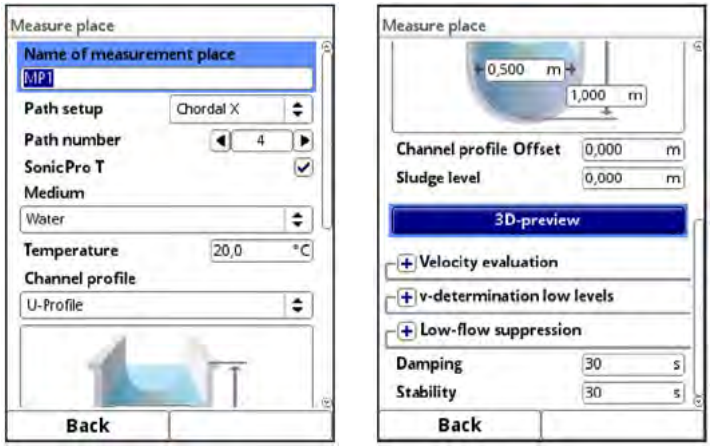


Fig. 27-1 Setting the measurement place parameters

Setting the level and flow velocity sensor's parameters completes the measurement place settings. Since the final positions of the flow velocity sensors are adjusted while the parameters are set the installation values each can be modified under >v-Paths<. With each modification the transmitter computes the corresponding installation values to provide the best possible support for the adjustment.

Use in the drinking water sector

Some pipe sensors can also be used for drinking water applications and have a drinking water approval (see "Technical Instruction Transit Time Sensors").

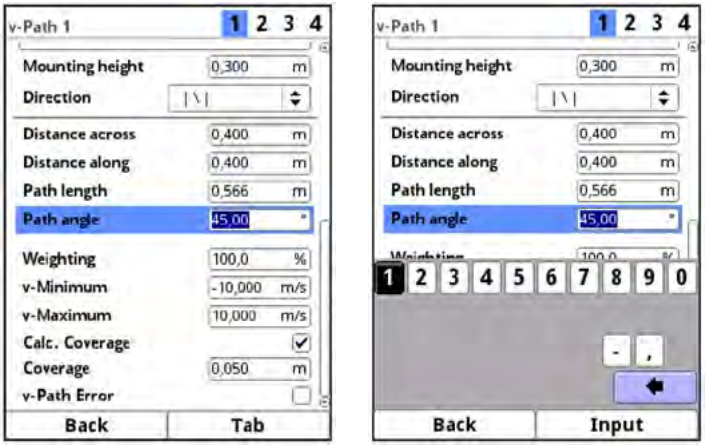


Fig. 27-2 Modifying all values

Start-up Examples

Take valid regulations and DIN ISO 748 standard as a basis

When selecting measurement places in open channels or water bodies necessarily observe applicable regulations and the text of the DIN ISO 748 standard “Hydrometry - Measurement of liquid flow in open channels using current-meters or floats” (ISO 748:2007)”.

This section explains two parameter setting examples for usual NivuFlow 650 applications step by step.

➲ To set the measurement place parameters it is necessary to enter all relevant data of the measurement place. Familiarise with Sect. “30 General Programming” starting at page 74 previously.

⇨ The setting of the measurement place parameters is described in Sect. “32.1 Setting parameters in Measurement place Menu” starting at page 79.

28 Example 1: Measurement in open Channels

28.1 In General

The first measurement example is performed in an open rectangular channel.

NIVUS rod sensors are used here as transit time sensors.

⇨ More information on holders for sensor installation on vertical boundaries of water bodies or channel walls can be obtained from your local representative or directly from NIVUS GmbH.

In order to set measurement place parameters the basic settings below are required at least:

- Number of paths and path arrangement
- Measured medium
- Shape and dimensions of measurement place
- Sensors used and respective positions

Observe the preparatory measures and other information for the measurement section as provided in the “Installation Instruction Transit Time Sensors”.

28.2 Set Parameters of a system with multiple crossed paths

28.2.1 Simple parameter Setting

Application Specifications:

- Open rectangular channel, width 2 m
- Vertical channel walls made of concrete, height 2.6 m
- No sedimentation on channel bottom
- No dry weather flume
- Path arrangement “Chordal X”
- 2 paths

- Sensors:
  - Level: i-series sensor, type i-06
  - Flow: rod sensors, type NOS-V2; path height: 40 % of usual filling level
- Position and mounting height of level sensor (3.30 m) due to conditions on site
- Level monitoring, standard level 2 m

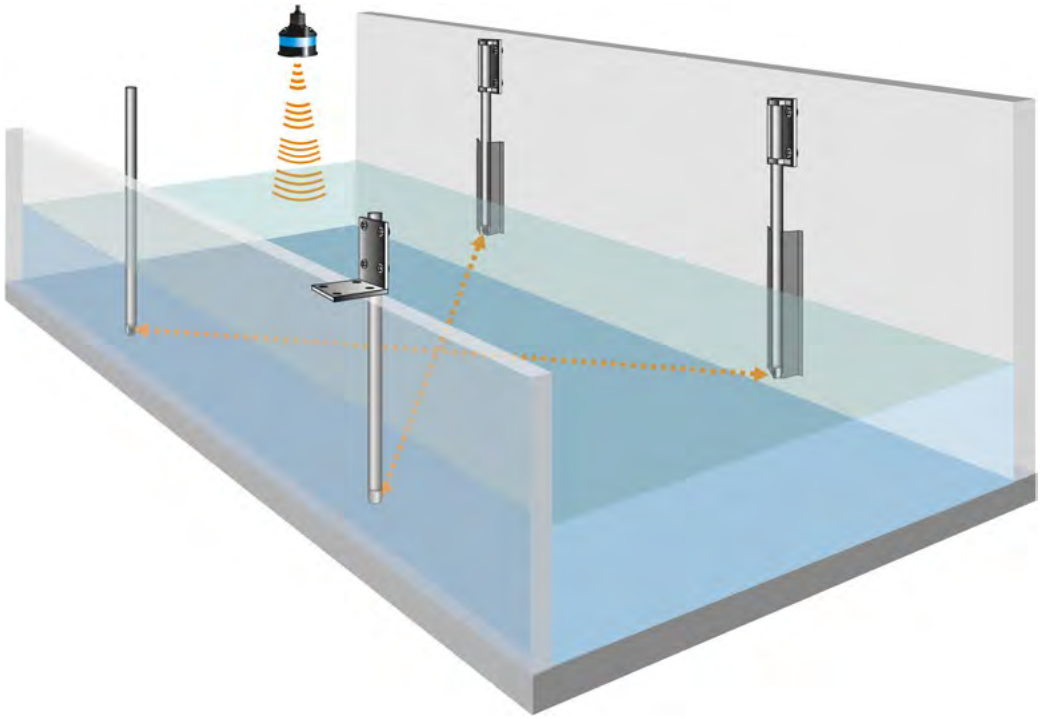


Fig. 28-1 Application example: rectangular channel with 2 measurement paths

➲ Procedure:

1. Select “Menu” (top left).
2. Open >Application< menu.
3. Open >Measure place< menu.
4. Specify measurement place name and confirm with “Enter”.
5. Specify path arrangement (“Chordal X”) and number of paths (2 paths).

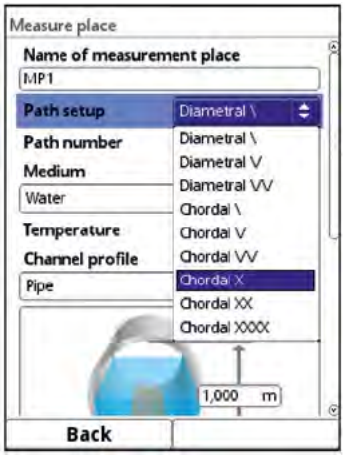


Fig. 28-2 Select path arrangement

Hints on the Medium

If you cannot find your medium to measure in the list select “User defined”.
Another menu opens up which can be used to specify e.g. the speed of sound within the medium.

Tip:

Various speeds of sound can be found on the Internet or contact NIVUS GmbH.

6. Use the selection menu to specify the medium to measure and to select/specify the current medium temperature.
7. Set the channel profile to “Rectangle”.
   The graphics section indicates a rectangle with two input fields.
8. Enter the rectangle data in the graphic area.

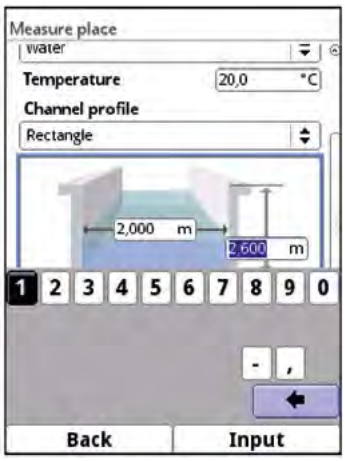


Fig. 28-3 Specifying rectangle dimensions

More specifications are not required - the following parameters (Channel profile Offset, Sludge level, Velocity evaluation etc.) remain in the default state.

Once a relevant parameter in menus >Measure place< or >v-Paths< has been changed it is necessary to re-initialise the path arrangements in order to recalculate path lengths and sensor positions.

➲ Exit >Measure place< menu **to adjust the measurement path settings**.

1. Use “Back” to return to the >Application< menu.
   The following query appears on the display:

Fig. 28-4 Accept modified measurement place parameters

2. Confirm modified parameters and path rearrangement. The display shows “Initialised!” after confirmation with >Yes<. The transmitter switches to the >Application< menu.

➲ Procedure for the **selection of level sensors** and the **specification of mounting values**:

1. Select menu >h-Sensors<.
2. Select the used sensor from >h-Sensor types< (i-Sensor) and specify more details in >Type< (Type i-06).
3. Enter the mounting height (3.30 m).
4. Back to menu >Application<.

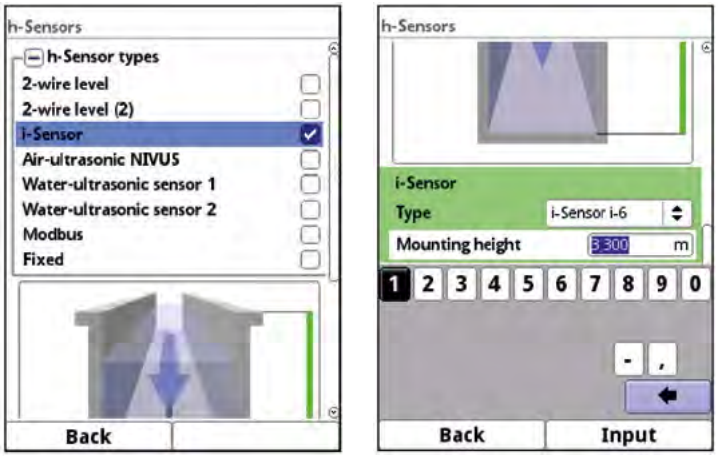


Fig. 28-5 Specify h-Sensor

➲ Procedure for the **selection of flow velocity sensors** and the **specification of mounting values**:

1. Select menu >v-Paths<.
2. Make sure the v-Path is active. If not tick the checkbox.
3. Choose the sensor type used.
   Here: Type NOS-V2.
4. Specify mounting height (of sensor face).
   Here: 0.80 m (40 % of 2 m).

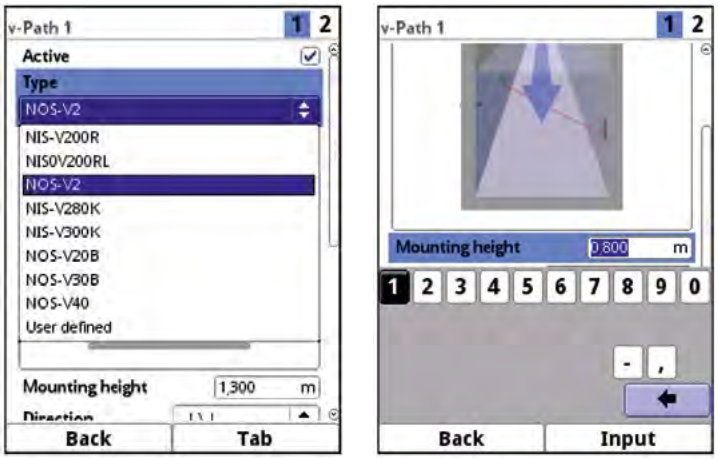


Fig. 28-6 Specify v-Sensors

The >Direction< is suggested by the transmitter for both paths compatibly. This setting can be retained.

The >Distance across< and >Distance along< fields on the display indicate the distance between both sensors.

The indicated distance is always the clearance between both sensors.

All other parameters are read-only or remain to be set to default.

5. Set the parameters for Path 2 similarly.

➲ Once entered, all required **measurement place Parameters need to be saved:**

1. Use “Back” 3 times to exit the menus until >Save Parameters?< is shown on the display.
2. Confirm >YES<.
3. Enter password, the confirmation “Parameters saved!” appears.
   The transmitter switches over to the main screen and uses the new parameters.

Fig. 28-7 Save parameters

28.2.2 Extended Parameter Setting

More specifications:

- Dry weather flume, width 20 cm and 3 cm sedimentation inside
- Sedimentation inside channel (3 cm sludge)

➲ Procedure:

1. Execute steps 1 (“Menu”-field, page 65) up to and including 8 („Enter rectangle data“; page 66) as described in Sect. “28.2.1 Simple parameter Setting”.
2. Activate >Dry weather flume<.
   This will extend the selection in the display.
3. Enter values for >Height< (more than 3 cm due to sedimentation) and >Diameter< (20 cm).

   Note:
   The dry weather flume is shown in the 3D preview, however not in the preview screen of the standard measurement place view.
4. Enter >Sludge level<: 3 cm.

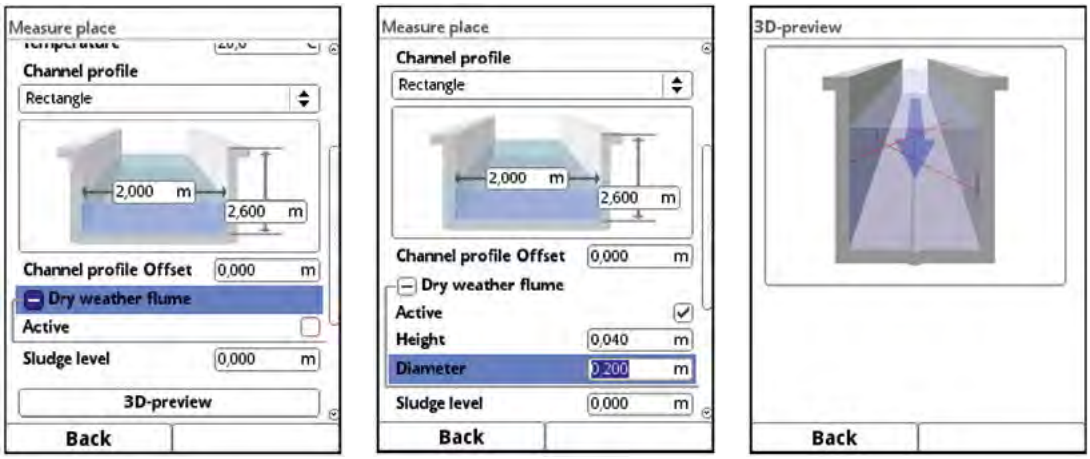


Fig. 28-8 Dry weather flume and sludge level

5. Rearrange paths and save parameters.

29 Example 2: Measurement in open waters

29.1 In General

The second measurement example is performed in an open water body.

The used transit time sensors are NIVUS hemispheres since they are very well suited for slanted installation on river banks. The related banks should be stable and should not tend to changes.

Measurement places featuring a defined and consistent flow cross section provide the best conditions.

In order to set measurement place parameters the basic settings below are required at least:

- Number of paths and path arrangement
- Measured medium
- Shape and dimensions of measurement place
- Sensors used and respective positions

Observe the preparatory measures and other information for the measuring section as provided in the “Installation Instruction Transit Time Sensors”.

Diving works possibly required

Observe that installing sensors in open waters might require diving works. Diving works in turn require observing particular regulations on safety at work. Prepare such activities very carefully.
Prior to planning diving activities make sure to obtain any necessary permits from the responsible authorities.

29.2 Setting Parameters of a Multi-Path System in >Channel<

Application Specifications:

- Open channel, width 5 m
- Stable, inclined banks
- No sedimentation on the channel bottom
- Path arrangement “Chordal X”
- 4 paths
- Sensors:
  - Level: i-series sensor, type i-06
  - Flow: hemisphere sensors, type V30BS; path height: 1,4 m
- Position and mounting height of level sensor (3.5 m above channel bottom) due to conditions on site
- Detect filling level

Measurement place dimensions must be known

Prior to installing sensors and setting parameters necessarily make sure that the measurement place is accurately measured and documented.
Determine a start/reference point for the following setting of the water body dimensions such as the water surface or the height of the side walls on embarked river banks.

➲ Procedure:

1. Select “Menu” (top left).
2. Open >Application< menu.
3. Open >Measure place< menu.
4. Specify measurement place name and confirm with “Enter”.
5. Specify path arrangement (“Chordal X”) and number of paths (4 paths).

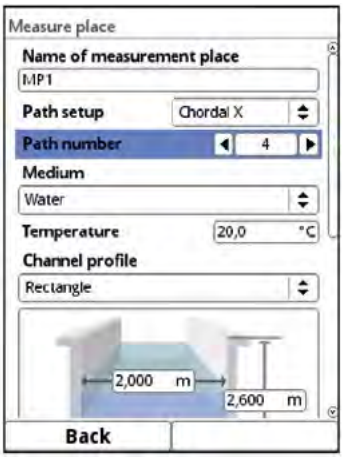


Fig. 29-1 Select path arrangement and number of path

Hints on the Medium

If you cannot find your medium to measure in the list select “User defined”.
Another menu opens up which can be used to specify e.g. the speed of sound within the medium.

Tip:

Various speeds of sound can be found on the Internet or contact NIVUS GmbH.

6. Use the selection menu to specify the medium (water) to measure and to select/ specify the current medium temperature.
7. Set the channel profile to “Channel”.
   The graphics section indicates a water bed with a selection field for the table.
8. Select >Table< in the graphics section and enter the dimensions (distance/depth) of the water bed based on the measurement plan.
   Here, enter the previously defined start/reference point as the first point for the parameter setting using the distance “0”.
   The shorter the distances specified between the points the more detailed the representation of the water body cross section.
9. Use the Back button to exit the table and verify the entered profile visually by using the >3D Preview<.

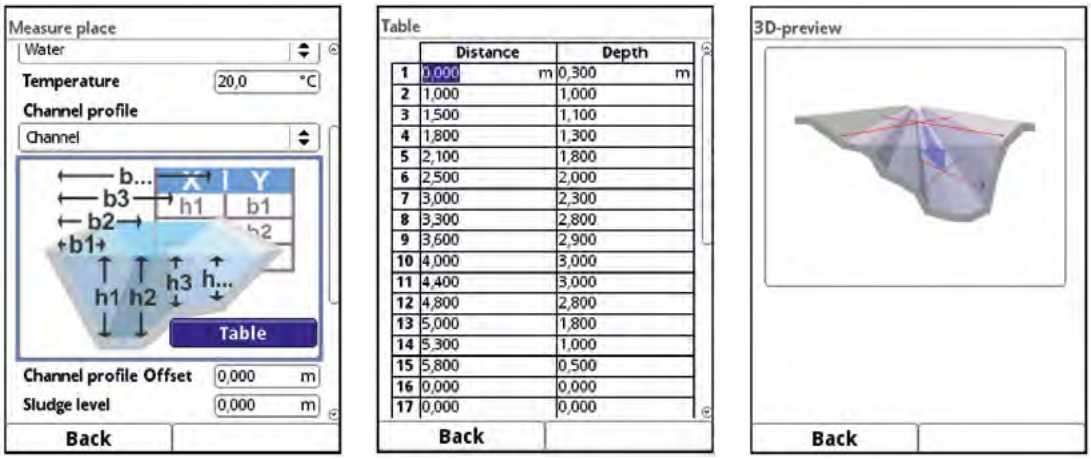


Fig. 29-2 Example water body profile: table values and 3D preview

More specifications are not required - the following parameters (Channel profile Offset, Sludge level, Velocity evaluation etc.) remain in the default state.

Once a relevant parameter in menus >Measure place< or >v-Paths< has been changed it is necessary to re-initialise the path arrangements in order to recalculate path lengths and sensor positions.

➲ Exit >Measure place< menu to adjust the **measurement path settings**.

1. Use “Back” to go to >Application< menu.
   The following query appears on the display:

Fig. 29-3 Accept modified measurement place parameters

2. Confirm modified parameters and path rearrangement. The display shows “Initialised!” after confirmation with >Yes<. The transmitter switches to the >Application< menu.

➲ Procedure for the **selection of level sensors** and the **specification of mounting values**:

1. Select menu >h-Sensors<.
2. Select used sensor from >h-Sensor types< (i-Sensor) and specify more details in >Type< (Type i-06).
3. Enter the mounting height (3,5 m above channel bottom).
4. Back to menu >Application<.

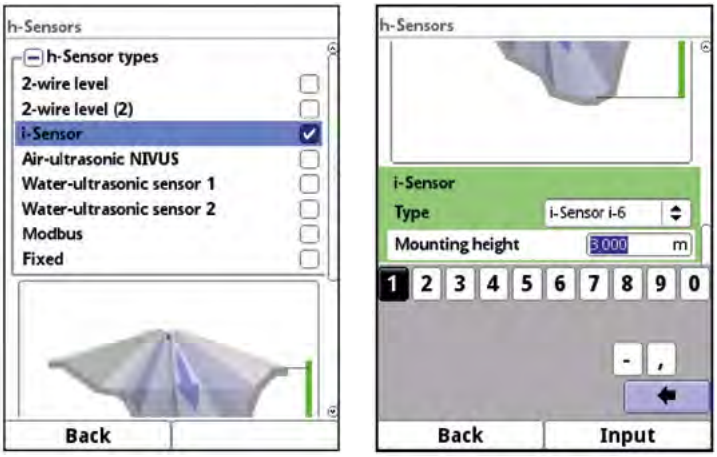


Fig. 29-4 Specify h-sensor

➲ Procedure for the **selection of flow velocity sensors** and the **specification of mounting values**:

1. Select menu >v-Path<.
2. Make sure the v-path is active. If not tick the checkbox.
3. Choose the sensor type used.
   Here: Type NOS-V30B.
4. Specify mounting height (of sensor face).
   The value may be also negative depending on the start/reference point of the parameter settings.

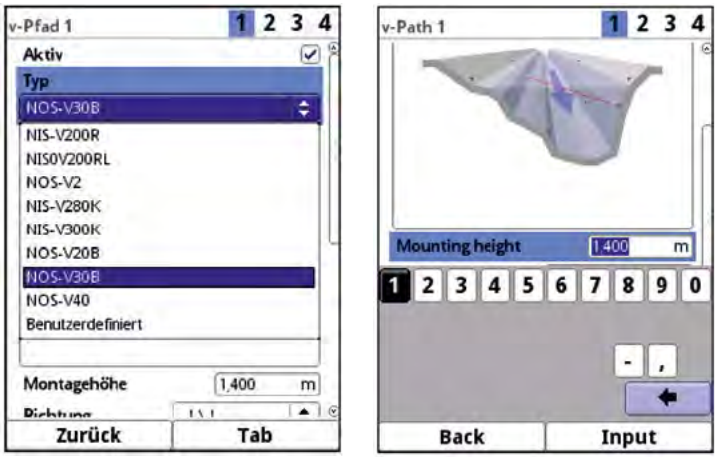


Fig. 29-5 Specify v-Sensors

The >Direction< is suggested by the transmitter for both paths compatibly. This setting can be retained.

The >Distance across< and >Distance along< field on the display indicates the distance between both sensors.

The indicated distance is always the clearance between both sensors.

All other parameters remain to be set to default.

5. Set the parameters for path 2 similarly.

➲ Once entered, all required **measurement place Parameters need to be saved:**

1. Use “Back” 3 times to exit the menus until >Save Parameters?< is shown on the display.
2. Confirm >YES<.
3. Enter password, the confirmation “Parameters saved!” appears.
   The transmitter switches over to the main screen and uses the new parameters.

Fig. 29-6 Save parameters

Setting Parameters

30 General Programming

30.1 Modification of parameters: Exit menus

When you exit any of the menus the transmitter will check whether parameters have been modified. If yes you will be prompted whether these parameters are to be saved.

⇨ See sect. “30.2 Save Parameters”.

Options and effects when you exit the menu:

- >Yes<: the modification will be accepted and saved.
- >No<: the modification will be rejected and the menu is exited.
- >Cancel<: You are exiting the prompt. Parameters remain to be modified but will not become effective and will not be saved, however.

30.2 Save Parameters

As a principle modified parameters will not become effective before they have been saved.

If you wish to accept and to save parameters you need to enter a valid password.

Default setting: 2718

The **service key** in this area indicates that the password has been entered within the last six hours and that any further **parameter changes** can be saved **without** having to re-enter the **password**. The six-hour period begins once the password is entered and ends automatically.

This period and thus unintentional parameters changes without password entry can be deliberately aborted. To do this, select the > Service level< under >System< / >Service<. **Do not make an entry** in the following prompt for the password, but confirm the empty, untouched field with the right >Enter< button. The transmitter leaves mode with the parameterization without entering a password.

If a number is displayed next to the service key, the transmitter is in service mode. This is usually the case when a NIVUS service technician has access to the transmitter.

30.3 Change Password

⇨ See also Sect. “34.5.2 Change (System) Password”.

You can change the default password at any time. However, keep in mind that a modified password will secure any modifications of the transmitter settings. Here, the password length is limited to a maximum of ten characters.

➲ Procedure to change the password:

1. Open the >System< menu.
2. Select >Service< submenu.
3. Activate the field >Change Password<.
4. Use the number field to enter the current password.
5. Then enter the new password (ten characters max.).
   The transmitter will accept the new password securing all transmitter settings.

Important Note

Share your password with authorised persons only!

If you should write down your password store it in a safe place.

Should your password get lost contact the NIVUS GmbH.

31 Parameter Functions

31.1 Main Menu

The transmitter parameters can be set using a total of five to eight (depending on the type) setup menus within the first menu level. Individual menus and their associated submenus are explained in greater detail starting in Sect. “32 Application / MP1 / MP2 / Combi Parameter Menu”.

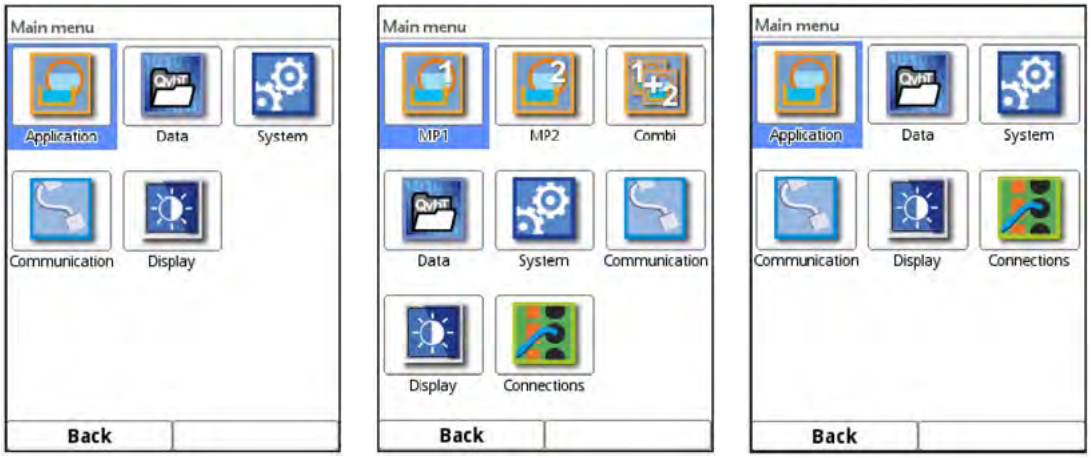


Fig. 31-1 Overview main menu

⇨ While setting parameters observe Sect. “26 Operation Basics”.

31.2 Overview: Functions Top Menu Level

31.2.1 Application Menu / MP1 / MP2 / Combi

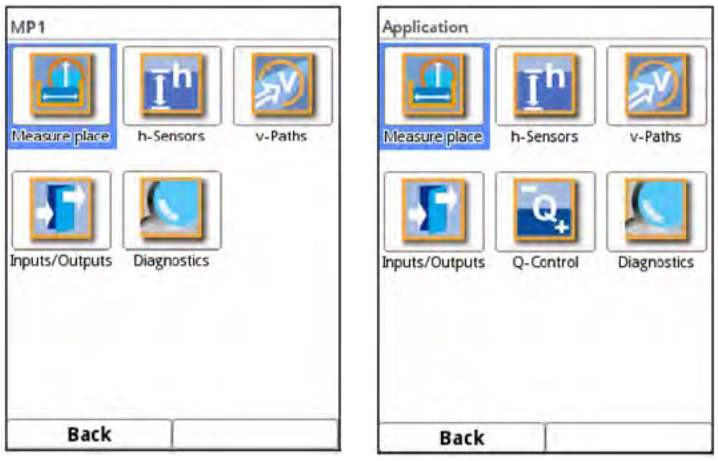


Fig. 31-2 Application menu

This menu is the most extensive and most relevant when it comes to setting the transmitter parameters. The >Application< menu contains five resp. six (types with regulator function) submenus. This is where shape and dimensions of the measurement site are to be set.

The sensors used as well as information on the mounting position are specified here.

Moreover the required analogue and digital inputs and outputs are defined here:

- Functions
- Measurement ranges
- Measurement spans
- Limit values

The Q-regulator parameters are set in >Application< menu. The Q-regulator is available with types TR and TZ.

Within this menu diagnostic options for the items below are available:

- Sensors
- Inputs and outputs
- Complete system
- Signal analysis
- Simulation

The diagnostic options are explained in Sect. “Diagnostics” starting at page 140.

Use this menu to enter or change:

- Constant, fixed sludge levels
- Low flow suppression
- Damping and signal evaluation and signal output
- Stability of signal evaluation and signal output

The parameterization for the combined measurement point differs from that for measurement points 1 and 2. The combined measurement point is a fictitious measurement point whose data is derived from the measurements of the two measurement points 1 and 2.

See Sect. “32 Application / MP1 / MP2 / Combi Parameter Menu”.

31.2.2 Data Menu

Fig. 31-3 Data menu

The >Data< menu allows access to all measurement values in the internal memory.

The functions below are available:

- Graphic representation of measurement values
- List of the 100 previous 24h-day totals
- Communication and transmission options for internal files
- Format external USB stick
- Transmission of parameters set from USB stick and back
- Options to set and erase the internal data memory
- Setting the storage cycle

⇨ See Sect. “33 Data Parameter Menu”.

31.2.3 System Menu

Fig. 31-4 System menu

The >System< menu contains information on the transmitter:

- Article No.
- Firmware version
- Serial No.

Furthermore the settings/adjustments below are available:

- Set language
- Set units
- Adjust date and time
- Read active error messages
- Display and erase error memory
- Feature unlock
- Change password
- Restart (system or measurement)
- Parameter reset

⇨ See Sect. “34 System Parameter Menu”.

31.2.4 Communication Menu

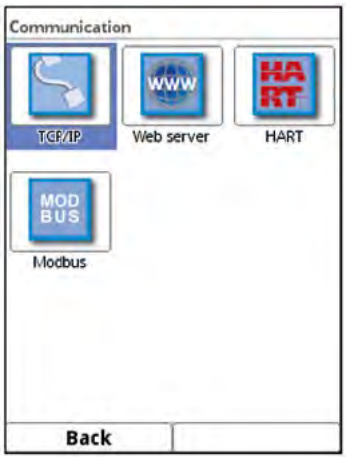


Fig. 31-5 Communication menu

This menu comprises the settings for the communication of various communication interfaces with other communication systems. The transmitter itself functions as a server and enables remote administration.

These settings are:

- Input and information about the IP and the domain,
- Details about HTTP and FTP server,
- Selecting/Deselecting NF Remote and Telnet Protocol,
- Information about connection via HART (AO1) (if function licence is active),
- Details on TCP and Modbus RTU,
- Settings for scaling of flow rate, level, velocity, temperature, analog and sum
- and there is a diagnostic option (the data available there are important for the NIVUS service).

⇨ See Sect. “35 Communication Parameter Menu”.

31.2.5 Display Menu

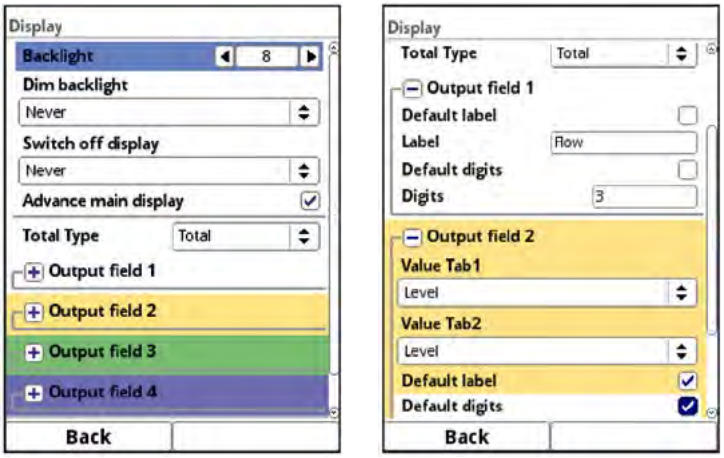


Fig. 31-6 Display menu

This menu permits to adjust the backlight settings as well as to adjust the settings of the five output fields of the main screen.

⇨ See Sect. “36 Display Parameter Menu”.

31.2.6 Connections Menu

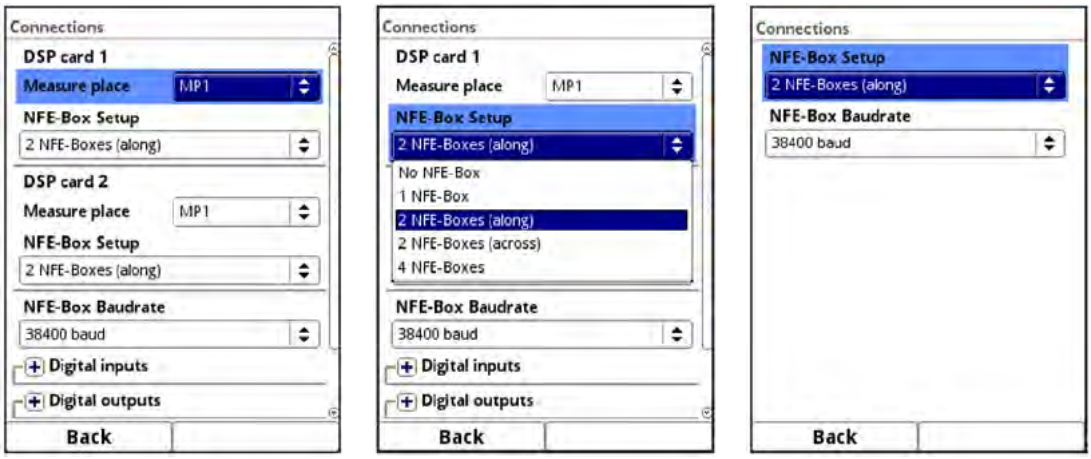


Fig. 31-7 Connections menu

This menu is only available for transmitter types T4, TM and TZ, as it deals with

- the transmitter configuration comprising multiple measurement points

and/or

- the connection of extension modules NFE.

The two DSP cards (digital signal processor cards) and the analog and digital inputs and outputs of the respective measurement points are assigned here. Operational parameters can then only be assigned and included in the calculations for the measurement points selected here. Furthermore the extension modules (NFE) arrangements are selected here.

32 Application / MP1 / MP2 / Combi Parameter Menu

32.1 Setting parameters in Measurement place Menu

The >Measure place< submenu is one of the most important basic menus when it comes to setting parameters.

The following basic settings are required to set the parameters of the measurement place:

- Activating the measurement point (for types with several measurement points)
- Name of measurement place
- Arrangement and number of paths
- Measurement medium and medium temperature
- Type and dimensions of channel profile
- Channel profile Offset
- Possible solid sediments settings (sludge level)
- 3D preview
- Velocity evaluation
- v-determination low levels
- Low-flow suppression
- Measurement damping and stability

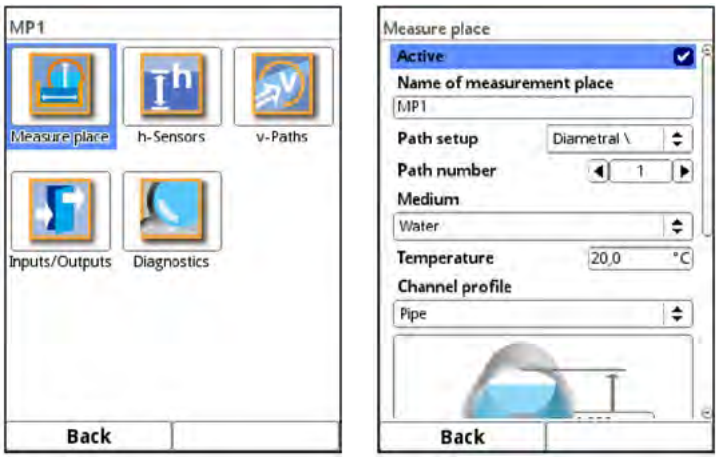


Fig. 32-1 Parameter menu application

32.1.1 Active

This option is only available for transmitter types T4 and TM, as it deals with the transmitter configuration comprising multiple measurement points.

The measurement point is enabled by checking the box. If no check mark is set, the measurement point is disabled, nothing is displayed and it cannot be parameterized.

32.1.2 Name of Measurement Place

Fig. 32-2 Enter the name of the measurement place

This is the place to enter the desired name of the measurement place. The name space is limited to 256 digits.

The default name is deleted automatically as soon as the first character of the new measurement place name is entered.

➲ Procedure:

1. Enter the name of the measurement place completely into the text field using the keypad.
2. Confirm the name by using the right function key “Input”.
   The name of the measurement place is accepted and will be indicated in the main menu.

32.1.3 Path Arrangement

Depending on the channel profile set either all or only a part of the path arrangements below are available:

- Diametral \ (circular pipes only)
- Diametral V (circular pipes only)
- Diametral VV (circular pipes only)
- Chordal \
- Chordal V
- Chordal VV
- Chordal X
- Chordal XX
- Chordal XXXX

32.1.4 Number of Paths

A maximum of four paths can be connected directly. The number of paths can be increased up to 32 by connecting up to four extension modules.

Set the number of paths by using the arrow buttons. The number is shown in the text field between both arrows.

⇨ See also Sect. “32.4 Setting parameters in v-Paths Menu”.

32.1.5 SonicPro T

The checkbox here must be ticked as soon as a SonicPro T overvoltage protection element is to be installed between sensor and transmitter or between sensor and NFE extension module.

When connecting the sensors/the system the service technician needs to check in menu >Application< / >Diagnostics< / >v-Paths< whether a resistor must be connected to the over-voltage protection element and if so, which colour the resistor needs to have (blue or red).

⇨ See Sect. “Modify SonicPro T overvoltage protection” at page 56 et sec.

32.1.6 Medium

Select between “Water” and “User defined”. The “Water” option features fixed properties, while “User defined” requires specifying medium properties such as speed of sound and damping and density when setting parameters.

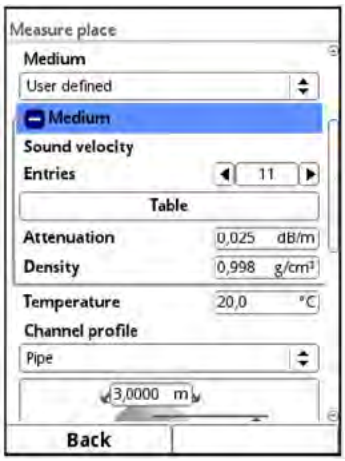


Fig. 32-3 Selecting the measurement medium

Selecting the measurement medium

Choose “User defined” if your medium to be measured is not in the list.

This action opens another menu point where you need to specify e.g. the speed of sound within the medium.

Tip:

Lists providing various speeds of sound can be found on the Internet or contact your local distributor or NIVUS GmbH.

32.1.7 Medium Temperature

The medium temperature must initially be entered once and as accurately as possible; it is required for correctly initializing the transmitter.

32.1.8 Channel Profiles

The transmitter allows selecting from a wide variety of standardised channel profiles mainly used in practice.

Since particularly older channel systems often have special shapes, the transmitter moreover provides the option to enter dimensions or heights/areas of symmetric and asymmetric channels in tables.

The profile chosen is shown as graph in the 3D preview box if selected. To indicate the graph the dimensions entered are set in relation to one another.

This visual control is important to instantly see whether the profile has been basically created correctly. Particularly for free profiles this kind of direct verification is helpful.

Select from the available channel profiles:

- Pipe
- Ellipse
- Egg profile (1:1,5)
- Rectangle
- U-Profile
- Trapezoid
- Channel
- Channel (local datum)
- Height-Width (sym.)
- Height-Width (asym.)
- Height-Area
- Q=f(h)

➲ Select profile.
The dimensional values are entered as soon as the profile has been chosen. The unit is set to meter [m] by default. This can be changed in the >System< / >Region Settings< / >Units< / >Level< menu (Fig. 32-4).

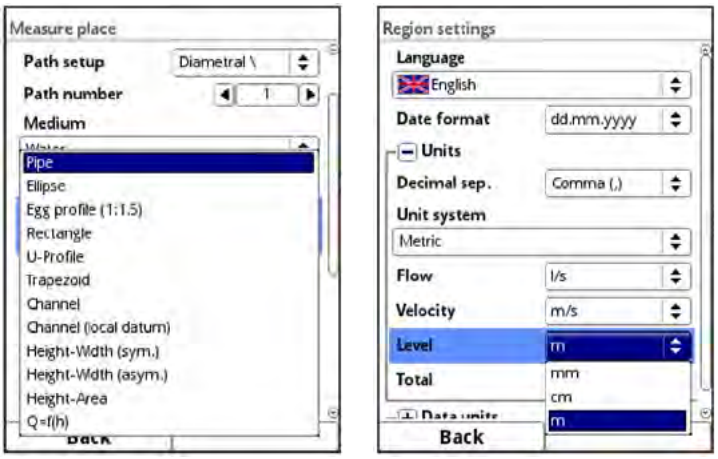


Fig. 32-4 Selecting the channel profile / Setting the units

Pipe
This selection is suitable for round pipes, however can be used for half shells featuring a filling level of 50 % max.

Deformed pipes featuring asymmetric height/width ratio can be set using the ellipsoid geometry selection.

For U-profiles there is an extra selection available.

Ellipse
Ellipsoid profiles can be found mainly in pipes subject to mechanical loads (lateral pressure or crown pressure). There are also special channel shapes known as ellipsoid profiles.

Ellipsoid profiles versus Egg profile

Symmetric ellipsoid profiles should not be confused with ovoid profiles (egg-shaped).

Ovoid profiles feature different radii in bottom and crown which makes them symmetrical only in a vertical sense.

➲ Enter both dimensions of the ellipsoid profile.

Egg profile (Ovoid; 1:1.5)
This channel shape is a “standard egg shape” according to German DWA A 110 featuring a width/height ratio of 1:1.5. Squeezed or shrunk ovoid profiles need to be set using a free profile.

When setting the egg profile parameters only the maximum channel width needs to be entered. The transmitter calculates the height automatically by using the fixed 1:1.5 ratio.

Rectangle
This selection can be used to set the parameters of channels featuring vertical walls and a horizontal bottom. The parameters can be easily set by merely entering width and height of the channel.

The menu moreover includes the option to set the parameters for channels with a centre dry weather flume.

- Rectangle with dry weather flume

➲ Procedure:

1. Select the dry weather flume.
2. Check the >Active< box.
   Two more input fields will open.

3. Specify height and diameter of the dry weather flume.
4. Use the 3D-Preview to verify whether dimensions are specified correctly.

U-Profile
The U-profile is composed from a bottom semicircle and vertical walls. The semicircle radius here is ½ the channel width and is entered automatically by the system.

Profiles with radii larger than ½x channel width should be created as free profiles.

Trapezoid
This selection allows setting the parameters for symmetric channels featuring a horizontal bottom and sloped walls. Parameters of symmetric channels with a horizontal bottom, sloped walls and featuring vertical walls at the top can be set in this menu too.

Right as with rectangular profiles, a dry weather flume can be added as extra option.

- Trapezoid with dry weather flume

➲ Proceed as described in the rectangle with dry weather flume section on page 83.

Channel

Sound Expert Knowledge required

Setting the parameters for a water bed requires sound knowledge and comprehensive experience on the operation of the NivuFlow Mobile as well as about hydrologic ambient conditions.

We recommend letting the NIVUS commissioning service or a company authorised by NIVUS do the programming works.

In this profile you define the reference point/zero point yourself. Mostly, the maximum level or the water surface on one bank or channel side is determined as zero point. By performing local measurements on site you can save the profile of a certain section of the water body in the transmitter here.

➲ Enter the freely defined measuring section into the table one after the other.

Symmetric profile using height-width (Heigth-Width (sym.))
This menu can be used to set any kind of symmetric profiles.

Selecting the button >Table< indicates a table of values where a maximum of 32 breakpoint pairs (channel height/channel width) can be entered. The system calculates these values automatically and saves them as symmetric profile in the internal memory.

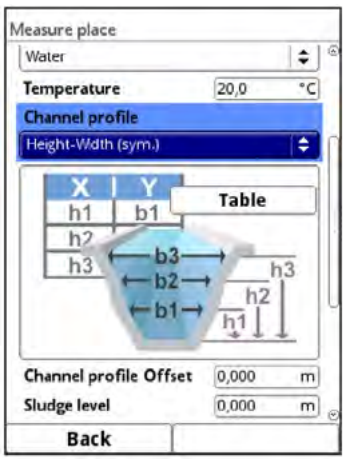


Fig. 32-5 Setting of profile using height-width (sym.)

Drawing required

A true to scale drawing is required to set the channel parameters.

➲ Procedure:

1. Draw a vertical auxiliary line onto the drawing in the channel centre.
2. Then draw horizontal auxiliary lines on the distinct points where the profile changes.
3. Measure the length of the auxiliary lines and subsequently convert the length true to scale.
4. Start at level “0” to define the starting point of the channel.
5. Enter height and width of all other breakpoints “freely”.
   The distance between individual height breakpoints may vary. Not all of the 32 breakpoints need to be necessarily entered in order to define the profile since the transmitter linearises between individual breakpoints.
   In case of large irregular changes of the channel dimensions select a lower distance between breakpoints in this section.
   A proportional graph of the values is indicated after the channel parameters have been set.
6. Use the 3D-Preview to verify whether the dimensions are specified correctly.
   Thanks to this visual aid, bad programming issues can be visualised and corrected directly if required.

Free asymmetric height-width profile (Height-Width (asym.))
In practice asymmetric profiles with unusual shapes can be found occasionally. This is where the programming options for asymmetric profiles are used.

Note on the viewing direction with free profiles

The viewing direction >Width left< or >Width right< is opposite to the flow direction in the channel.

Drawing required

A true to scale drawing is required to set the channel parameters.

➲ Procedure:

1. Draw a vertical auxiliary line onto the drawing from the lowest point of the channel to the top.
2. Starting at this line, draw horizontal auxiliary lines from the distinct points of profile changes to the left and to the right.
3. Measure the distances of each of these auxiliary lines starting at the centre auxiliary line to the right and to the left.
4. Convert the results true to scale and enter the breakpoints into the 3 value columns as follows: height / width to the left / width to the right.
   Necessarily observe here the relevant note above on the **viewing direction** with free profiles on page 85.
5. Start at level “0” to define the starting point of the channel.
6. Enter all other breakpoints “freely”.
   A maximum of 32 breakpoints can be entered. The distance between individual

height breakpoints may vary. Not all of the 32 breakpoints need to be necessarily entered in order to define the profile since the transmitter linearises between individual breakpoints.
In case of large irregular changes of the channel dimensions select a lower distance between breakpoints in this section.
A proportional graph of the values is indicated here too after the channel parameters have been set.

7. Use the 3D view to verify whether the dimensions are specified correctly.
   Thanks to this visual aid, bad programming issues can be visualised and corrected directly if required.

Free symmetric height-area profile (Height-Area)
Some hydraulic tables may contain height-area value pairs instead of height-width to specify symmetric channels. In such cases enter the value pairs into the selected height-area table.

Necessarily observe here the relevant note above on the **viewing direction** with free profiles on page 85.

The following procedure is the same as with programming height-width profiles. The programmed profile however cannot be indicated as graph here.

Q/h-Function (Q=f(h))

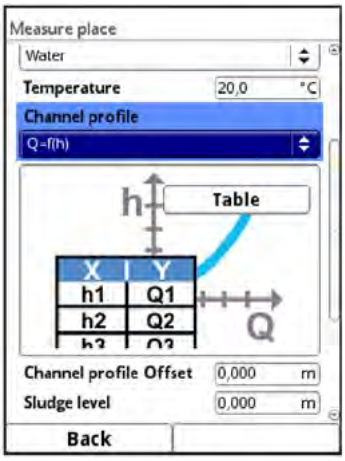


Fig. 32-6 Q/h-Function

This function significantly varies from the functions described above.

The selection is neither considering the channel profile nor the flow velocity and the **communication** with flow velocity sensors which may be connected is **disabled**. The missing flow velocity values will not be considered to create possible error diagnostics.

The system exclusively operates a Q/h-function. This means that a defined flow rate depending on the currently measured level is indicated. This value is entered into a value table depending on the height.

This table can hold a maximum of 32 height-related breakpoints. The transmitter linearises between individual breakpoints.

32.1.9 Channel profile Offset

Regarding the individual channel profiles specifying the >Channel Profile Offset< allows including a local level for the respective measurement place.

Default setting: 0.000 m

This setting is not possible for channel profile “Channel (local datum)” since this setting here can be adjusted for the individual measurement spots (in the table).

32.1.10 Sludge Level

Depending on measurement medium and flow velocity, horizontal pipelines may tend to sedimentation on the pipe bottom.

The >Sludge Level< parameter permits to specify a certain sedimentation level within the channel. The sedimentation is then considered as “non-moving partial area on the channel bottom with horizontal surface”. Prior to computing the flow rate this level height is subtracted from the wetted hydraulic total area.

32.1.11 3D-Preview

Selecting the 3D-preview permits to indicate the configured measurement place including the according sensors.

32.1.12 Velocity evaluation

For flow velocity evaluation it is possible to select from the both standardised evaluation methods >Midsection< (mid cross section method), >Meansection< (cross section centre method) and the option >Free<.

Depending on your selection specify values for >Factor Bottom< or >Factor Surface<.

- >Midsection< mode:
  >Factor Bottom< - factor for evaluation of the average velocity along the first measuring section (bottom); usual value: 0.4...0.8
- >Meansection< mode:
  >Factor Bottom< - factor for evaluation of the average velocity along the bottom; usual value: 0.7...0.9
  >Factor Surface< - factor for evaluation of the average velocity on the surface; possible value: 0.0...1.0
- >Free< mode:
  No possibility/need to specify the factor.

Default setting: >Midsection< mode and >Factor Bottom< 80 %

This value does not necessarily have to be changed; it is possible to obtain realistic results using the default settings.

32.1.13 v-determination Low Levels

Due to constructional and physical reasons the flow velocity sensors cannot measure the flow velocity anymore below a certain minimum level. This minimum level is depending on the mounting height of flow velocity sensors/paths.

Poor application conditions may push this level even higher. This level is referred to as >h-crit<.

Fig. 32-7 v-determination low levels

The >v-determination low levels< menu facilitates the detection of temporary low flow volumes (such as discharges at night, infiltration water or similar).

A requirement for this function is:
The application must be backwater-free.

Working principle:
As soon as the level falls significantly, from a certain point on it is not possible anymore to measure the flow velocity.

The transmitter creates an internal table of v/h-readings at the point of the minimum level (h-crit) on which a flow velocity still can be measured. The system here uses the latest measurable flow velocity reading. The exponent of the channel shape set is considered automatically to calculate this curve. As soon as no flow velocity can be recorded anymore, a level however is measured, the system automatically computes an “appropriate“ flow velocity within this value table.

- **>v-Determination Automatic<**
  If the box is checked (function active), the latest measured flow velocity value is used as calculation value for low flow levels when >h-crit< is reached.

  This calculated flow velocity value is used to compute the flow rate if the filling level should continue sinking (below >h-crit<).

  If the filling level is rising above >h-crit< and after that falls below again, the latest measured valid flow velocity value is used for the next calculation of the flow rate.

  If the box is not checked (function inactive) and the filling level falls below >h-crit< the transmitter computes the flow rate by using the flow velocity value specified in >v-manual<.

  If there are

  - very low flow levels
  - or backwater
  - or low medium quantities standing still at zero flow rates

  expected within the channel, NIVUS GmbH recommend to deactivate the function by

entering “0” in >v-manual< to avoid the transmitter calculating flow rates even in case of very low filling levels.

Default setting: checked

- **>h-crit automatic<**
  If the box is checked (function active) the specified sensor type as well as the mounting parameters set are considered for calculation. The lowest possible filling level enabling flow velocity measurement is automatically determined by the transmitter.

  If the box is not checked the transmitter uses the flow velocity value specified in >h-manual<.

  Default setting: checked

- **>h-manual<**
  Here, manually enter the filling level used for calculation if the >h-crit automatic< function is deactivated; the value at least must be equal to >h-crit< since otherwise computed values may be missing.

  After the first measurement using real values >h-manual< can be set to a new value, however, the change will not become effective before the values for >h-manual< have been reset using the service menu. If in doubt contact the NIVUS hotline.

  Default setting: 0.000 m

- **>v-manual<**
  Here, manually enter the flow velocity used for calculation (together with >h-manual<) if the >v-Determination Automatic< function is deactivated; the value can be calculated corresponding with the level e.g. using a hydrologic software application.

  After the first measurement using real values >v-manual< can be set to a new value, however, this modification does not become effective before the values for >v-manual< have been reset in the service menu. If necessary contact the NIVUS hotline.

  Default setting: 0.000 m/s

- **>h-crit<**
  Use this menu to define the value used as the lowest applicable level value for calculations. This level value must be lower than >h-manual<.

  As soon as the filling level falls below >h-crit< no measurement results are used for calculation anymore and the transmitter interpolates logical values using a v/h calculation instead.

  Default setting: 0.000 m

- **>v-crit<**
  As soon as >v-Determination Automatic< is deactivated and the filling level falls below >h-crit< the transmitter calculates the flow velocity according to Manning-Strickler.

  >v-crit< cannot be specified directly, this value is computed from the entry of real value pairs for >h-manual< and >v-manual<.

  >v-crit< is visible only when >v-Determination Automatic< is active.

  Default setting: -.--- m/s

32.1.14 Low-Flow Suppression

This parameter is used to suppress lowest movements or apparent flow rates. The main area of use is the measurement of discharge volumes in permanently filled constructions.

➲ Check >Active< and enter the desired value in >Q suppressed< or >v suppressed<.

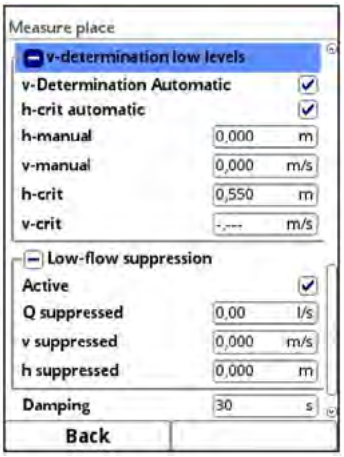


Fig. 32-8 Low-Flow Suppression

The low-flow suppression disregards the detection of very low flow velocity fluctuations.

- **>Q suppressed<<**
  Enter the flow rate as a positive value.
  Negative values are not possible. The specified value is considered as absolute value and is effective in both positive and negative directions. The measurement system will automatically reset the readings to “0” if the values should be lower than the value specified here.

  Default setting: 0.000 l/s

- **>v suppressed<**
  This parameter permits to suppress apparent flow rates in applications featuring large profiles and high levels. Very low velocity fluctuations may cause heavy apparent flow rate fluctuations over a long period which cannot be suppressed using the >Q suppressed< function. The measurement system will automatically reset the readings to “0” should the flow velocities be lower than the value specified here. This will also set the calculated volume to “0”.
  Only positive values can be entered here. The specified value is considered as absolute value and is effective for both positive as well as for negative velocities.

  Default setting: 0.000 m/s

- **>h suppressed<**
  Enter low limit values for levels here. If the real levels are lower than the value entered here, the system will set the measurement values automatically to “0”. No areas are calculated in such cases and flow rate calculations cannot be carried out.

  Default setting: 0.000 m

32.1.15 Damping

This menu enables to adjust the display and analog output damping in seconds.

Damping relates to **all** values which are available as input. It is not possible to select individual values and to damp single values in different ways.

Taking the specified period, all readings are saved and a floating average is created for each individual average value. This average is used for further calculation of the flow rate.

Input the value in steps of one second.

Default setting: 30 s

32.1.16 Stability

The stability parameter defines the period the transmitter bridges values without having valid measurement events (e.g. in case of invalid flow velocity or level readings) available.

During this period the transmitter operates using the latest valid reading. If the specified period is exceeded without detecting a correct value the transmitter goes back to reading “0” considering the damping set. The transmitter does not store the values.

Input the value in steps of one second.

Default setting: 30 s

32.2 Setting parameters in Measurement place Combi Menu

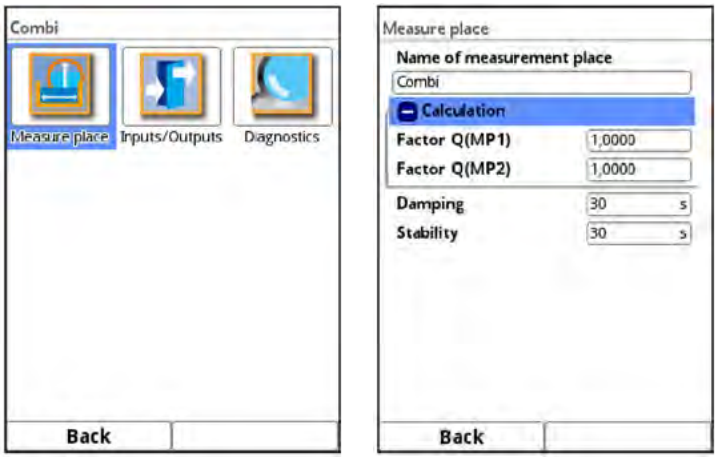


Fig. 32-9 Setting parameters in measurement place Combi menu

The points **>Name of Measurement Place<**, **>Damping<** and **>Stability<** of the fictitious Combi measurement point are identical to those of measurement points 1 and 2.

⇨ See Sect. “32.1.2 Name of Measurement Place”, “32.1.15 Damping” and “32.1.16 Stability”.

In addition, **>Calculation<** can be set. This specifies the ratio in which each of the two measurement points 1 and 2 are to be weighted for calculating the fictitious combined measurement point. The adjustable values range from -100 to +100.
Default setting: 1.0000 at both measurement places

32.3 Setting parameters in h-Sensors Menu

After setting the measurement place parameters one or more level sensors need to be defined and the according measurement ranges must be specified.

The level sensor parameters can be set in >h-Sensors< submenu.

32.3.1 h-Sensor types

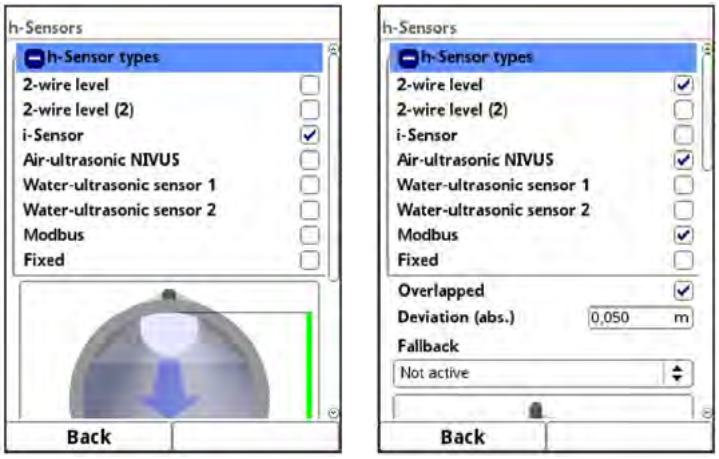


Fig. 32-10 Level Sensor Selection

The field >h-Sensor types< contains a selection of level sensors.

➲ Open parameter >h-Sensor types< and select the type of sensor connected to the transmitter.
For the very most applications it is sufficient to select one level sensor.

➲ In case of using more than one level sensor (e.g. i-Sensor and 2-wire level) check one box for each sensor.

Sensor connected?

After finishing the parameter settings the missing or faulty programmed sensors are detected and the instrument issues an error message.

The number of selected sensors corresponds with the number of individual level measuring section covering the entire measurement cross section. Only one level sensor can provide a valid reading per measurement. The transmitter does not accept faulty and not reasonable combinations.

A **maximum of three** different level sensors can be selected.

Adjust the sensor measurement ranges underneath the channel graph.

Sensor detection

The transmitter does not recognise the type of 2-wire level sensor. Hence, the indication of the sensor in the display is not crucial for the measurement range.

As standard the transmitter indicates the 2-wire level sensor as ultrasonic sensor from the top.

The level sensors are shown within the channel shape previously specified when setting the measurement place parameters: >Application< / >Measure place<.

Select from the following level sensors:

- **2-wire level**
  The level is measured by using an external 2-wire sensor supplied by the transmitter. The use of 0/4…20 mA signal from external transmitters such as NivuMaster or Multi-Ranger can be enabled in this menu as well.
- **2-wire level (2)**
  The level is measured by using an external 2-wire sensor supplied by the transmitter.
- **i-Series sensor**
  Connection of NIVUS i-Series ultrasonic sensors on analog input AI1.
- **Air-ultrasonic NIVUS**
  The level is measured from the top down using an air-ultrasonic sensor.
- **Water-ultrasonic sensor 1**
  The level is measured from the bottom up using a water ultrasonic sensor.
- **Water-ultrasonic sensor 2**
  The level is measured from the bottom up using a water ultrasonic sensor.
- **Modbus**
  Connection of an external level sensor.
- **Fixed (value)**
  This option is conceived for permanently full pipes and channels. Such applications do not require level measurements. The measurement system in this case provides the constant filling level required for flow calculation.

  This parameter can be used as supporting value for tests or for initial start-ups if level values are not available.

Use of two level sensors with overlap
Choose this option if the level sensor is expected to be overflown as described in the following example using a pipe measuring section with dome top.

Range 1 is a 2-wire pressure probe on the canal bottom with a measurement range of 0...1 m. This pressure transducer is specified as “2-wire level (2)”.

The pressure sensor shall measure the range from 0 to max. 0.35 m. The range on top is covered by a second sensor.

Range 2 is an i-Series sensor (installed above the water surface above the canal). This transducer shall measure as from a level of 0.32 m and is to cover up the range up to full filling.

Due to this arrangement and the according parameter settings both measurements operate with an overlap area of 0.03 m (see also Sect. “32.3.2 Overlapped”).

➲ Procedure:

1. Sensor 1 (2-wire pressure probe):
   Enter the level measurement range (level min. / max.), set the offset to “0.0 m” (4 mA) and the measurement span to “1.0 m”.
2. Sensor 2 (i-Series sensor):
   Enter the level measurement range (level min. / max.), select the sensor type and enter the mounting height.
3. Verify the settings using the graph above.

32.3.2 Overlapped

This parameter is indicated/selectable only if more than one level sensor has been selected.

By including the individual measurements from a second sensor with the transmitter’s calculations it is possible to obtain “smooth transition” between the different measuring sections. Particularly within the range of the real filling level the change to the second sensor might possibly result in sudden jumps of measurement values.

The overlap is indicated on the screen by offset colour bars next to the channel (Fig. 32-11).

Fig. 32-11 Overlapping: Selection and display

32.3.3 Deviation (abs.)

The >Deviation (abs.)< parameter is indicated/selectable only if at least two level sensors are connected and overlap is activated.

Here define a value lower than the shared/overlapping measuring section. The >Deviation (abs.)< is either added to or subtracted from the median *1 to a valid range for the individual measurements.

Should the values of one or more sensors be out of the valid range the individual measurements are not valid and will not be considered by the transmitter. Moreover, an error message is generated and saved in the error memory.

The transmitter continues to measure and checks the results for validity. As soon as there are measurements available again within this range the results will be included with the calculations and the error message will be no longer active.

***1 Determination of the Median:**
The measurement values of the sensors determined within the overlapping measurement areas are compared and a so-called median is defined:

- for two sensors this is the mean value of both measurement values (= mean of measurement values), i.e.
  - Sensor 1: 0.9 m
    Sensor 2: 1.0 m
  - giving a median of 0.95 m
- for three sensors the measurement value of the sensor in between (= middle measurement value), i.e.
  - Example I:
    Sensor 1: 0.9 m
    Sensor 2: 1.0 m
    Sensor 3: 0.92 m
  - giving a median of 0.92 m (value of the sensor in between)
  - Example II:
    Sensor 1: 0.9 m
    Sensor 2: 1.0 m
    Sensor 3: 1.0 m
  - giving a median of 1.0 m (value of the sensor in between)

32.3.4 Fallback

>Fallback< is activated and selected as soon as one of the defined level measurements is covering the entire measurement range with the other sensor(s), however, covering only a part of the range. Advantage of this method: readings from the >Fallback< sensor are available even if a partial measurement should fail.

In the previous example the i-Series sensor would be suitable as >Fallback< sensor but would then be set to measure the entire measurement range, not just as from a level of 0.32 m.

If in this case the 2-wire level sensor (2-wire pressure probe) for any reason whatsoever would be missing a value for calculation, the transmitter would refer to the i-Series sensor and its readings using the >Fallback< function.

32.4 Setting parameters in v-Paths Menu

The specifications in this menu point refer to the channel as defined (shape and dimensions) in the >Measure place< menu (see Sect. “32.1.8 Channel Profiles”).

Moreover, this menu permits to enter some specifications required to calculate the sensor positions. The transmitter shows the sensor mounting distances after the specifications are completed.

Up to eight flow rate sensors (4 paths) can be **directly** connected to a NivuFlow 650 transmitter, depending on the type. **Up to 64** sensors (32 paths) can be **indirectly** connected via one or more extension modules (see Sect. “17.1 Device Types”)

The >v-Paths< menu provides tabs for the v-paths 1 to x on the top right for setting the parameters (use >Tab<).

The basic structure applies for all menus; the indicated sensors and values, however, may vary depending on the application.

Only a selection of v-paths can be parameterized

For transmitters with several measurement points, this menu works directly with the menu >Connections<. Only those v-paths that were also preselected under >Connections< can be parameterized. The other v-paths are not displayed and cannot be parameterized.

32.4.1 Active

The v-path is enabled by checking the box. If no check mark is set, the v-path is disabled, nothing is displayed and it cannot be parameterized.

32.4.2 Sensor Types

The same selection of sensors (Fig. 32-12) is available for all v-paths.

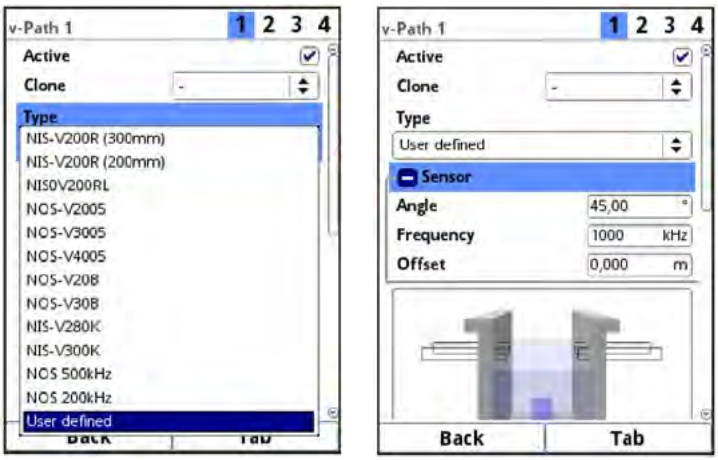


Fig. 32-12 Sensor Selection Menu

➲ Select sensor type:

- **>NIS-V200R (300mm)<, >NIS-V200R (200mm)<, >NIS0V200RL<, >NOS-V2005<, >NOS-V3005<, >NOS-V4005<, >NOS-V20B<, >NOS-V30B<, >NIS-V280K<, >NIS-V300K<, >NOS 500kHz< and >NOS 200kHz<**
  The values for the NIVUS sensors themselves are pre-set and cannot be selected or changed.
- **>User defined<**
  The values for >Angle<, >Frequency<, >Offset< must be specified.

Specialist knowledge required

The use of and settings for non-standard sensors require extensive expert knowledge and require the use of NIVUS commissioning personnel or an authorized specialist company.

32.4.3 Sensor Mounting Position

Hints on the Mounting Angle

In horizontal pipelines do not use pipe bottom or pipe crown as mounting places (risk of soiling, air bubbles).

NIVUS recommends a mounting angle of 45°.

Depending on channel profile, path arrangement and the number of paths it is necessary to define >Mounting height< or >Direction<. The settings must be adjusted **for each path** individually.

>Mounting height<
Sensor mounting height in channel profile (related to cross section); the sensor based on the channel dimensions suggests mounting heights which, however, can be changed manually.

>Direction<
The direction specifies which of the both path sensors in flow direction is installed first or last (related to cross section).

For sensor positioning **both** specifications are required as soon as they are indicated.

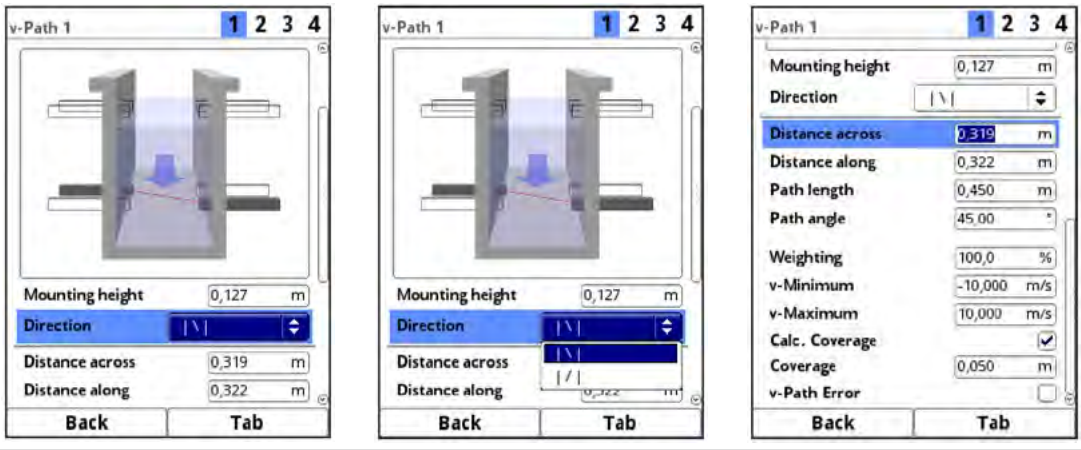


Fig. 32-13 Sensor mounting

The following settings for length and angle in the same path depend on each other. Modifying one changes the others.

>Distance across<
Distance from the sensor (centre piezo) to the opposite inner pipe wall

>Distance along<
Distance between sensors (centre piezo) lengthwise along the pipe; on the opposite side of the pipe, as well, depending on the path arrangement

>Path length<
Length of the signal path within the medium

>Path angle<
Angle between the sensors (within a path)

32.4.4 Weighting

Contract a specialist company

The weighting value depends on the application and the sensor position.

Such applications require extensive fluid mechanics knowledge and require the use of NIVUS commissioning personnel or an authorized specialist company.

>Weighting<
By modifying the >Weighting< value the involved paths can be weighted and prioritised differently. At least two paths are required to use the function.

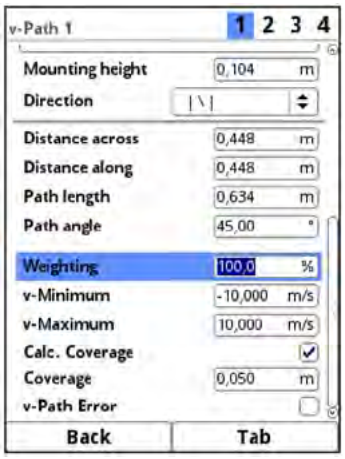


Fig. 32-14 v-Paths adjustments

32.4.5 v-Minimum and v-Maximum

The >v-Minimum< and >v-Maximum< settings define the limit values for the velocity measurement. The transmitter ignores occasional higher and lower velocities which hence will not be shown. Permanently measured deviations are indicated as “0”. Only the next realistic readings (within the measurement range) will be indicated correctly.

Values within a range of -10 to +10 m/s can be set.

Default setting:

- v-Minimum: -10.000 m/s
- v-Maximum: 10.000 m/s

32.4.6 Coverage

This parameter defines the medium level above the installed level sensor.

If >Calc. Coverage< is set the transmitter will compute the section. If the box is not checked it is not possible to specify >Coverage< manually.

32.4.7 v-Path Error

When the check mark is set, an error message is displayed if signal problems occur within the measurement path, e.g., signal is not sent/received.

32.5 Setting parameters in Inputs and Outputs (analog and digital) Menu

This menu is to define the function of the analog as well as digital inputs and outputs. Other parameters such as measurement and output spans, offsets, limit values, error reactions etc. can be set here as well.

➲ Open the >Inputs/Outputs< menu from >Main Menu< / >Application<.

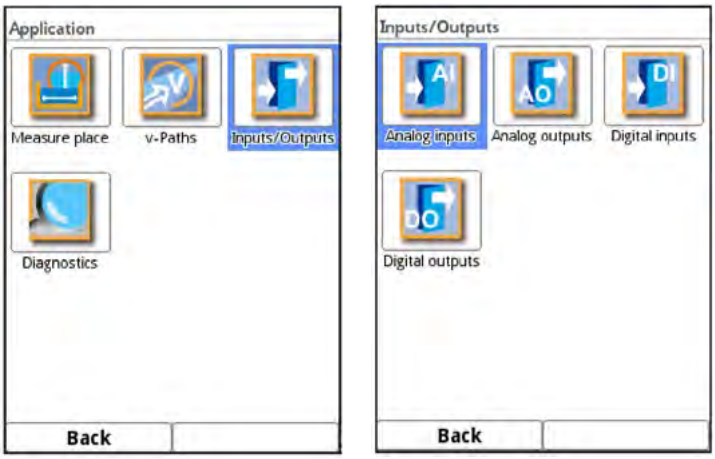


Fig. 32-15 Selection menu Inputs/Outputs

The inputs/outputs menu is subdivided into four parts:

- Analog inputs
- Analog outputs
- Digital inputs
- Digital outputs

Note

Entry using the letter block see Sect. “26.3 Use/Entry using the letter block”.

Operational parameters can only be assigned for a selection of inputs and outputs (analog and digital)

For transmitters with several measurement points, this menu works directly with the menu >Connections<. Only those inputs/outputs that were also preselected under >Connections< can be parameterized. The other inputs/outputs are not displayed and cannot be parameterized.

32.5.1 Analog Inputs

The number of analog inputs depends on the type (see Sect. “17.1 Device Types”).

The available analog inputs are shown in the top right corner of the display.

The analog inputs can be selected successively by pressing the right-hand control key >Tab<. The selection is shown as clear text message in the top left corner of the display.

Default setting: Input inactive

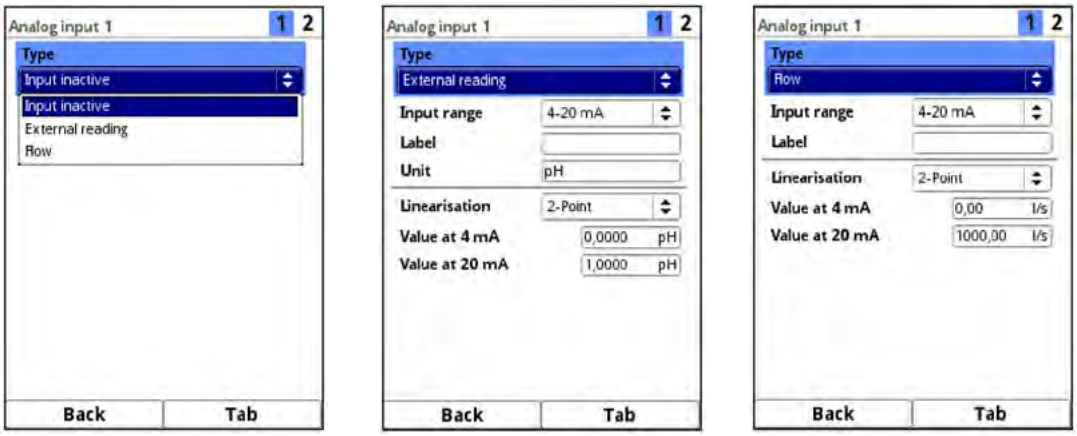


Fig. 32-16 Analog inputs: Activation / Ext. Reading / Flow

Currently the analog inputs can be used for external readings (such as temperature in °C) and for flow measurement. The transmitter hence can be utilised as an extra data logger for readings from other systems. This, however, does not affect the transmitter's functionality as a flow meter.

The values below must be chosen/entered in **>External Reading<**.

- Selection/Input Options:
  Input Range: >0-20 mA< or >4-20 mA<
  Label: manual input
  Unit: manual input
  Linearisation: >2-Point< or >Table<
  For >2-Point< linearisation: manual input of values for 4 or 20 mA
  For >Table< linearisation: manual input of the number of >Entries<, then select >Table<, complete and confirm.

The values below must be chosen/entered in **>Flow<**.

- Selection/Input Options:
  Input Range: >0-20 mA< or >4-20 mA<
  Label: manual input
  Linearisation: >2-Point< or >Table<
  For >2-Point< linearisation: manual input of values for 4 or 20 mA
  For >Table< linearisation: manual input of the number of >Entries<, then select >Table<, complete and confirm.

32.5.2 Analog Outputs

The number of analog outputs depends on the type (see Sect. "17.1 Device Types").

The available analog outputs are shown in the top right corner of the display.

The analog outputs can be selected successively by pressing the right-hand control key >Tab<. The selection is shown as clear text message in the top left corner of the display.

Default setting: Output inactive

The following different functions can be assigned to the analog output.

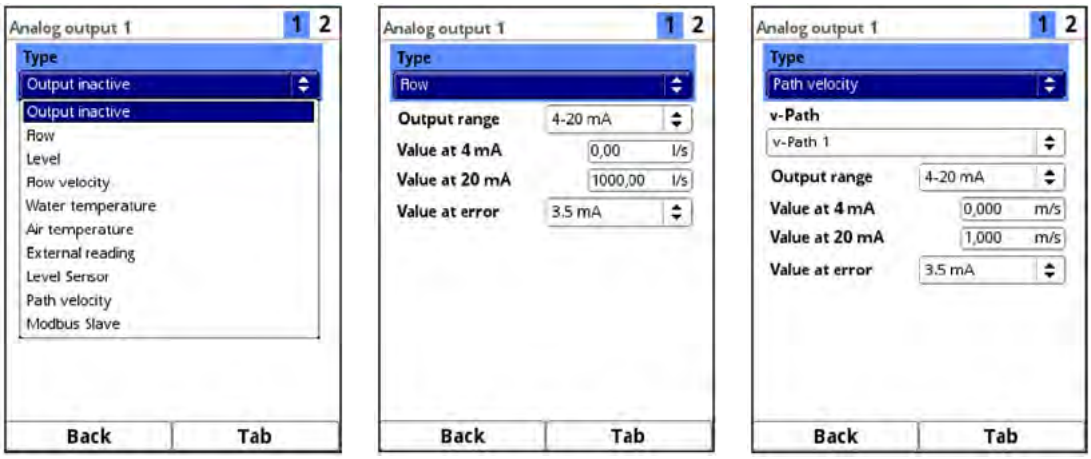


Fig. 32-17 Analog outputs: Activation / Flow / Path velocity

- **>Flow<**
  The application flow rate (calculated from average flow velocity and wetted cross section) is available on the selected analog output.
  - Selection/Input Options:
    Output range: >0-20 mA< or >4-20 mA<
    Value at 0/4 mA: manual input
    Value at 20 mA: manual input
    Value at error: >0 mA< or >Hold value< or >3.5 mA< or >21.0 mA<
- **>Level<**
  The filling level of the current level section is available on the selected analog output.
  - Selection/Input Options:
    Output range: >0-20 mA< or >4-20 mA<
    Value at 0 mA: manual input
    Value at 20 mA: manual input
    Value at error: >0 mA< or >Hold value< or >3.5 mA< or >21.0 mA<
- **>Flow velocity<**
  The calculated average flow velocity used to compute the current flow rate is available on the selected analog output.
  Not for measurement place Combi.
  - Selection/Input Options:
    Output range: >0-20 mA< or >4-20 mA<
    Value at 0/4 mA: manual input
    Value at 20 mA: manual input
    Value at error: >0 mA< or >Hold value< or >3.5 mA< or >21.0 mA<
- **>Water temperature<**
  The medium temperature calculated based on the transit times is available on the selected analog output.
  Not for measurement place Combi.
  - Selection/Input Options:
    Output range: >0-20 mA< or >4-20 mA<
    Value at 0/4 mA: manual input
    Value at 20 mA: manual input
    Value at error: >0 mA< or >Hold value< or >3.5 mA< or >21.0 mA<
- **>Air temperature<**
  The measured air temperature can be issued on the selected analog output.
  - Selection/Input Options:
    Output range: >0-20 mA< or >4-20 mA<

Value at 0 mA: manual input
Value at 20 mA: manual input
Value at error: >0 mA< or >Hold value< or >3.5 mA< or >21.0 mA<

- **>External reading<**
  Possibly linearised measurement values available at the analog input are available here.
  - Selection/Input Options:
    Analog input: >Input 1< or >Input 2< or >Input x<; depending on the number of inputs available
    Output range: >0-20 mA< or >4-20 mA<
    Value at error: >0 mA< or >Hold value< or >3.5 mA< or >21.0 mA<
- **>Level Sensor<**
  The filling level of the selected level sensor can be issued here.
  Not for measurement place Combi.
  - Selection/Input Options:
    Sensor: >i-Sensor< or >Fixed Value< or >....<; here all connected level sensors are listed and selectable
    Output range: >0-20 mA< or >4-20 mA<
    Value at 0/4 mA: manual input
    Value at 20 mA: manual input
    Value at error: >0 mA< or >Hold value< or >3.5 mA< or >21.0 mA<
- **>Path velocity<**
  If more than one flow velocity sensor is used and if the average flow velocity of the individual measurement paths is to be determined it is possible to select the desired flow velocity sensor and to output the according measurement value.
  Not for measurement place Combi.
  - Selection/Input Options:
    v-Path: >v-Path 1< or >v-Path 2< or >v-Path 3< or >v-Path x<, depending on the number of connected path
    Output range: >0-20 mA< or >4-20 mA<
    Value at 0/4 mA: manual input
    Value at 20 mA: manual input
    Value at error: >0 mA< or >Hold value< or >3.5 mA< or >21.0 mA<
- **>Error message<**
  By activating individual selection fields (check box) it is possible to assign individual error types to the digital output. Moreover the output logic can be switched between normally open and normally closed.
  - Selection/Input Options:
    Logic: >Normally open< or >Normally closed<
    Error mask:
    v-measurement: check
    h-measurement: check
    T-measurement: check
    External measurement: check
    System: check
    Delay: manual input
    Hold: manual input
- **>Modbus Slave<**
  The analog output is (remotely) controlled via a connected Modbus address of another system. No settings are necessary/possible here.

32.5.3 Digital Inputs

The number of digital inputs depends on the type (see Sect. “17.1 Device Types”).

The available digital inputs are shown in the top right corner of the display.

The digital inputs can be selected successively by pressing the right-hand control key >Tab<. The selection is shown as clear text message in the top left corner of the display.

Default settings: Input inactive

The following different functions can be assigned to the digital input.

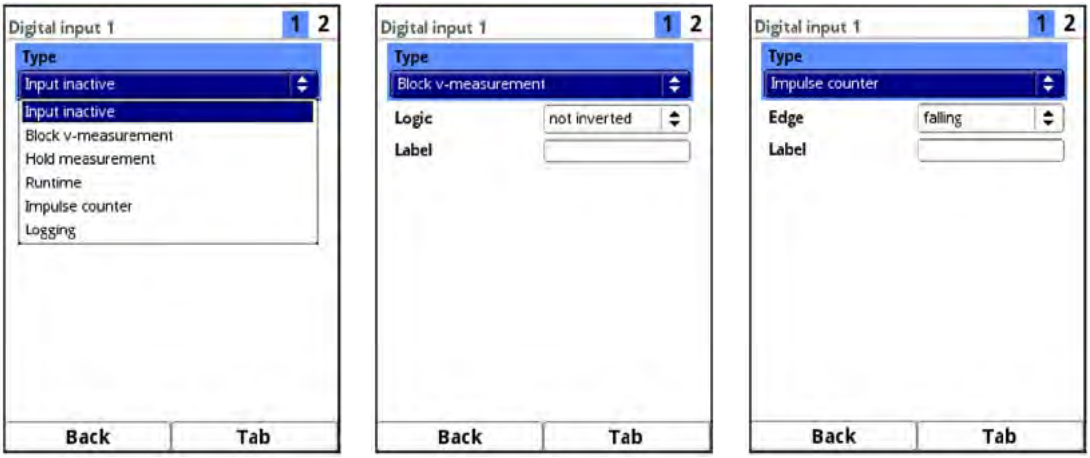


Fig. 32-18 Digital inputs: Activation / Block v-measurement / Impulse counter

- **>Block v-measurement<**
  The flow measurement can be blocked as long as there is a signal available on the digital input by using an external contact.
  Not for measurement place Combi.
  - Selection/Input Options:
    Logic: >not inverted< or >inverted<
    Label: manual input
- **>Block totalizer<**
  For measurement place Combi only.
  Setting the check mark disables the addition of the sums of measurements points 1 and 2. This means that only the two individual values for the flow rate are available.
  - Selection/Input Options:
    Logic: >not inverted< or >inverted<
    Label: manual input
- **>Hold measurement<**
  The value is held as long as the input is enabled.
  - Selection/Input Options:
    Logic: >not inverted< or >inverted<
    Label: manual input
- **>Runtime<**
  The system detects and saves the duration of the oncoming signals on the digital input. Such records are used e.g. for the runtimes of pumps or other units.
  - Selection/Input Options:
    Logic: >not inverted< or >inverted<
    Label: manual input

- **>Impulse counter<**
  The system counts and saves the number of oncoming signals on the digital input. The impulses are counted by detecting the status change of the digital input (1->0 or 0->1).
  - Selection/Input Options:
    Edge: >rising< (status change “0” to “1”) or >falling< (status change “1” to “0”)
    Label: manual input
- **>Logging<**
  Logging of readings and the according status changes for diagnostic purposes. Evaluation is carried out by detecting the status changes of the digital input (1->0 or 0->1).
  - Selection/Input Options:
    Logic: >not inverted< or >inverted<
    Label: manual input

32.5.4 Digital Outputs

The number of digital outputs depends on the type (see Sect. “17.1 Device Types”).

The available digital outputs are shown in the top right corner of the display.

The digital outputs can be selected successively by pressing the right-hand control key >Tab<. The selection is shown as clear text message in the top left corner of the display.

Default setting: Output inactive

The following functions can be assigned to the digital outputs:

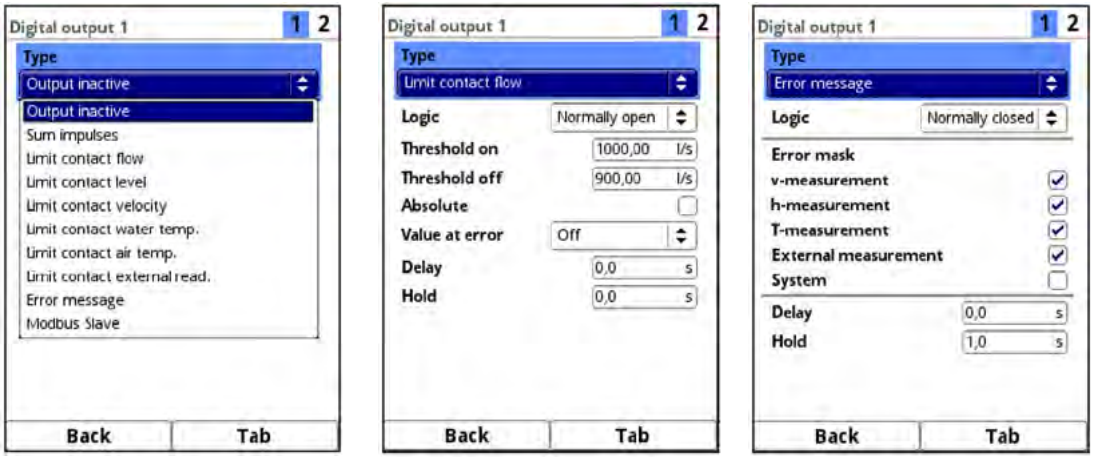


Fig. 32-19 Digital outputs: Activation / Limit contact flow / Error message

- **>Sum impulses<**
  Output of volume-proportional sum impulses.
  - Selection/Input Options:
    Logic: >Normally open< or >Normally closed<
    Negative sum impulses: check box
    Quantity: manual input
    Duration: manual input
- **>Limit contact flow<**
  If the entered upper flow limit value is exceeded, a digital signal is output. If the value falls below the lower flow limit, this digital signal is reset = hysteresis function to avoid output jitter.
  - Selection/Input Options:
    Logic: >Normally open< or >Normally closed<
    Threshold on: manual input
    Threshold off: manual input

Absolute: check
Value at error: >Off< or >On< or >Hold Value<
Delay: manual input
Hold: manual input

- **>Limit contact level<**
  If the entered upper level limit value is exceeded, a digital signal is output. If the value falls below the lower level limit, this digital signal is reset = hysteresis function to avoid output jitter.
  - Selection/Input Options:
    Logic: >Normally open< or >Normally closed<
    Threshold on: manual input
    Threshold off: manual input
    Absolute: check
    Value at error: >Off< or >On< or >Hold Value<
    Delay: manual input
    Hold: manual input
- **>Limit contact velocity<**
  If the entered upper velocity limit value is exceeded, a digital signal is output. If the value falls below the lower velocity limit, this digital signal is reset = hysteresis function to avoid output jitter. The calculated mean flow velocity is used (also calculated from several paths). Not possible with the combined measurement point.
  - Selection/Input Options:
    Logic: >Normally open< or >Normally closed<
    Threshold on: manual input
    Threshold off: manual input
    Absolute: check
    Value at error: >Off< or >On< or >Hold Value<
    Delay: manual input
    Hold: manual input
- **>Limit contact water temp.<**
  If the entered upper water temperature limit value is exceeded, a digital signal is output. If the value falls below the lower water temperature limit value, this digital signal is reset = hysteresis function to avoid output jitter.
  - Selection/Input Options:
    Logic: >Normally open< or >Normally closed<
    Threshold on: manual input
    Threshold off: manual input
    Absolute: check
    Value at error: >Off< or >On< or >Hold Value<
    Delay: manual input
    Hold: manual input
- **>Limit contact air temp.<**
  If the entered upper air temperature limit value is exceeded, a digital signal is output. If the value falls below the lower air temperature limit value, this digital signal is reset = hysteresis function to avoid output jitter.
  - Selection/Input Options:
    Logic: >Normally open< or >Normally closed<
    Threshold on: manual input
    Threshold off: manual input
    Absolute: check
    Value at error: >Off< or >On< or >Hold Value<
    Delay: manual input
    Hold: manual input

- **>Limit contact external read.<**
  If the entered upper external measured value limit is exceeded, a digital signal is output. If the value falls below the lower external measured value limit, this digital signal is reset = hysteresis function to avoid output jitter.
  - Selection/Input Options:
    Logic: >Normally open< or >Normally closed<
    Analog input: >Input 1< or >Input 2< or >Input x<; depending on the number of inputs available
    Threshold on: manual input
    Threshold off: manual input
    Absolute: check
    Value at error: >Off< or >On< or >Hold Value<
    Delay: manual input
    Hold: manual input
- **>Error message<**
  By activating individual selection fields (check box) it is possible to assign individual error types to the digital output. Moreover the output logic can be switched between normally open and normally closed.
  - Selection/Input Options:
    Logic: >Normally open< or >Normally closed<
    Error mask:
    v-measurement: check
    h-measurement: check
    T-measurement: check
    External measurement: check
    System: check
    Delay: manual input
    Hold: manual input
- **>Modbus Slave<**
  The digital output can be used via the Modbus for the controlled output of signals from other systems.
  - Selection/Input Options:
    Logic: >Normally open< or >Normally closed<

32.6 Setting Parameters in Q-Control Menu (function bookable as extra licence)

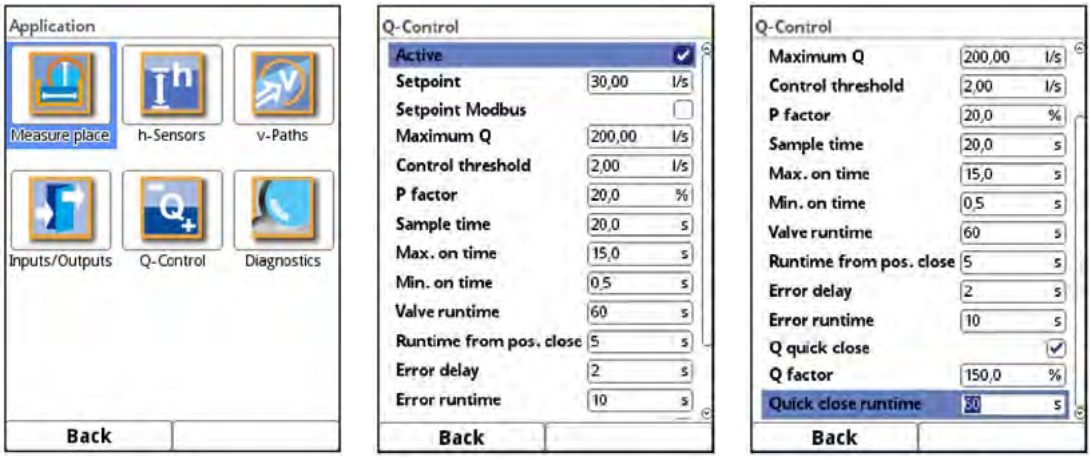


Fig. 32-20 Q-Control menu

This menu is available for Types TR and TZ as soon as the transmitters are equipped per default with a 3-step controller to drive a slide valve or other actuators (equipment option, see Sect. “17 Configuration”). Moreover, this controller function must be purchased separately as

function licence which subsequently needs to be unlocked.

⇨ See Sect. “17.2 Additionally bookable Function Licences” and “34.5.3 Feature unlock”.

To activate the regulator in this menu check the box next to >Active<.
Per default the control is inactive.

The values below must be selected or entered manually here:

- **>Setpoint<**
  Flow rate setpoint to set; control uses this value as a basis all further activities
- **>Setpoint Modbus<**:
  Check; the flow rate setpoint set previously is used for calculation in case of an error until a real measurement value is available again
- **>Maximum Q<**
  Maximum possible flow at the measurement place to compute the control value
- **>Control threshold<**
  Minimum difference between measurement value and setpoint until activation of slide valve
- **>P factor<**
  Transmission factor [%] of control difference to compute the control value; amplification factor of the regulator
- **>Sample time<**
  Time between two recalculation events of the regulator
- **>Max. on time<**
  Maximum permissible actuator control time
- **>Min. on time<**
  Minimum permissible actuator control time
- **>Valve runtime<**
  Time required [s] for opening (CLOSED -> OPEN) / closing the slide valve (OPEN -> CLOSED)
- **>Runtime from pos. close<**
  On-time [s], in case of a flow measurement error, until opening (after closing) the slide valve to set a defined slide valve position
- **>Error delay<**
  Waiting time [s], in case of a flow measurement error, until the slide valve is closed
- **>Error runtime<**
  Procedure time [s] of slide valve in the opposite direction, in case of a torque error; to clear a possible blockage
- **>Q quick close<**
  Check box; menu will be extended and both following values can be specified.
  Task: in case of suddenly overshooting of
  “>Setpoint< multiplied by >Q-Factor<”
  the slide valve will close using the defined >Quick close runtime<.
  - **>Q factor<**
    Factor [%] to trigger quick closing; in parameter range 120 % to 300 %
  - **>Quick close runtime<**
    On-time [s] of slide valve motor with triggered >Q-Quick close<.

32.7 Setting Parameters in Diagnostics Menu

The Diagnostics menu is described separately in greater detail in Sect. “Diagnostics” starting at page 140 of the instruction manual.

33 Data Parameter Menu

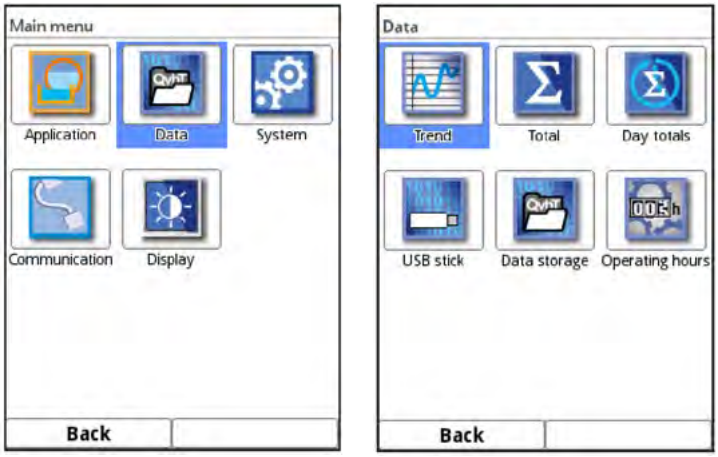


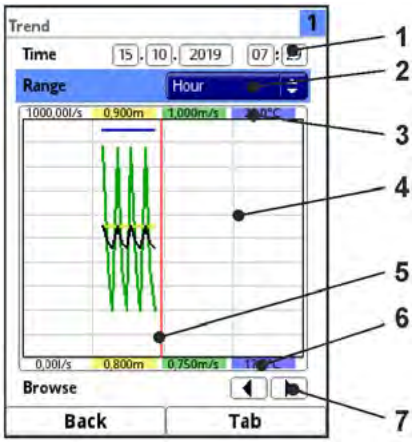
Fig. 33-1 Data menu

The data menu contains all internally saved readings and is subdivided in six submenus.

33.1 Trend

The Trend graph is a representational recorder function. Choosing the trend graph provides access to current and previously saved (historic) measurement data.

The individual measurement points are shown at the top right of the display. The Tab key can be used to scroll between the measurement points.



1 Date/Time selection
2 Indication period
3 Scaling max. range
4 Display with grid lines
5 Date/Time line
6 Zero point scaling
7 Browse (next/back)

Fig. 33-2 Trend Graph Details

➲ Procedure to view current measurement data:

1. Select the desired range (indication period).
   The selected range is shown. Measurement data are not automatically updated while represented (the current readings can be found in the lower third of the main screen).
2. Use the arrows (Fig. 33-2 no. 7) to browse next or back if required leaving the basic display settings unaltered.
3. In order to get back to the main screen press the left function (Back) three times.

The **Date/Time Selection** (Fig. 33-2 no. 1) can be found in the top area of the main screen. The line is highlighted blue and hence active.

➲ Proceed as follows to select a specific point in time (historical measurement data):

1. Pressing the rotary pushbutton engages the first field (day).
2. Specify the desired day.
3. Pressing the rotary pushbutton again takes you to the next field (month).
4. Repeat your entry until the desired time (day, month, year, hour, minute) is completely specified.
5. Confirm your entry with the right function key. Date and time will be accepted.
   The readings are shown in the display depending on the date and the period selected (Fig. 33-2 no. 2).
   The vertical red line (Fig. 33-2 no. 5) marks the selected point of time (date and time).

➲ Interrupt your entry by pressing the left function key (back).

Representation:
The selected period covers the area between the left and the right display margin.

The **period** within which data are to be represented can be modified.

➲ Modify the setting using the >Range< section (see Fig. 33-2 no. 2).

1. Turn the rotary pushbutton until >Range< is highlighted blue.
2. Press the rotary pushbutton – the selectable periods are shown.

Available are:

- (1) hour
- 4 hours
- (1) day
- (1) week
- 4 weeks

3. Turn the rotary pushbutton until the desired section is highlighted blue.
4. Confirm your entry with the right function key. The desired period will be accepted.

Representation:

- The vertical red line marks the selected point of time (date and time).
- The representation grid is internally fixed.
- The selected period >Hour< always begins left with minute “0” and ends right with minute “59”.
- For increased readability the screen is divided by three vertical help lines. Each division represents a period of 15 minutes.

Underneath the display you can find the **function >Browse<**.

Use the arrow symbols to browse one hour forwards or backwards each time you press the button.

If **period >4 hours<** is chosen the start of the representation depends on the selected point of time.

Depending on the start time the representation begins:

- 00:00 h
- 04:00 h
- 08:00 h
- 12:00 h
- 16:00 h
- 20:00 h

Representation:

- The range of representation ends exactly 4 hours later on the right side.
- This representation is divided by three vertical help lines too. The distance between the lines is one hour.

Use the >Browse< function to move backwards and forwards within this screen in steps of 4 hours.

If **period >Day<** is chosen the representation begins always on the left at hour 00:00 and ends on the right at hour 24:00.

Representation:

- For increased readability the screen is divided by five vertical help lines. Each division represents a period of 4 hours.

Use the arrow symbols to browse one day forwards or backwards each time you press the button.

If **period >Week<** is chosen the representation begins always on the left at “Monday 00:00 h” and ends on the right at “Sunday 24:00 h”.

Representation:

- For increased readability the screen is divided by six vertical help lines. Each division represents one weekday.

Use the arrow symbols to browse one week forwards or backwards each time you press the button.

If **period >4 Weeks<** is chosen the representation begins always on the left at “Monday 00:00 h” and ends on the right at “Sunday 24:00 h”.

Representation:

- The reference point in time of the 4-weeks representation is the 29.12.1969, 00:00 h.
- For increased readability the screen is divided by three vertical help lines. Each division represents a period of 7 days.

Use the arrow symbols to browse four weeks forwards or backwards each time you press the button.

Note

Once the period >4 Weeks< is selected it may take a few seconds to load the data completely.

33.2 Total

The totals, divided into positive and negative totals, for the respective measurement points are displayed. In addition, the resettable totals are displayed and they can also be reset using the >Reset total< button.

The individual measurement points are shown at the top right of the display. You can scroll between the measurement points with the Tab key.

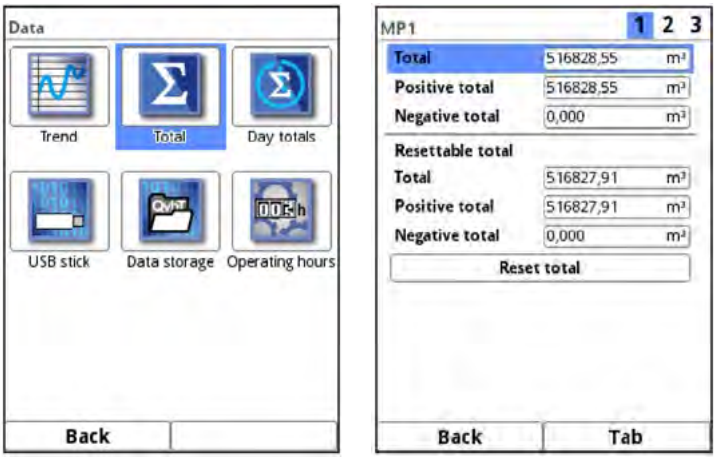


Fig. 33-3 Positive and negative totals

33.3 Day Totals

This is where the flow totals can be viewed in a table. Each value represents a period of 24 hours.

The individual measurement points are shown at the top right of the display. You can scroll between the measurement points with the Tab key.

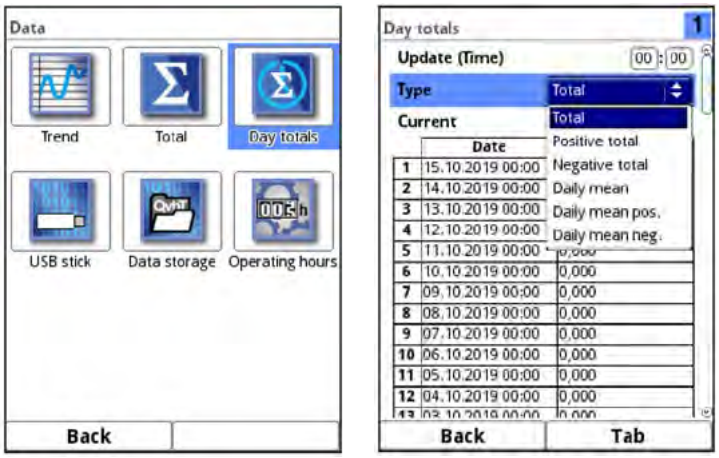


Fig. 33-4 Selection Day Totals

The sum type to be displayed can be selected under **>Type<**: **>Total<**, **>Positive total<**, **>Negative total<**, **>Daily mean<**, **>Daily mean pos.<** and **>Daily mean neg.<**.

A maximum of 100 totals (= 100 days) is stored. Starting with value 101 the oldest value will always be overwritten (ring memory).

➲ Turn the rotary pushbutton to the right to scroll down the table and to the left to scroll up again.

It is possible to view older day totals as well. A prerequisite to view older values is that the unit has run for a longer period.

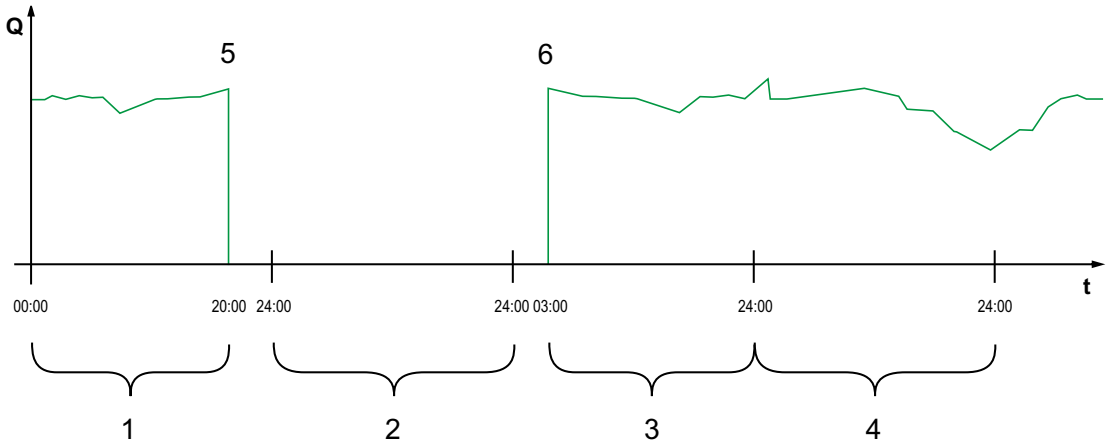
Example: 98 values – the unit is running for 98 days

In general, only totals created during days with the transmitter actually powered up can be

viewed.

If the transmitter should be shut down between two totalising events (< 24 hours) a total will be calculated by using **measured** values. Such a total is **not equal to the real daily flow rate** but corresponds to the rate measured by the transmitter while powered up.

Should the transmitter be shut down before the next totalising event and remains shut down until the moment of the following totalising event (> 24 hours) no total will be created for this period (see Fig. 33-5). Data will not be saved and the period remains to be unspecified. This “gap” can be identified from the completely missing entry (date/values) within the listed sequence. No empty lines will be created.



1 Total day 1: total covering 20 hours
2 Day 2: Power failure – no totalising
3 Total Day 3: Total covering 21 hours
4 Total Day 4: Total covering 24 hours
5 Power failure
6 Power available again

Fig. 33-5 Totalising scheme

- The totalising period is set to the period between 00:00 o’clock and 24:00 o’clock as **per default**. This means that the day totals are always created between 00:00 o’clock and 24:00 o’clock.
- The totals are created at 00:00 o’clock as **per default**.

➲ The time of totalising can be modified as follows:

1. Turn the rotary pushbutton until >Update (Time)< is highlighted blue.
2. Press the rotary pushbutton to activate the hours section.
3. Specify the desired time to start totalising (e.g. 08:00) and press the rotary push-button to confirm and simultaneously activate the minutes range.
4. Specify the desired minutes.
5. Confirm your specifications by pressing the right function key >Enter<.
   The time of totalising has now been changed to 08:00 o’clock.
   Due to these settings the 24-h-total will be automatically created covering the period between 08:00 o’clock and 08:00 o’clock of the following day.

The >Current< field indicates the subtotal accrued since the latest totalising event.

33.4 USB stick

Requirements to USB sticks:

- USB 2.0 supported
- FAT 32 format (or FAT 12 or FAT 16)
- Maximum permissible memory 32 GB

Working with USB stick:

➲ Plug the USB stick into the USB slot located above the display.

Functions:

- Transmission of measurement data to USB stick
- Instrument parameters can be saved to USB stick
- Saved parameters can be restored from USB stick back to the instrument
- Formatting the USB stick

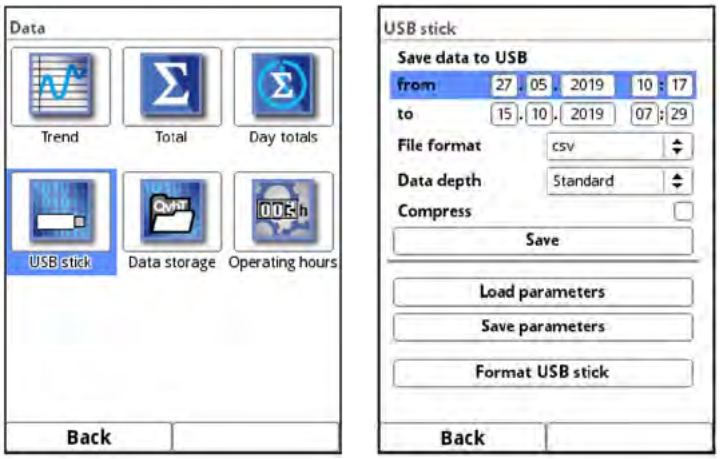


Fig. 33-6 Selection submenu

The transmitter is equipped with an internal data memory. Portions of your measurement data or the complete memory contents can be transmitted to USB stick.

Within this section it is possible to specify the desired period of transmission.

Per default the transmitter is set to transmit the data between the latest transmission and the current point in time. You are free to adjust this period as desired, however.

➲ To **transmit data** to USB stick proceed as follows:

1. Press the rotary pushbutton to engage the top field.
2. Turn the rotary pushbutton to specify the desired start day.
3. Press the rotary pushbutton again to get to the month input.
4. Repeat the procedure until the desired date and time have been specified completely.
5. Confirm your entries by pressing the right function key >Enter<.
6. Turn the rotary pushbutton to highlight the >to< field blue.
7. Press the rotary pushbutton to set the desired stop day.
8. Specify the desired stop time as described before.
   Now the period of data to be transmitted to USB stick is specified.

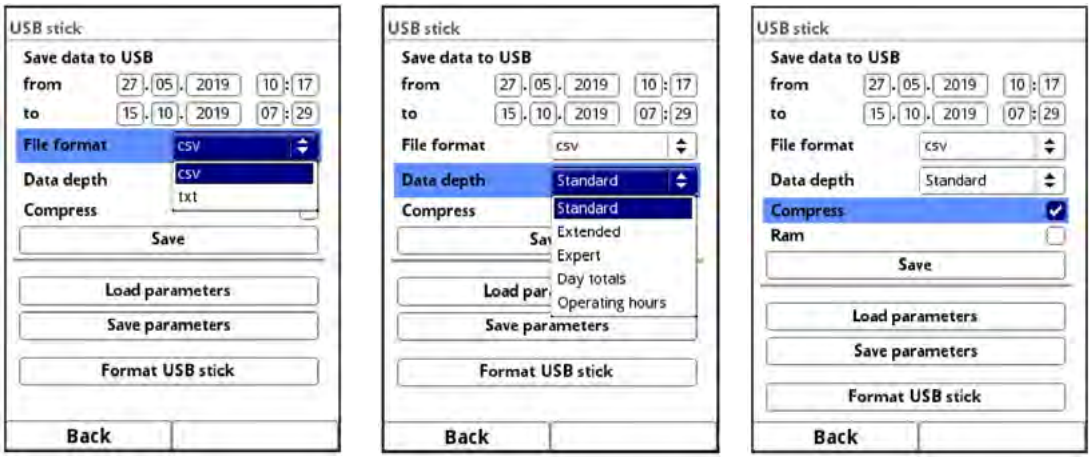


Fig. 33-7 Transmission period / data depth / compression

9. To choose the desired data format turn the rotary pushbutton which opens a selection menu.
   The formats txt and csv are available.
10. Press the rotary pushbutton to accept the data format.

The selectable **data depth** comprises five possible levels:

- **Standard**

  This is the appropriate format for most applications and hence is the default setting.
  The saved data sets contain the following information:

  - Date and time
  - Totaliser
  - Calculated flow rate
  - Level
  - Average flow velocity
  - Water temperature
  - Current values as well as the accordingly calculated values of enabled analog and digital inputs

- **Extended**

  This option is appropriate for the verification of critical, important applications and is required mainly for servicing personnel.
  The saved data sets contain the following information:

  - All data sets from the previous data depth >Standard<
  - Average flow velocities of the v-Paths

- **Expert**

  This option is appropriate for the verification of critical, important applications and is required mainly for servicing personnel.
  The saved data sets contain the following information:

  - All data sets from the previous data depth >Extended<
  - Noise
  - Amplification

- **Day Totals**

  This option saves only the day totals, no individual values.

- **Operating hours**

  This option saves only the operating hour totals, no individual values.

The **>Compress< function** makes sense only when large data sets are to be transmitted. In such cases the selected files are zipped as ".zip" files. If the check mark is set, you can also select **>Ram<** and the data will be written to RAM instead of to a USB stick.

➲ After a transmission period, data format and data depth have been defined the data can be saved on a USB stick.

1. Activate the **>Save<** button.
2. Press the rotary pushbutton to save the data to a USB stick.

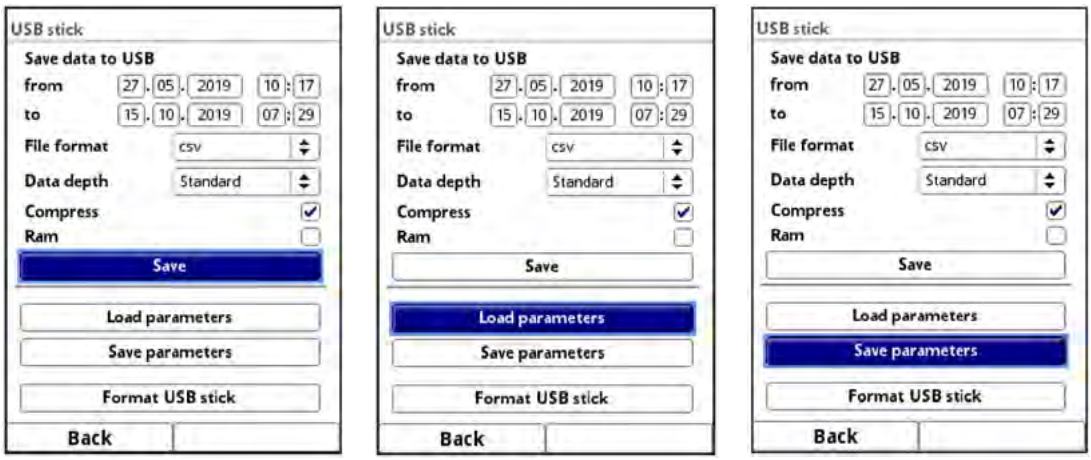


Fig. 33-8 Save/load parameters

Depending on the data depth set, the created table may contain the data or the according information below. The units in [ ] correspond with the default settings but can be modified if required.

Header	Data depth	Meaning
Date	Standard, Extended, Expert	Date of table entry (saving date)
Time	Standard, Extended, Expert	Time of table entry (saving time)
app1_sum [m³]	Standard, Extended, Expert	Cumulative value of measured flow rate at the saving time
app1_q [m³/s]	Standard, Extended, Expert	Average calculated flow rate in storage cycle
app1_h [m]	Standard, Extended, Expert	Average and used level height in storage cycle
app1_v [m/s]	Standard, Extended, Expert	Average and used flow velocity in storage cycle
app1_t_water [°C]	Standard, Extended, Expert	Average calculated water temperature in storage cycle

app1_t_air [°C]	Standard, Extended, Expert	Average calculated air temperature in storage cycle when using an air-ultrasonic sensor
app1_h_isensor [m]	Extended, Expert	Average calculated air temperature in storage cycle when using an i-Series sensor
p1_v [m/s]	Extended, Expert	Path velocity
p1_g_srch [dB]	Extended, Expert	Signal amplification of search scan
p1_g_sig [dB]	Extended, Expert	Signal amplification of measurement signal
p1_ntyp_up [dBµ]	Extended, Expert	Typical noise on channel 1 towards the flow direction / upstream
p1_nmax_up [dBµ]	Extended, Expert	Maximum noise on channel 1 towards the flow direction / upstream
p1_ntyp_dn [dBµ]	Extended, Expert	Typical noise on channel 1 in flow direction / downstream
p1_nmax_dn [dBµ]	Extended, Expert	Maximum noise on channel 1 in flow direction / downstream
sys_t [°C]	Expert	Temperature in the transmitter

Tab. 33-9 Explanations on the data (USB storage)

The function **>Load Parameters<** permits to load data files previously saved to USB stick back to the transmitter.

By using the function **>Save Parameters<** you can save all parameters of the measurement place to USB stick. During this procedure a total of two files will be created and saved.

Formats of the created files:

- **XXXX_DOC_AABBCCDDEE.pdf**
  This file is for documentation purposes and contains basic settings as well as modified parameter settings.
- **XXXX_PAR_AABBCCDDEE.xml**
  This file contains the complete parameter set for the transmitter and is used to save the parameter settings.

Explanation of file names:

XXXX	=	Name of measurement place as set
AA	=	Year
BB	=	Month
CC	=	Day
DD	=	Hour
EE	=	Minute

➲ You can convert unformatted or incorrectly formatted USB sticks into the correct format directly on the instrument:

1. Turn the rotary pushbutton until >Format USB-Stick< is highlighted blue.
2. Press the rotary pushbutton to format the plugged USB stick.
   >SUCCESSFUL< will appear in the display as soon as the stick has been formatted.

33.5 Data storage

This submenu can be used to modify the storage cycle and to erase the internal data memory.

Fig. 33-10 Data storage

Setting options for the storage cycle:

- 30 s, 1 min, 2 min, 5 min, 10 min, 15 min

Default setting for the storage cycle: 1 min

The mean value covering the entire cycle is **always** saved instead of the instantaneous value at the moment of storage.

Using the button **>Delete storage<** you can erase the complete internal data memory. The memory is password protected to avoid unintentional deletion.

Important Note

Erased data cannot be restored!

➲ Procedure:

1. Enter the required password to erase data.
2. Confirm the password with the right function key >Enter<.

33.6 Operating hours

The values of the total operating hours as well as the individual day totals can be viewed in the table here. Each value in the table covers 24 hours.

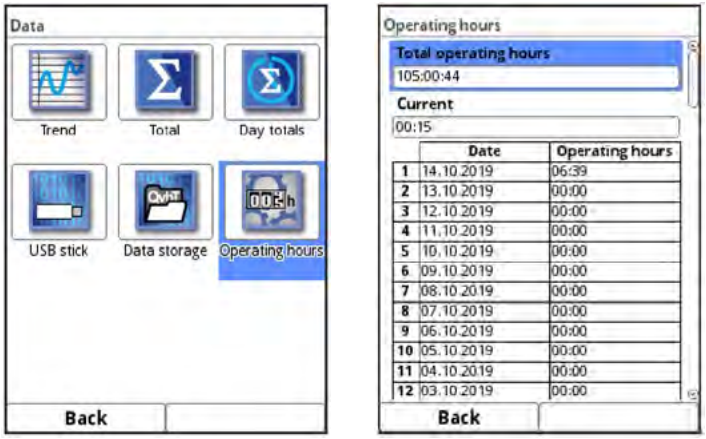


Fig. 33-11 Selecting Operating Hours

A maximum of 100 totals (= 100 days) is stored. Starting with value 101 the oldest value will

always be overwritten (ring memory).

➲ Turn the rotary pushbutton to the right to scroll down the table and to the left to scroll up again.

It is possible to view older day totals as well. A prerequisite to view older values is that the unit has run for a longer period.

Example: 98 values – the unit is running for 98 days

In general, only the values at which the transmitter was actually in operation can be read off.

The **>Total operating hours<** and **>Current<** values can be selected and specified using the keypad (e.g. if the transmitter had to be replaced).

34 System Parameter Menu

34.1 Information

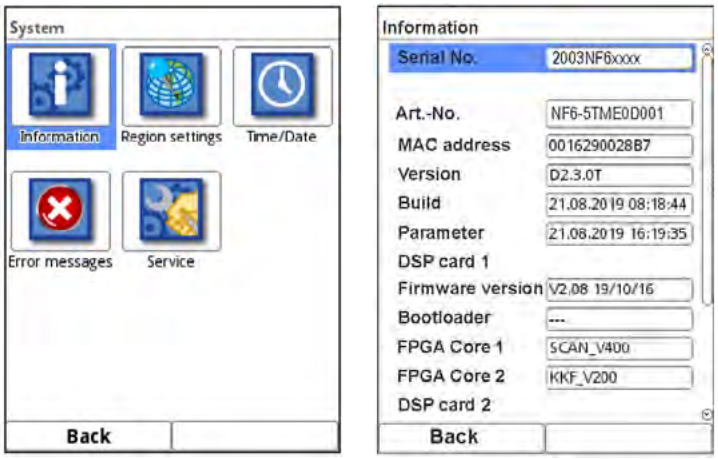


Fig. 34-1 System submenu/system information

>Information< is a read-only menu and provides the instrument information below:

- Serial no. and article no.
- MAC address
- Firmware version of the transmitter

Furthermore, you can find here the following information on the activated sensors and extension modules:

- Article numbers
- Current firmware versions
- Serial numbers

34.2 Region settings

The following settings can be adjusted in this menu:

- (Operation) Language
- Date format
- Units of measurement values
  Here it is possible to distinguish between indicated and saved measurement values.

Fig. 34-2 Language settings / language / date format

34.2.1 (Operation) Language

The following languages or alternative languages are currently available:

- English, German, French, Italian, Spanish, Portuguese, Swedish, Danish, Finnish, Polish, Hungarian, Romanian, Czech and Russian

34.2.2 Date Format

The following date formats can be set:

- DD.MM.YYYY (Day/Month/Year)
- MM/DD/YYYY (Month/Day/Year)

34.2.3 Units

➲ Procedure:

1. Turn the rotary pushbutton until the >Units< field is highlighted blue.
2. Press the rotary pushbutton to turn the PLUS on the left to MINUS and to open the selection list at the same time.
3. Turn the rotary pushbutton to the desired option.

Decimal Separators

- Comma
- Full stop

The decimal separators specified here are used only for indication in the transmitter display.

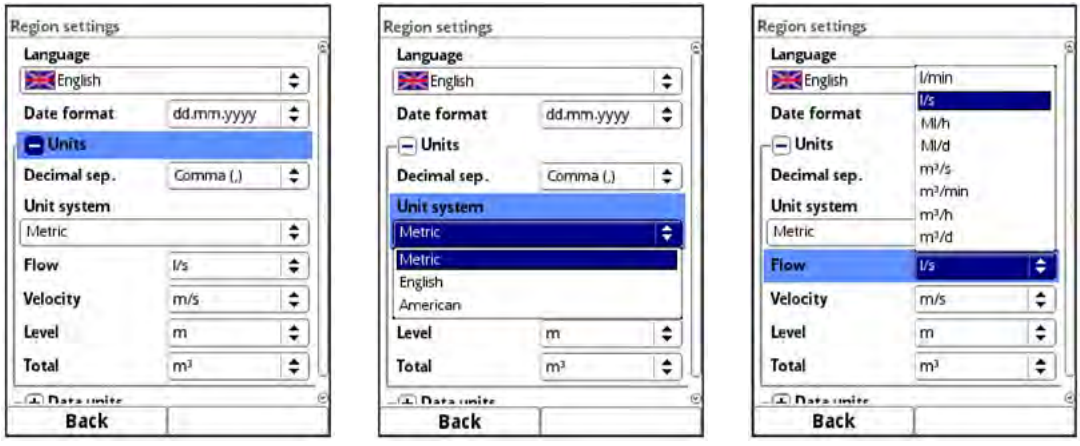


Fig. 34-3 Units system

Units system
Available units:

- Metric
- English
- American

The adjustable units depend on the selected units system:

- In metric system - e.g. liter, cubic metre, cm/s etc.
- In English system - e.g. ft, in, gal/s etc.
- In American system - e.g. fps, mgd etc.

Units for display representation

- Flow
- Flow velocity
- Level
- Total
- Temperature (in unit system "English" only)

34.2.4 Data Units

➲ When adjusting the >Data units< proceed right as described under >Units<.

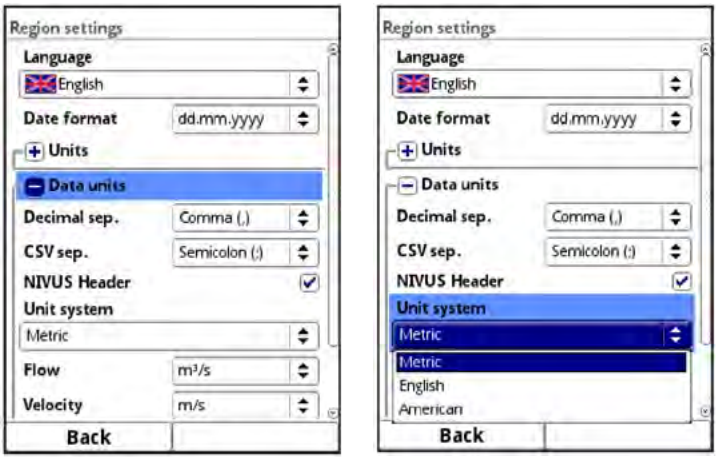


Fig. 34-4 Data units

In the **>Data units<** section the detected measurement values are **converted and saved** according to the selected unit.

Decimal Separators

- Comma
- Point

Specifying the decimal and csv separators is vital for correctly reading the data. When evaluating measurement data using other than German software applications (e.g. English Excel) be sure the decimal and csv separators are selected correctly.

CSV Separators

- Comma
- Semicolon

NIVUS Header
When the check mark is set, a NIVUS logo is displayed/printed on the output table. Without a check mark there is no NIVUS logo and the table appears neutral.

Units for storage

- In metric system - e.g. l/s, m³/s, m³/d, cm/s etc.
- In English system - e.g. ft³/s, in, gal/min, Mgal/d, in/s, yd/s etc.
- In American system - e.g. gps, gpm, cfs, cfm, cfh, cfd, mgd etc.

Units for storing measurement data

- Flow
- Flow velocity
- Level
- Total
- Temperature (in unit system "English" only)

34.3 Time/Date

This submenu is used to change the system time of the transmitter and the current date.
This function is required to select summer or winter time, after power failure or if the internal buffer battery should fail. If the transmitter is operated for a long period the internal clock may deviate. The deviations can be corrected here.

Note

Changing the system time will affect data storage. With the data storage enabled double data sets or data gaps may occur after the system time has been changed.

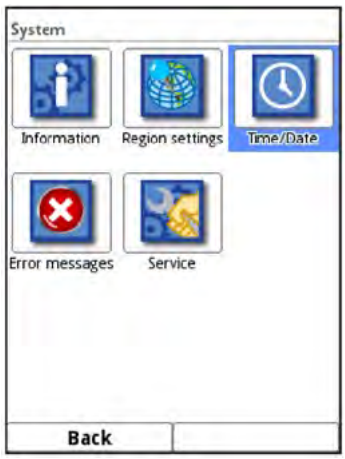


Fig. 34-5 Selecting Time/Date

The current system time as well as the time zone (UTC or GMT) relative to the zero meridian can be adjusted here.
The time server (SNTP) can be activated here, as well.

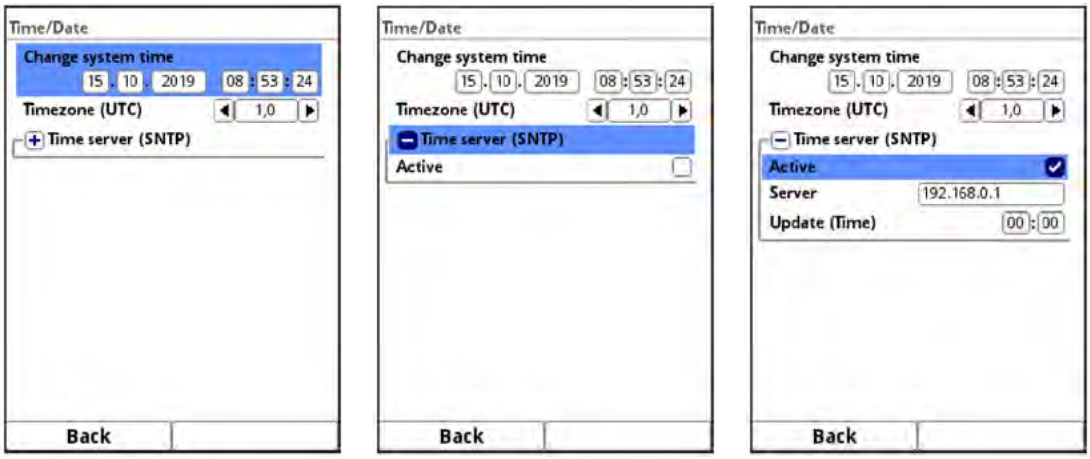


Fig. 34-6 Settings

34.4 Error messages

Use this menu to recall the currently active queued error messages and to erase the error message memory.

The memory is password protected to avoid unintentional deletion.

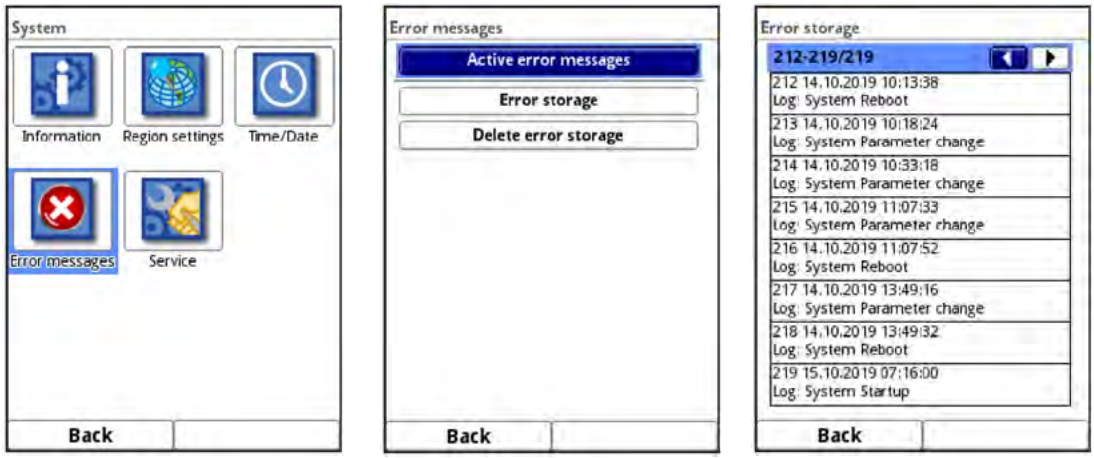


Fig. 34-7 Error messages

⇨ See also Sect. “Error Messages” starting at page 156.

34.5 Service

This submenu contains the following functions:

- Service level
- Change password
- Feature unlock
- Reboot (system)
- Restart measurement
- Parameter reset
- Update NivuFlow (service level with password)
- Update h-Sensor (service level with password)

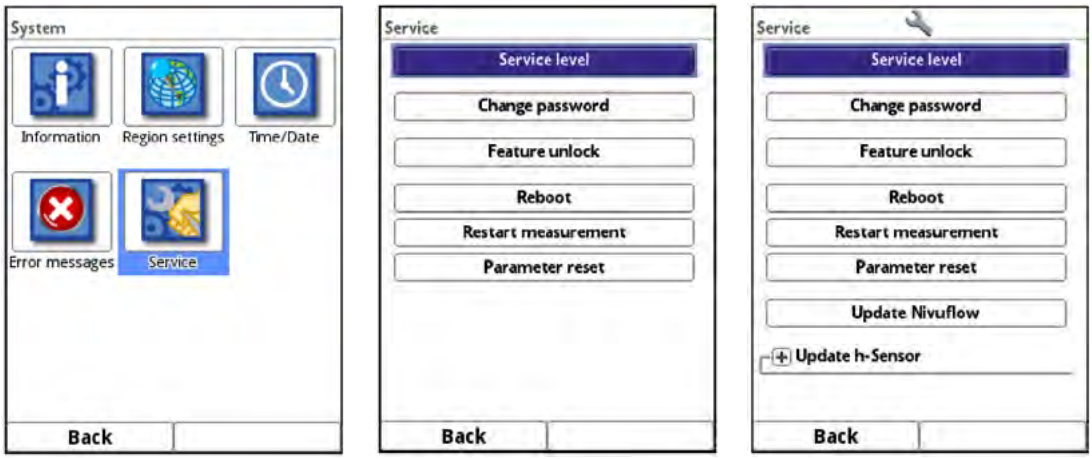


Fig. 34-8 Service

34.5.1 Service Level

Additional functions and settings are stored at various points under the **service level**, which can be activated with the transmitter password.

Further service levels are reserved for the NIVUS customer service as well as authorised expert companies and hence are protected by **special service passwords**.

System-relevant modifications and special settings for particular applications can be adjusted here.

Such modifications shall be executed by the NIVUS commissioning personnel exclusively!

34.5.2 Change (System) Password

Default password: “2718”

NIVUS recommend that this password is changed in order to protect the system from unauthorised access. You are free to select any password with a maximum length of ten digits.

For your own safety we recommend you share your password only with **authorised individuals**.

A password changed by you **cannot** be recovered by NIVUS!

If the password is lost, the entire system must be reset; set parameters will be lost and must be re-assigned.

Write down your password and store it in a safe place.

⇨ See also Sect. “30.3 Change Password”.

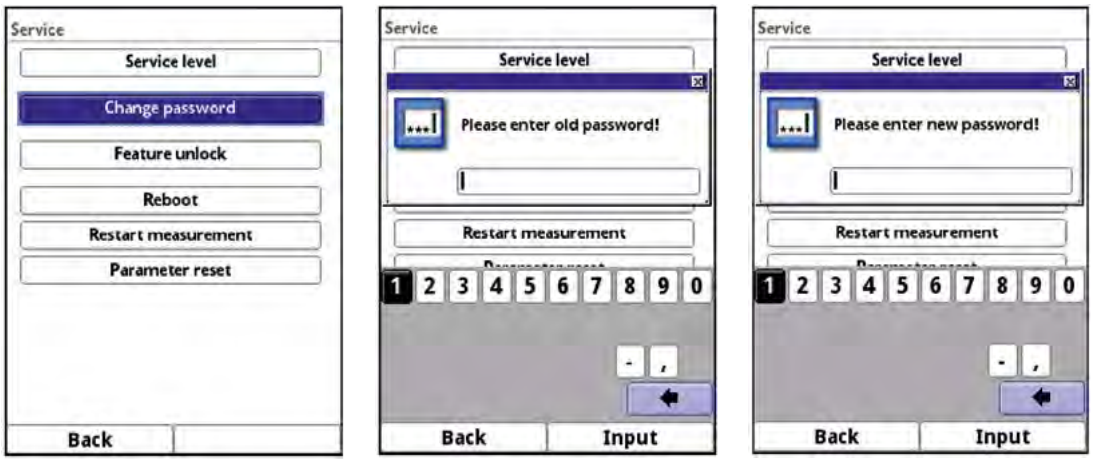


Fig. 34-9 Changing the (system) password

34.5.3 Feature unlock

Use this function to unlock (optionally available) features provided that they have been ordered from NIVUS.

➲ Feature unlocking procedure:

1. Click button >Feature Unlock<.
2. In the menu opening up click >Feature Unlock< button.
3. Enter function code and confirm with "Input".
   The transmitter confirms the feature unlock indicating "Successful". The assigned licence is shown in the display.
4. The unit requires a restart. Subsequently, the new features are available in the according menus and now can be adjusted and used.

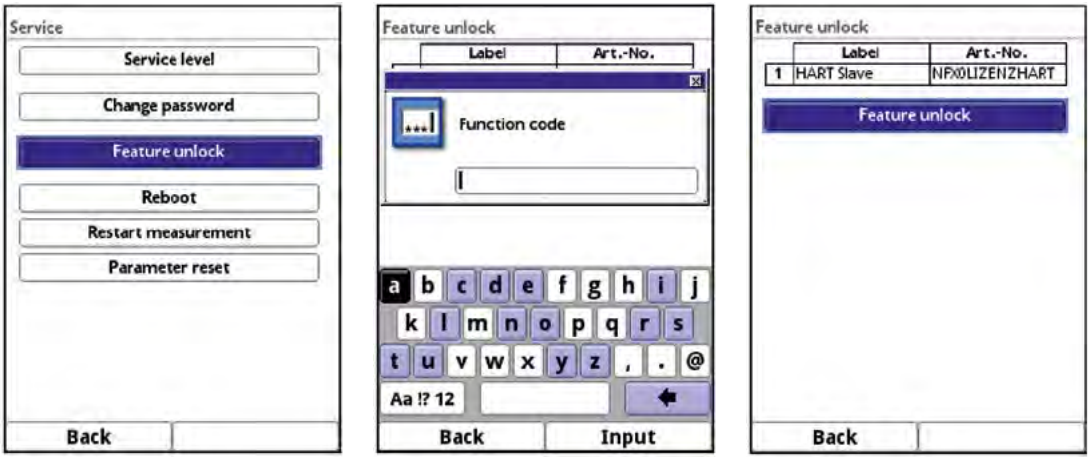


Fig. 34-10 Feature unlock

34.5.4 Reboot

A transmitter reboot will interrupt the current measurement process.

The system will reboot using the parameters set and saved last. After booting, the system behaves as when the instrument is switched on (like a PC).

This menu point replaces the system shutdown and reboot.

All parameters, counters and saved data are retained.

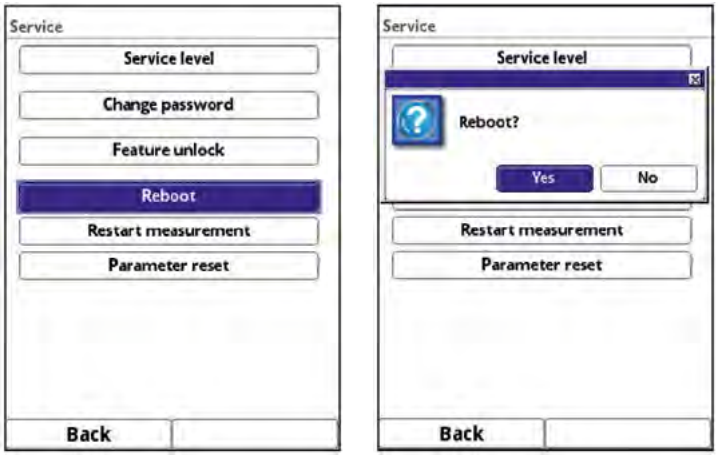


Fig. 34-11 Reboot

34.5.5 Restart Measurement

This option interrupts the currently running measurement process and starts a new measurement.

34.5.6 Parameter reset

The parameter reset will reset any parameters to default settings. Counters, changed password and saved measurement data are retained.

The actual parameter reset is not executed before you exit the parameter settings menu (back to main menu) and the storage is confirmed. The process can be aborted up to this action.

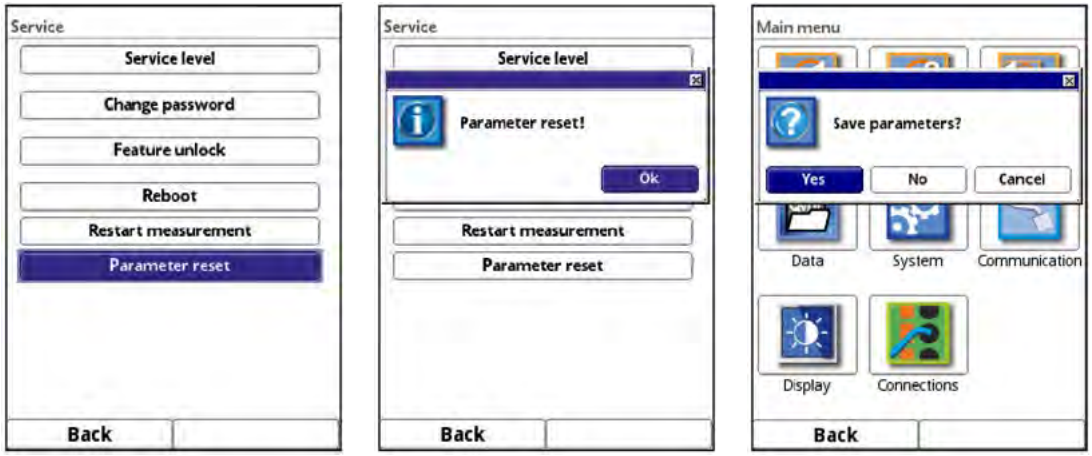


Fig. 34-12 Resetting the parameters to default settings

34.5.7 Update NivuFlow

Upload a NivuFlow firmware stored on USB.

Accessible in Service Level.

Only in consultation with the companies of the NIVUS Group.

34.5.8 Update h-Sensor

Upload a sensor firmware stored on USB.

Accessible in Service Level.

Only in consultation with the companies of the NIVUS Group.

It is possible to update either all sensors together or only one sensor individually.

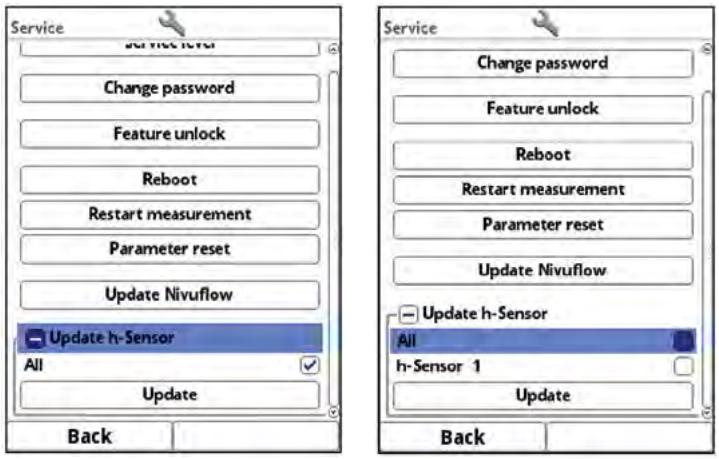


Fig. 34-13 Update h-Sensor

35 Communication Parameter Menu

This menu is used to set up communication to other devices.
Furthermore the network integration can be set up here as well. The details will not be explained here.
If you should not have the required IT skills we recommend you leave such tasks to **IT specialists** or the **NIVUS commissioning personnel**.

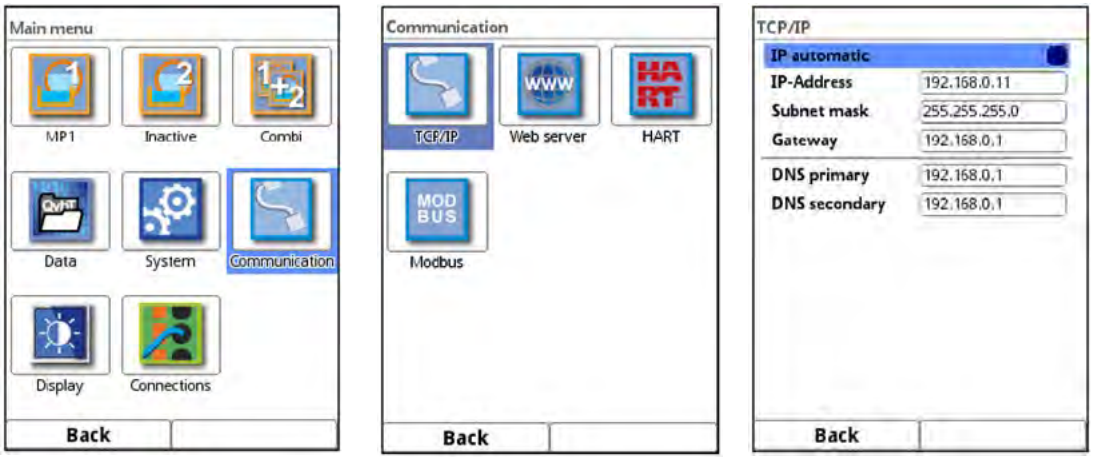


Fig. 35-1 Communication

35.1 TCP/IP

Settings for data transport within a decentralised network. Here the settings for the IP address and the domain are adjusted or only displayed.

- >IP automatic<:
  if active (check box) the IP address is provided automatically via DHCP by the network; the addresses are read-only parameters and cannot be changed manually; if the function is active the DNS can be selected automatically as well
- >IP-Address<:
  Address in the local network
- >Subnet mask<:
  Description of the local network
- >Gateway<:
  Address of a router (if existing only)
- >DNS<:
  Addresses of name servers for address resolution; divided into primary and secondary; only primary if >DNS automatic< is activated

35.2 Web server

Adjust the required settings for the remote control of the NivuFlow transmitter here. The web server provides all operation function via Internet as an alternative to operation on site.

Access data to the web server are specified. Operation is carried out remotely using a web browser via HTTP or a data transfer software application directly via the FTP server.

HTTP:

- >HTTP Acitve<:
  Enable unencrypted access via port 80
- >HTTPS Active<:
  Enable encrypted access via port 443

- >Username< and >Password<:
  Must be specified for access
- >Use own server certificate<:
  Check and choose file

FTP:

- >FTP<:
  Enable unencrypted access via port 21
- >FTPS<:
  Enable encrypted access via port 21
- >Password xxx<:
  Access to the various “drives” by the username; only parametrisation of the passwords required; default setting: nivus
- >Use own server certificate<:
  Check and choose file
- >Router Mode (FTPS)<.
  Check and enter the external IP address and relevant ports (Port Start / Port Num) eingeben; special FTP mode which allows TLS via router
  Precondition: the parametrisation of the transmitter has to match the router.

NF Remote:

- >NF Remote<:
  Allow remote access by NIVUS

Telnet:

- >Telnet<:
  Allow remote access via Telnet

Default Certificate:

- >Default Certificate<:
  Specify / change the used certificate; enter/select IP address and domain type (IP / name) or load >Root Certificate< from USB stick;
  The device has its own certificate, however, can be equipped with a third-party certificate via USB port.

Fig. 35-2 Web server

35.3 HART (extra function bookable as licence)

The communication function via HART must be purchased as bookable function licence which needs to be unlocked subsequently.

⇨ See Sect. “17.2 Additionally bookable Function Licences” and “34.5.3 Feature unlock”.

For communication via HART (using AO1) the ID information of the connected device needs to be specified.

Fig. 35-3 HART

35.4 Modbus

It is possible to integrate the transmitter into other systems via Modbus.

The Modbus protocols are available upon request if required. Contact the NIVUS GmbH headquarters in Eppingen.

Fig. 35-4 Modbus

The functions below are available here:

- Slave address (1 to 247)
- TCP (Port used)
- RTU
  - Interface (RS232 or RS485)
  - Baud rate (1200, 2400, 4800, 9600, 19200, 38400, 57600 or 115200 baud)
  - Parity (None, Odd or Even)
  - Stop bits (1 or 2)

The following scaling can be set, as well:

- Scaling flow
- Scaling level
- Scaling velocity

- Scaling temperature
- Scaling analog
- Scaling total

The range resolution is defined by entering the values for 0 / 65,535 digits (or -32,768 / 32,768 when the check mark for “Signed” is set).

A value must be entered (default setting: “0”) for “Error value (digits)” in order to output an error message if an error occurs.

The scaling per digit is defined with “Scaling Total”.

Specialist knowledge required

These settings require extensive expert knowledge and require the use of NIVUS commissioning personnel or an authorized specialist company.

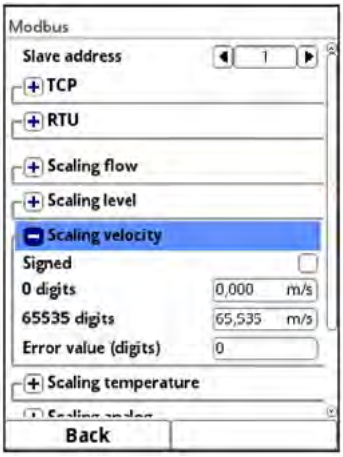


Fig. 35-5 Programming measurement value scaling

In >Diagnostics< menu the individual points (Reference Flow, Reference Total, Flow, Level, Velocity, Water temperature and Air temperature) can be viewed in greater detail.

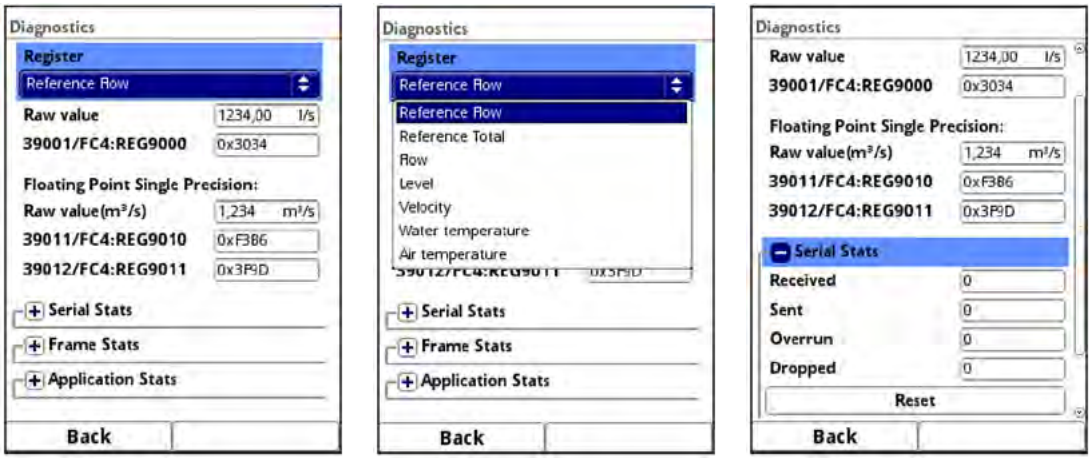


Fig. 35-6 Modbus diagnostics

The **Raw value** and the assignment of modbus registers are shown simultaneously.

Fixed values can be specified to adjust the scaling/transmission sequence between transmitter and connected Scada/PLC.

The statistics (Serial Stats, Frame Stats and Application Stats) are arranged in layers. Each one can be reset after viewing.

Serial Stats relate to the serial interfaces (not with access via Modbus TCP) and provide information on the number of received, transmitted and rejected/lost bytes.

Frame Stats refer to the communication frame and provide information on sources of errors such as the sequence of bytes, checksums, parity, valid packets and other errors.

Application Stats concern the application level and provide information on functional errors such as unsuccessful transmissions, not supported function codes, not assigned data addresses and other errors.

36 Display Parameter Menu

The following settings can be adjusted in the display menu:

- Backlight
- Designation of the five main screen fields
- Decimal places of individual value representations

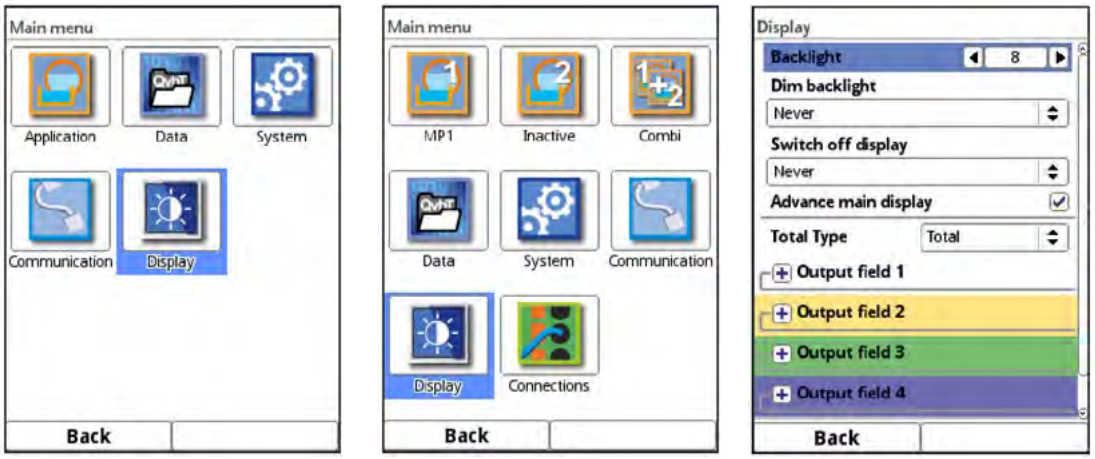


Fig. 36-1 Display / backlight / delay time

(Dim) backlight
The backlight can be adjusted in ten levels.

Adjust the backlight to the ambient conditions. Avoid setting the display too bright.

In order to extend the display life NIVUS recommend to enable the automatic display dimming option here (dim light). The display will dim automatically if it has not been used for a certain time. This period can be determined by using the delay time option (never, 30 s, 1 min, 2 min and 5 min).

As soon as settings are made on the transmitter (e.g. pressing a key) the display will go back to standard brightness.

Analog to display dimming the display can be also switched off (delayed) to save energy or remain to be switched on constantly.

Default setting: brightness level “8”, dim backlight and switch off display “Never”.

Advance main display (for multiple measurement place types only)
If the check mark is set, the main display automatically switches back and forth between the activated measurement points. Each measurement point and its current values are displayed for approx. 5 s without any further settings.

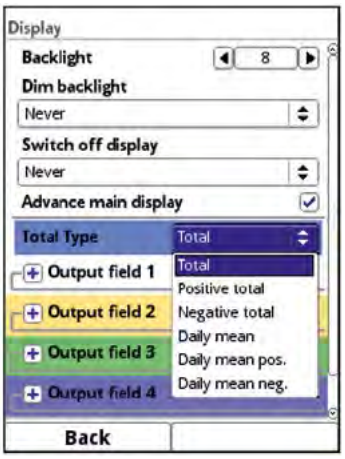


Fig. 36-2 Total Type

Total Type
The totals types to be displayed are defined here. The following options are available: >Total<, >Positive total<, >Negative total<, >Daily mean<, >Daily mean pos.< and >Daily mean neg.<.

Output fields
The five main screen output fields (>Flow<, >Level<, >Velocity<, >Temperature< and >Total< and/or flow for >Measurement place 1< and >Measurement place 2< and >Total< for measurement place Combi) can be defined by the user in terms of names and decimal places.

Note

*The values **assigned** to fields **cannot** be changed.*
*Example: the "Flow" field will **always** issue the flow value even if it has been renamed to "Temperature".*

The underlying colours of the output fields correspond to the colours of the values in the main display.

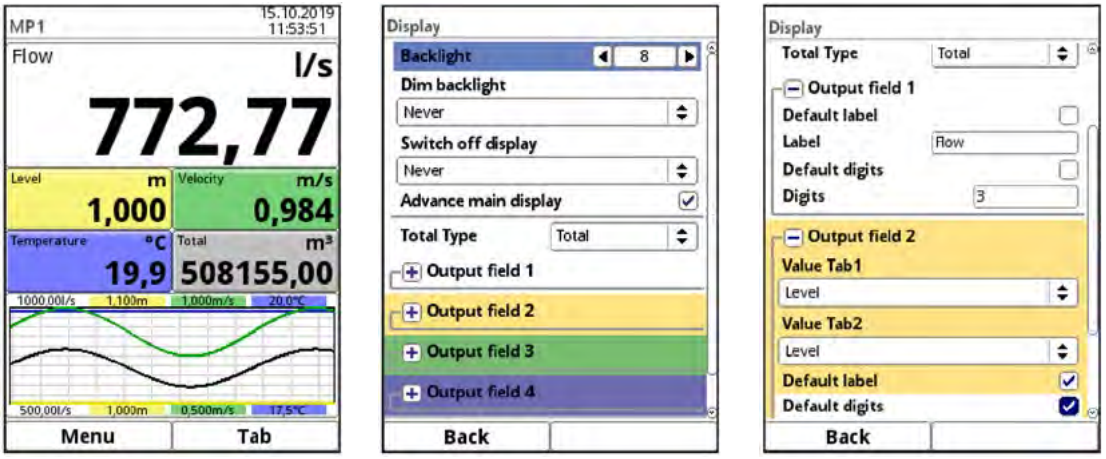


Fig. 36-3 Output fields, colours and settings

➲ **Renaming** procedure:

1. Unfold the output field.
2. Untick >Standard Name<.
3. Enter a new name. Any name can be entered. The length of the name is limited to 16 characters.
   The name entered **does not** change the values on the main screen.

The same procedure can be used to specify the desired number of **decimal digits**. Here a maximum of five decimal digits is possible.

Note

During setting the decimal digits observe the measurement accuracies of the sensors and the measurement units set.
The temperature sensor e.g. has a maximum resolution of 0.1 K.

The display fields 2, 4 and 5 offer setting options for two values each. The following applies >Value Tab 1< for measurement place 1 and >Value Tab 2< for measurement place 2.

The selection options are:

- Output field 2: >Level<, >Analog input 1<, >Analog input 2< and >Not active<
- Output field 4: >Water temperature<, >Air temperature<, >Analog input 1<, >Analog input 2< and >Not active<
- Output field 5: >Total<, >Analog input 1<, >Analog input 2< and >Not active<

37 Connections Parameter Menu

This submenu exists for multiple measurement place transmitter types (T4 and TM) only or for transmitter types which can be connected to extension modules (even if used only for one measurement place, types TM and TZ).

The extension modules are defined here: Arrangement/Setup and Baudrate.

The assignment of the terminal strips for the analog inputs/outputs and the digital inputs/outputs to the measurement points is defined in this menu. This assignment is used to display the calculated values (e.g. in the main display and in the parameter menus of the measurement points) and, if necessary, for the subsequent calculation with the values. The inputs/outputs first need to be assigned in the Connections menu so that they can be displayed and parameterized in the measurement place menu.

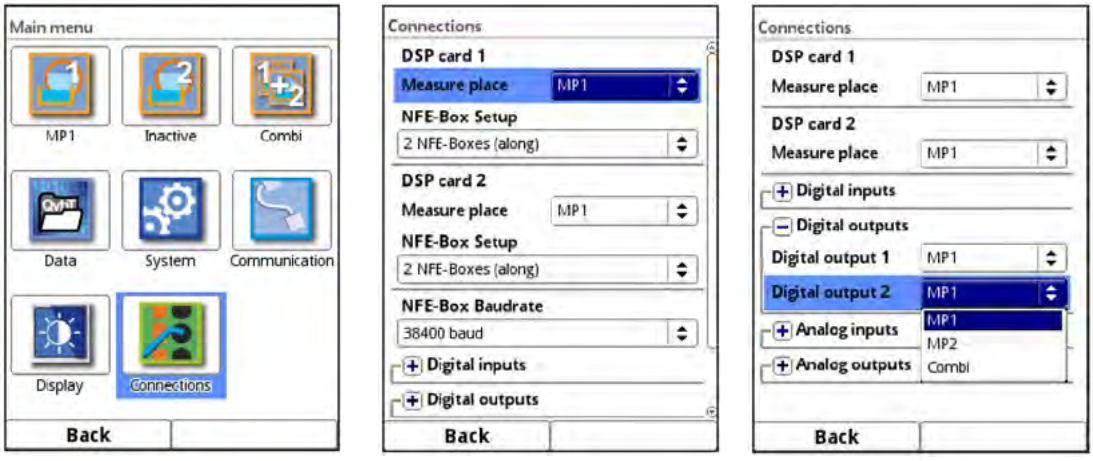


Fig. 37-1 Connections menu

Main Display

These two functions are available in the main display:

- Display values
- Direct access to the most important adjustment parameters

38 General overview

The following information can be found in the **top display line**:

- Name of measurement place
- Date (or 1, 2, 3; see Fig. 38-2)
- Time (or 1, 2, 3; see Fig. 38-2)

The **red full circle with white cross** in the top display line indicates current malfunctions of system or individual sensors.

The **service key** here indicates that the password has been entered within the last six hours and that any further **parameter changes** can be saved without having to re-enter the **password**. The six-hour period begins once the password is entered and ends automatically.

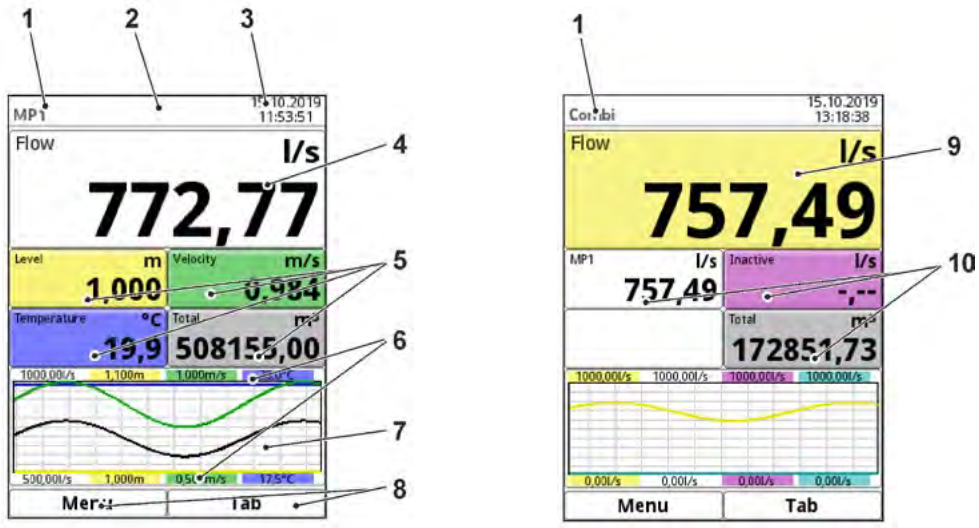
If a number is displayed next to the service key, the transmitter is in service mode. This is usually the case when a NIVUS service technician has access to the transmitter.

⇨ See also Sect. “30.2 Save Parameters”.

When in operation mode, the transmitter indicates the following important readings in the **main display sector** (default settings):

- Flow quantity
- Level
- Velocity (calculated average flow velocity)
- Medium temperature
- Total

The **bottom line** of the display shows a trend graph (hydrograph) as well as the current functions of both function keys.



1 Name of measurement place

2 Error message (if pending), information or display for active service mode

3 Date/Time
4 Display range 1 (Output field 1 for flow rate)
5 Display range 2 (Output field 2...5 for level, average flow velocity, medium temperature and total)
6 Automatic scaling for display range 3
7 Display range 3 (trend graph on level, velocity, medium temperature and amount)
8 Operating display for the assignment of the function keys
9 Display range 4 (Output field 6 for flow rate of combined measurement place - Combi)
10 Display range 5 (Output field 7...9 for the flow rates for measurement point 1 and measurement point 2 and for the sum from the combined measurement points)

Fig. 38-1 Main screen overview

The **main display** for types T4 and TM (with several measurement points) **switches** back and forth between the active measurement points, provided that switching is activated under >Advance main display< (see Sect. “36 Display Parameter Menu”). Clicking on the display fields stops the display switching.
You can scroll between the individual measurement points **manually** using the **Tab key**.

The menu allows **direct access** to the most relevant settings and information:

➲ Rotate the rotary pushbutton until the desired section is highlighted in black.

➲ Press the rotary pushbutton - the relevant section will open a dialogue window.

As soon as the display fields are selected (shown in black), the numbers 1...3 are displayed in the upper right-hand corner instead of date and time for the types T4 and TM:
1 - measurement place 1
2 - measurement place 2
3 - measurement place Combi

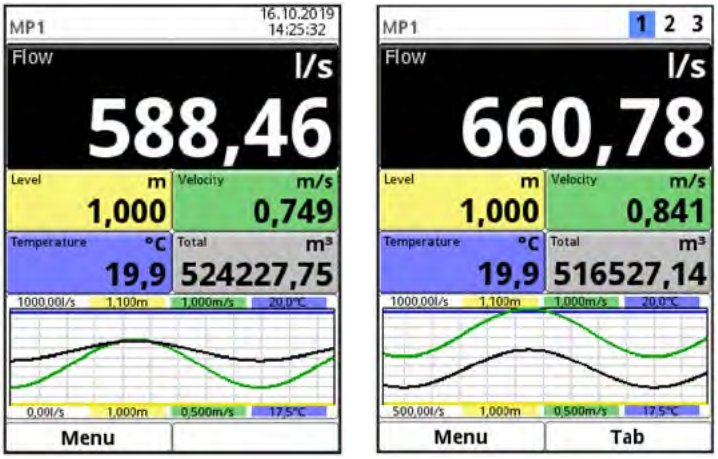


Fig. 38-2 Flow volume section selected (figure on the right side: types T4/TM)

Note

After having modified the system-specific parameters, you need to confirm that the modifications are saved to activate the modified parameters.

38.1 Display Flow in measurement places 1 and 2

Once the dialog window has been activated by pressing the rotary pushbutton you can use the pop-up menu to access the individual menus (Information, Diagnostics, Settings, Display and Error messages) (see Sect. “34.1 Information”, “Diagnostics”, “32.1 Setting parameters in Measurement place Menu”, “36 Display Parameter Menu” and “34.4 Error messages”).

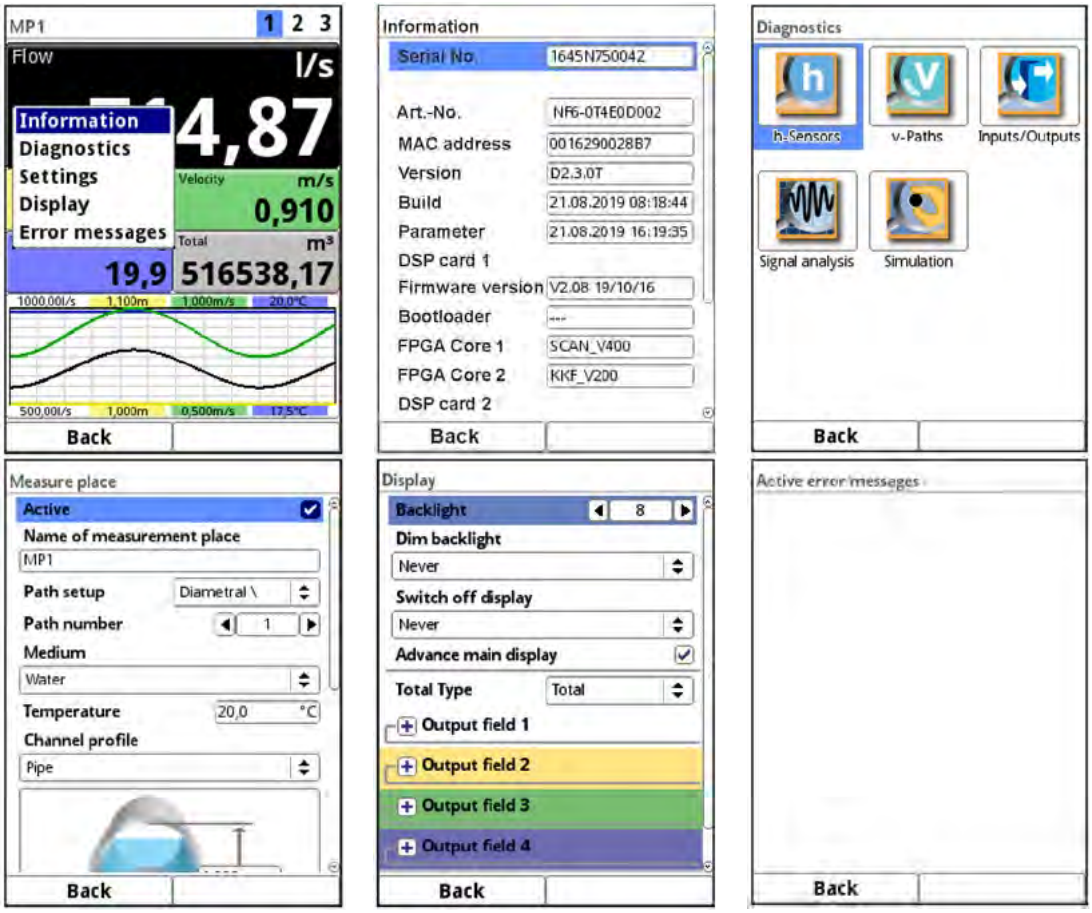


Fig. 38-3 Flow: Pop-up menu and pages

38.2 Display Level in measurement places 1 and 2

Once the dialog window has been activated by pressing the rotary pushbutton you can use the pop-up menu to access the individual menus (Diagnostics, Settings and Display) (see Sect. “Diagnostics”, “32.1 Setting parameters in Measurement place Menu” and “36 Display Parameter Menu”).

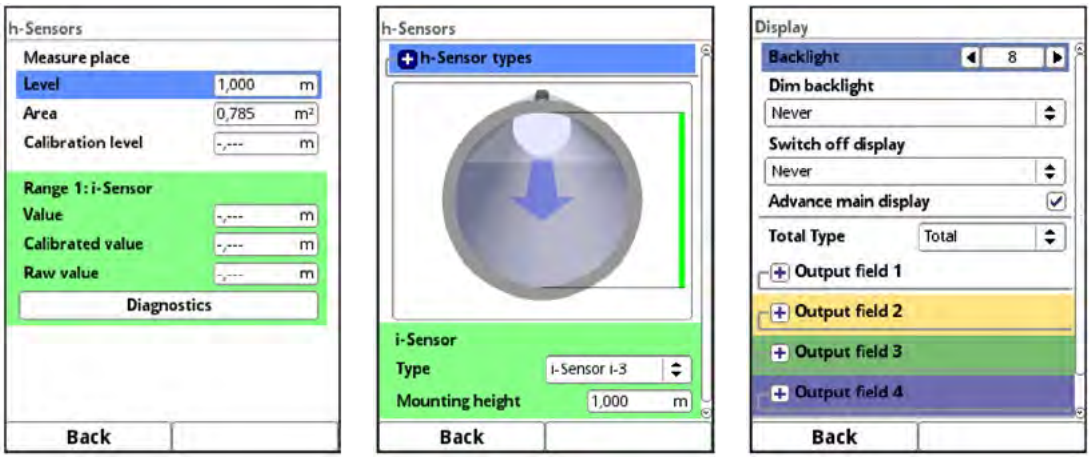


Fig. 38-4 Level: Pop-up menu and pages

38.3 Display Velocity in measurement places 1 and 2

Once the dialog window has been activated by pressing the rotary pushbutton you can use the pop-up menu to access the individual menus (Diagnostics, Settings and Display) (see Sect. “41 Diagnostics v-Paths”, “32.4 Setting parameters in v-Paths Menu” and “36 Display Parameter Menu”).

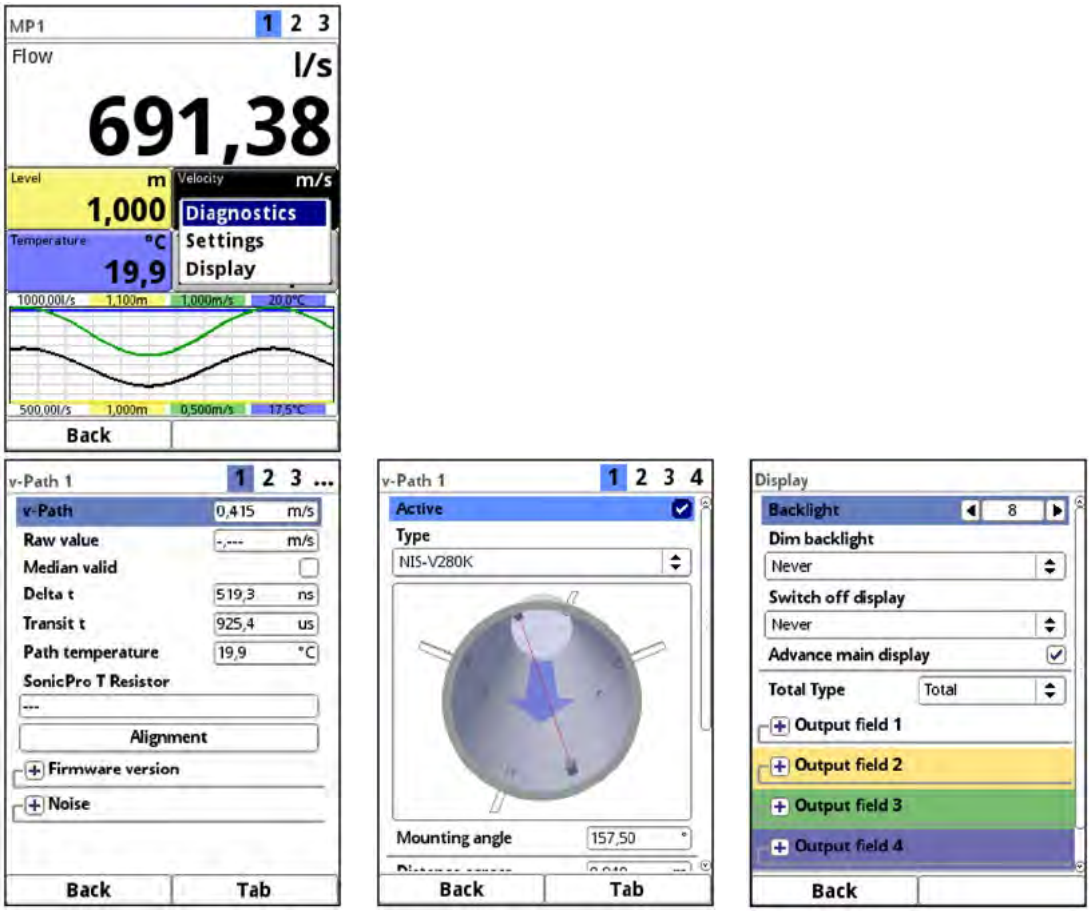


Fig. 38-5 Velocity: Pop-up menu and pages

38.4 Display Temperature in measurement places 1 and 2

Once the dialog window has been activated by pressing the rotary pushbutton you can use the pop-up menu to access the menu Display (see Sect. “36 Display Parameter Menu”).

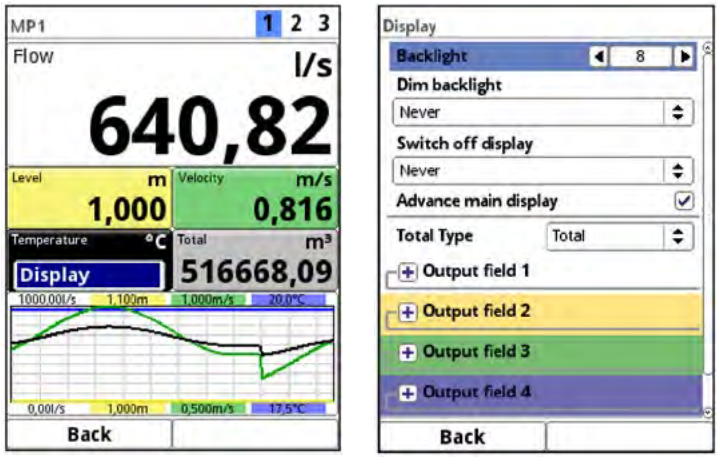


Fig. 38-6 Temperature: Pop-up menu and page

38.5 Display Sum in measurement places 1 and 2

Once the dialog window has been activated by pressing the rotary pushbutton you can use the pop-up menu to access the individual menus (Total, Day Totals and Display) (see Sect. “33.2 Total”, “33.3 Day Totals” and “36 Display Parameter Menu”).

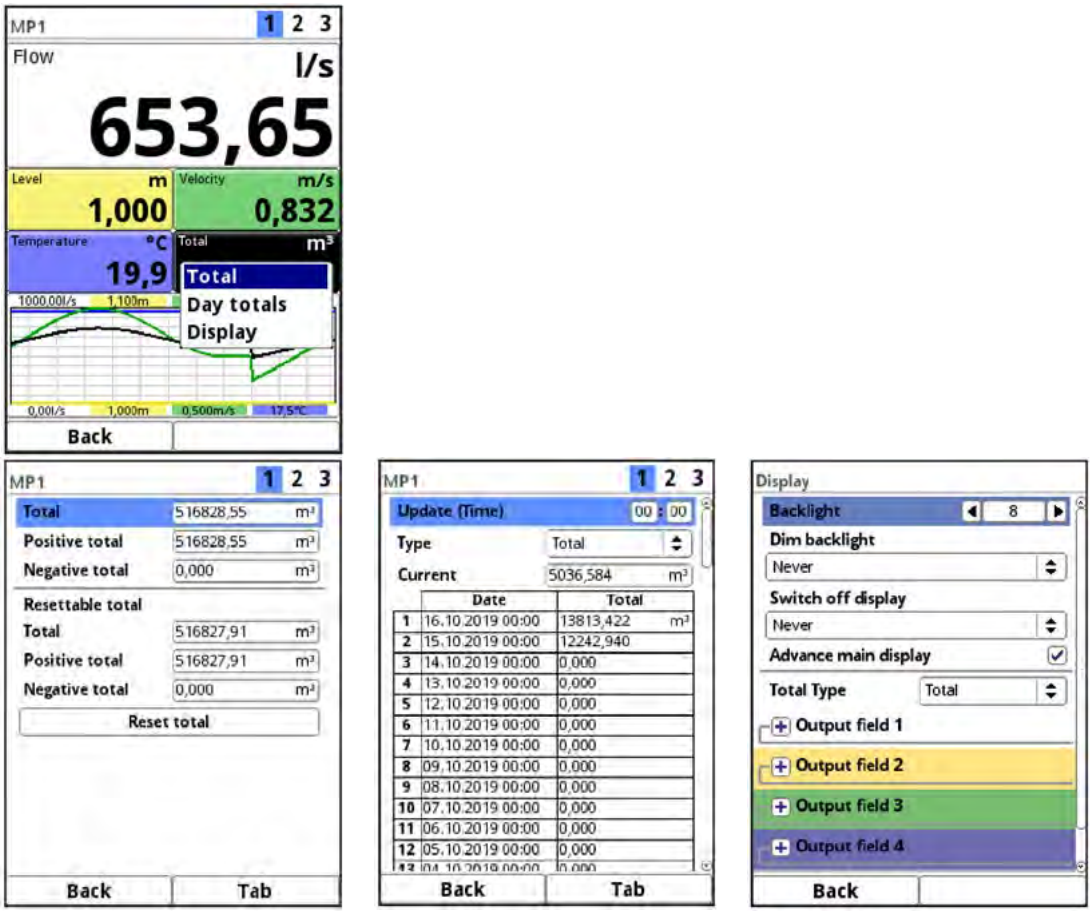


Fig. 38-7 Total: Pop-up menu and pages

38.6 Display Trend/Hydrograph in measurement places 1 and 2

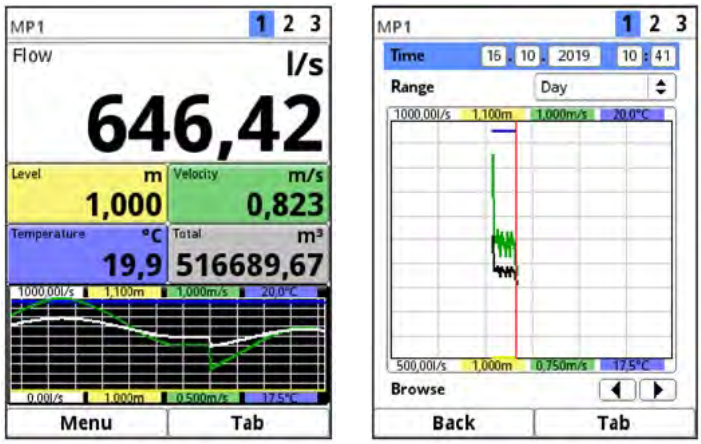


Fig. 38-8 Trend/Hydrograph: Pop-up menu and page

If more comprehensive and in-depth graphs should be required, the graph section can be selected directly.

Here you can specify display period as well as the display range.

Browse next or back within the selected period using the >Browse< arrow keys (located below the display).

38.7 Display Flow in measurement place Combi

Once the dialog window has been activated by pressing the rotary pushbutton you can use the pop-up menu to access the individual menus (Information, Diagnostics, Settings, Display and Error messages) (see Sect. “34.1 Information”, “Diagnostics”, “32.1 Setting parameters in Measurement place Menu”, “36 Display Parameter Menu” and “34.4 Error messages”).

Fig. 38-9 Flow Combi: Pop-up menu and pages

38.8 Display Measurement Place 1/2 in measurement place Combi

Once the dialog window has been activated by pressing the rotary pushbutton you can use the pop-up menu to access the individual menus (Diagnostics, Settings, Display and Error messages) (see Sect. “Diagnostics”, “32.1 Setting parameters in Measurement place Menu”, “36 Display Parameter Menu” and “34.4 Error messages”).

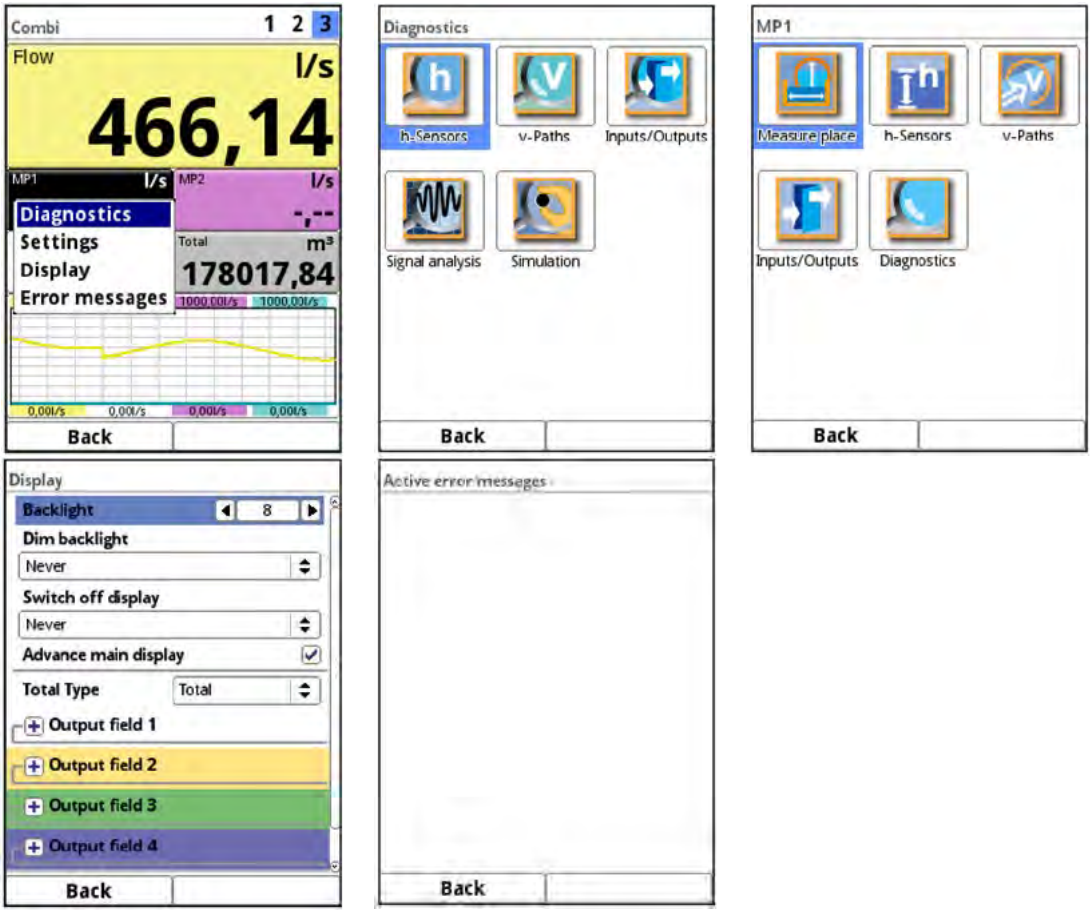


Fig. 38-10 MP1 Combi: Pop-up menu and pages

38.9 Display Total in Measurement Place Combi

Once the dialog window has been activated by pressing the rotary pushbutton you can use the pop-up menu to access the individual menus (Total, Day Totals and Display) (see Sect. “33.2 Total”, “33.3 Day Totals” and “36 Display Parameter Menu”).

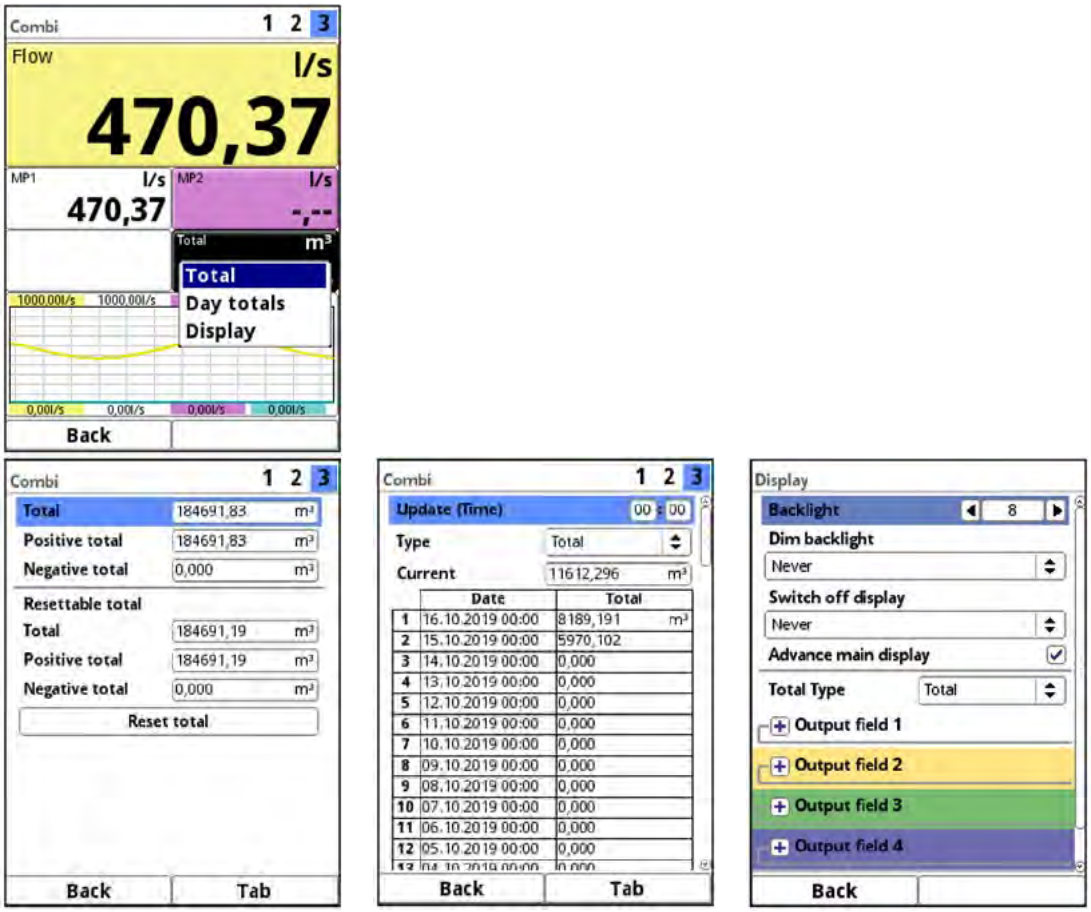


Fig. 38-11 Total Combi: Pop-up menu and pages

Diagnostics

39 Diagnostics Menu Principles

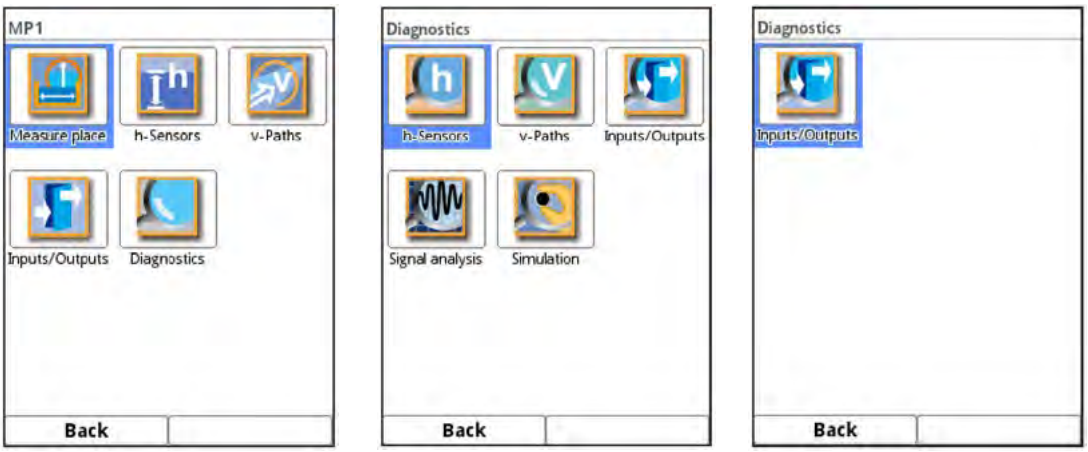


Fig. 39-1 Diagnostics Menu

The >Diagnostics< menu can be found in the >Application< menu and/or >MP x< and/or >Combi< menu. The diagnosis is divided into five submenus, except in the >Combi< menu, where there is only one submenu.

This menu and all its submenus are read-only and simulation menus.

Settings on the areas below can be viewed or simulated in this section:

- h-Sensors
- v-Paths
- Inputs and Outputs (state and simulation) (in >Combi< too)
- Signal analysis
- Simulation

Observe the safety information on simulation

Necessarily observe the safety information on simulation on page 154.

The Diagnostics section can also be very helpful for the operator for certain problems, but the main user is NIVUS Customer Service.

40 Diagnostics h-Sensors

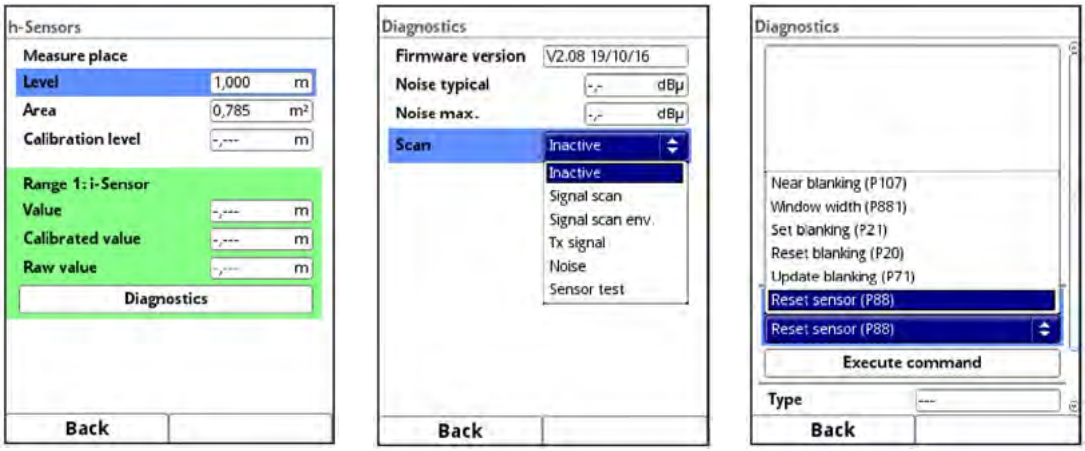


Fig. 40-1 Menu Diagnostics h-Sensors

This menu has a relation to the menu >Applications< / >h-Sensors<. Depending on the type and number of sensors defined here the sections are indicated in the corresponding colours.

⇨ See Sect. “32.3 Setting parameters in h-Sensors Menu”.

The Diagnostics screen shows the current level. The adjustment height can be set and must be confirmed with OK. The adjustment height is equal to the offset and is normally specified when the h-sensor parameters are set.

Depending on which sensors are selected the value, the calibrated value or the raw value are indicated.

- Value: issued value
- Calibrated value: corrected used value
- Raw value: real measured value

With the >Diagnostics< button it is possible to indicate information on “Signal scan env.”, “Signal scan”, “Tx signal”, “Noise” and “Sensor test” (depending on the connected/selected sensor type) if required.

Various commands such as “Near blanking”, “Window width”, “Set blanking”, “Reset blanking”, “Update blanking” and “Reset sensor” can be selected and executed in this menu as well.

41 Diagnostics v-Paths

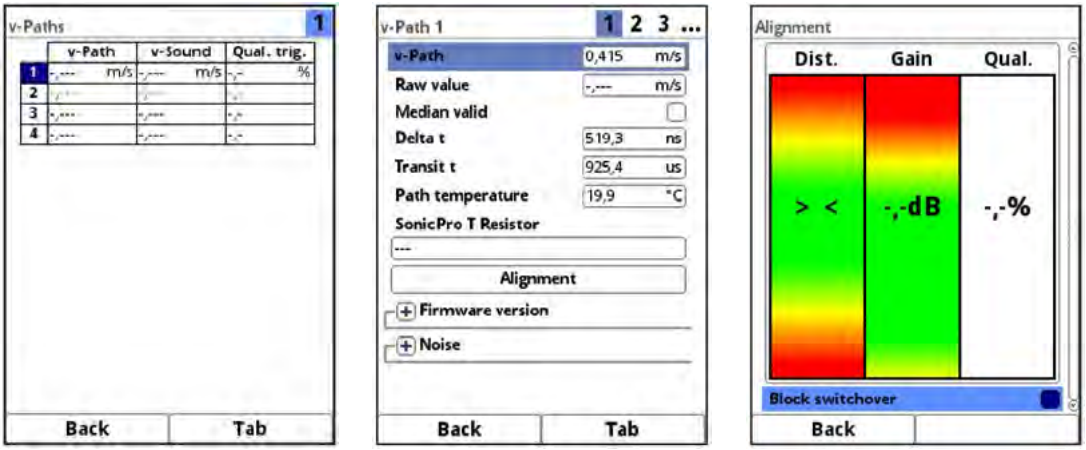


Fig. 41-1 Menu Diagnostics v-Paths

This menu is used to view information on hardware and current sensor/path data (see Fig. 41-1). There is no simulation available in this menu.

The transmitter starts the menu with an overview. You can jump to the individual v-paths from this overview.

The following settings/current values are available/readable:

- **>v-Path x<**
  Individual measured velocities
  The right function key (Tab) can be used to view each path individually.
  Prerequisite: at least one 2-path measurement must be available.
- **>Raw value<**
  Actual measured value
- **>Median valid<**
  A check mark indicates that the respective path operates within the usual limits. If no check mark is set, the path yields atypical values / outliers.
- **>Delta t<**
  Measured transit time difference; the transmitter uses this value to compute the velocity (v)
- **>Transit t<**
  Average signal transit time between sensor 1 and sensor 2 of the according path
- **>Path temperature<**
  Calculated medium temperature of the according path
- **>SonicPro T Resistor<**
  This section shows whether the SonicPro T overvoltage protection can be installed without the need for constructional modifications (screen: “---”) or whether a modification is required (screen: “red” or “blue”).

⇨ Details about possible/required modifications on the resistor see Sect. “Modify SonicPro T overvoltage protection” at page 56 et sec.

- **>Alignment<**
  Tool for sensor positioning and thus for path alignment:
  >Dist.< (Distance):
  Indicates via the arrow pointer whether the parameterized sensor position needs to be corrected because of the actual operating conditions (move together or further away from each other). In the green area the sensor position is optimal, in the yellow and red areas it needs to be adjusted.

>Gain<:
Graphical representation of the receive gain. Gains in the green area are optimal. Care should be taken in the upper yellow area (high gain), as interference signals such as noise are also amplified there; this could cause the measurement system to fail. A measurement cannot be taken in the red area (very high gain): the measurement point is unsuitable for the measuring technique.
>Qual.< (Quality):
The quality display expresses as a percentage how well both sensors are installed relative to each other. This needs to be considered for clamp-on installations especially, since incorrectly mounted sensors can corrupt measurements.

- **>Block switchover<**
  In multi-path systems, the display switches continuously from path to path for alignment purposes.
  Select the check mark to stop the currently selected path in order to align the signal.

- **>Firmware version<**
  Information on the firmware version and the components is stored here. These specifications are relevant for NIVUS service personnel.
- **>Noise<**
  - **>Upstream typical<**
    A continuous level (noise), transmitted in the measurement area against the flow direction.
  - **>Upstream max.<**
    Peaks - short-term disturbances such as pumps etc., which are detected here against the flow direction.
  - **>Downstream typical<**
    A continuous level (noise), transmitted in the measurement area with the flow direction.
  - **>Downstream max.<**
    Peaks - short-term disturbances such as pumps etc., which are detected here with the flow direction.

  It is imperative: the higher the value the worse the signal.

42 Inputs and Outputs (analog and digital)

Fig. 42-1 Diagnostics Input/Output menu

⇨ See also Sect. “32.5 Setting parameters in Inputs and Outputs (analog and digital) Menu”.

42.1 Analog Inputs

This menu can be used to indicate the current values on the transmitter inputs as well as the readings assigned to this value by using the measurement span.

Fig. 42-2 Indication of analog input values

42.2 Analog Outputs

This menu can be used to indicate the calculated current values to be output through the analog converter as well as the readings assigned to these values by using the measurement span.
Moreover it is possible to simulate (password protected) the particular analog values.

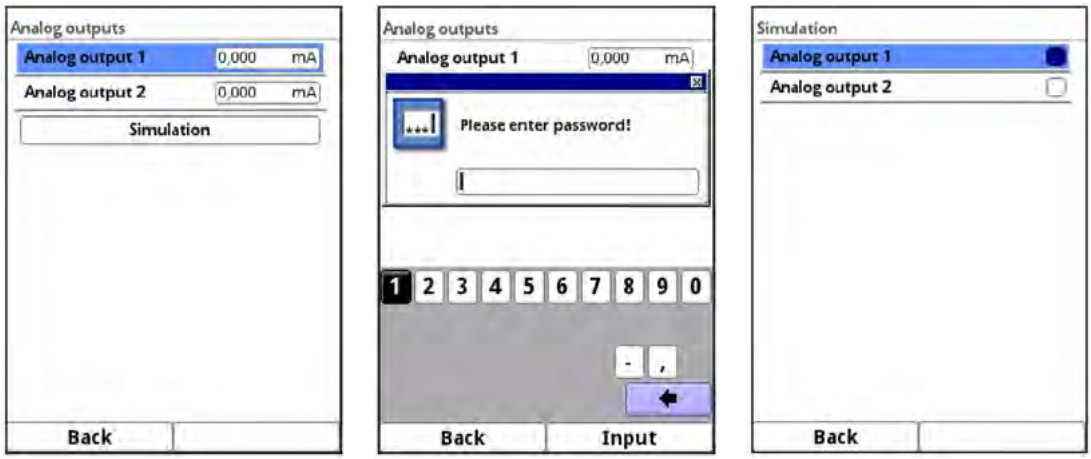


Fig. 42-3 Indication of analog output values

Note

Only the signal available on the analog output converter is shown here. The currents actually flowing cannot be output.

This menu cannot be used to detect and to indicate external faulty wiring.

DANGER ***Personal injury or property damage***

The simulation of analog outputs shall be executed by trained electricians only. The responsible expert personnel must have sound knowledge of the entire control procedures of the according facility.

Prepare the simulation process carefully:

- *Switch the subordinated systems to manual operation.*
- *Disable actuating drives and similar or limit the according function.*

It is absolutely necessary to have a safety person available during execution!

Disregarding may lead to personal injury or damage your facility.

All legally associated companies and subsidiaries of NIVUS group herewith in advance refuse any responsibility for any possible damage to persons or objects at any extent due to the extremely high risk of danger and unforeseeable consequences in the event of incorrect or faulty simulation!

DANGER ***Effects on plant sections***

The simulation of NivuFlow outputs will directly affect any subordinated plant sections without any safety interlocking measures!

Simulations are allowed to be executed exclusively by qualified expert personnel.

Observe the hints contained within the earlier warning!

Note

The simulation mode access is password protected due to the reasons of safety mentioned above.

Share your password with authorised and trained expert personnel only for reasons of personal safety!

➲ To simulate an analog output proceed as follows:

1. Enter your password.
2. Turn the rotary pushbutton until the desired analog output is highlighted blue.
3. Press the rotary pushbutton to activate (check) the analog output.
4. Then specify the desired output current as a numeric value.
   Observe that the analog output(s) will provide the specified voltages until the simulation is stopped.
5. Press the left function key to exit the simulation menu.

42.3 Digital Inputs

This menu shows the signals oncoming on the digital inputs.
Active digital inputs are checked.

Fig. 42-4 Indication of digital inputs

42.4 Digital Outputs

The adjusted digital output values are indicated here.

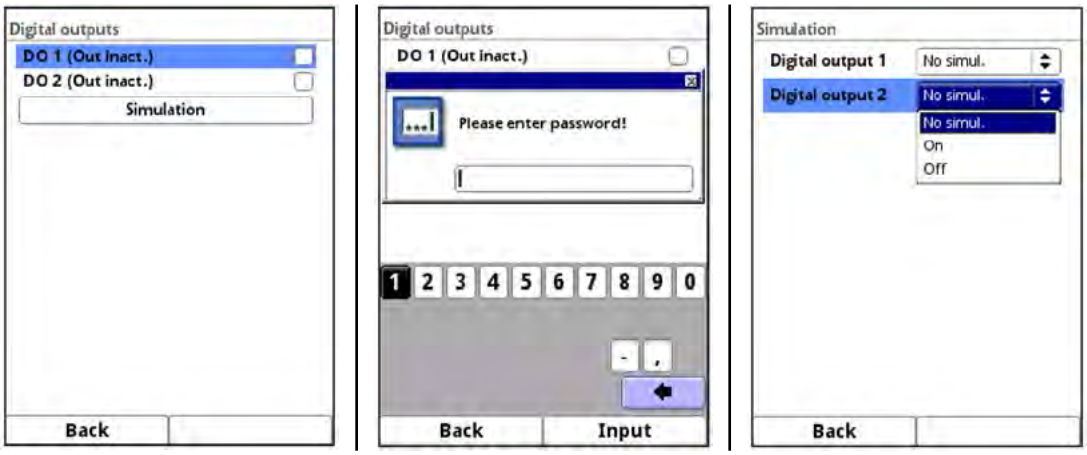


Fig. 42-5 Indication of digital outputs

A password protected simulation of digital outputs is available in this menu too.

DANGER ***Personal injury or property damage***

The simulation of analog outputs shall be executed by trained electricians only. The responsible expert personnel must have sound knowledge of the entire control procedures of the according facility.

Prepare the simulation process carefully:

- *Switch the subordinated systems to manual operation.*
- *Disable actuating drives and similar or limit the according function.*

It is absolutely necessary to have a safety person available during execution!

Disregarding may lead to personal injury or damage your facility.

All legally associated companies and subsidiaries of NIVUS group herewith in advance refuse any responsibility for any possible damage to persons or objects at any extent due to the extremely high risk of danger and unforeseeable consequences in the event of incorrect or faulty simulation!

DANGER ***Effects on plant sections***

The simulation of NivuFlow outputs will directly affect any subordinated plant sections without any safety interlocking measures!

Simulations are allowed to be executed exclusively by qualified expert personnel.

Observe the hints contained within the earlier warning!

Note

The simulation mode access is password protected due to the reasons of safety mentioned above.

Share your password with authorised and trained expert personnel only for reasons of personal safety!

➲ To simulate a digital output proceed as follows:

1. Enter your password.
2. Turn the rotary pushbutton until the desired digital output is highlighted blue.
3. Open the pull-down menu and select >No simul.<, >On< or >Off<.
   Observe that the digital output(s) will provide the specified voltages until the simulation is stopped.
4. Press the left function key to exit the simulation menu.

The same procedure applies to activate the simulation of each output.

43 Q-Control (extra function bookable as licence)

The diagnostics menu shows the current status of the Q control. This is a read-only section and parameters cannot be changed.

See also Sect. “32.6 Setting Parameters in Q-Control Menu (function bookable as extra licence)”.

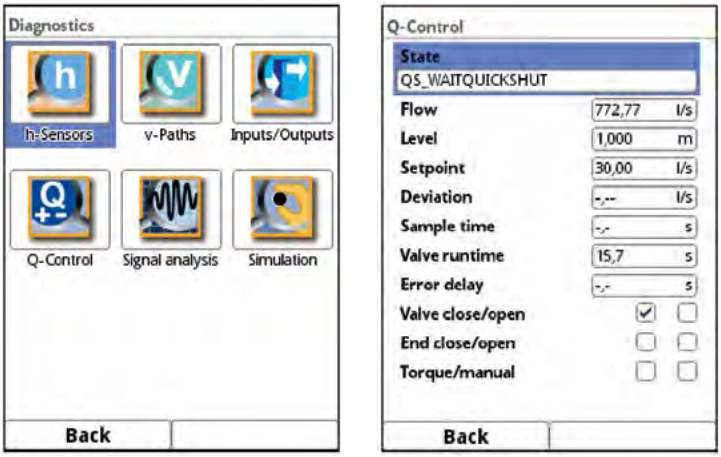


Fig. 43-1 Q-Control

Indicated parameters:

- **>State<**: code/name of the current state
- **>Flow<**: current flow rate
- **>Level<**: current filling level
- **>Setpont<**: setpoint adjusted under >Application< / >Q-control<
- **>Deviation<**: difference between current flow rate and adjusted setpoint
- **>Sample time<**: current sampling time
- **>Valve runtime<**: current slide valve runtime
- **>Error delay<**: current delay time pending
- **>Valve close/open<**: a checked box indicates the current state; first box is for close, second box is for open
- **>End close/open<**: a checked box indicates the current state; first box is for close, second box is for open
- **>Torque/manual<**: a checked box indicates the current state; first box is for torque (= automatic operation), second box is for manual

44 Signal Analysis

This menu is used to scan and to review the incoming signal from the sensor. Moreover the sensor function can be tested here.

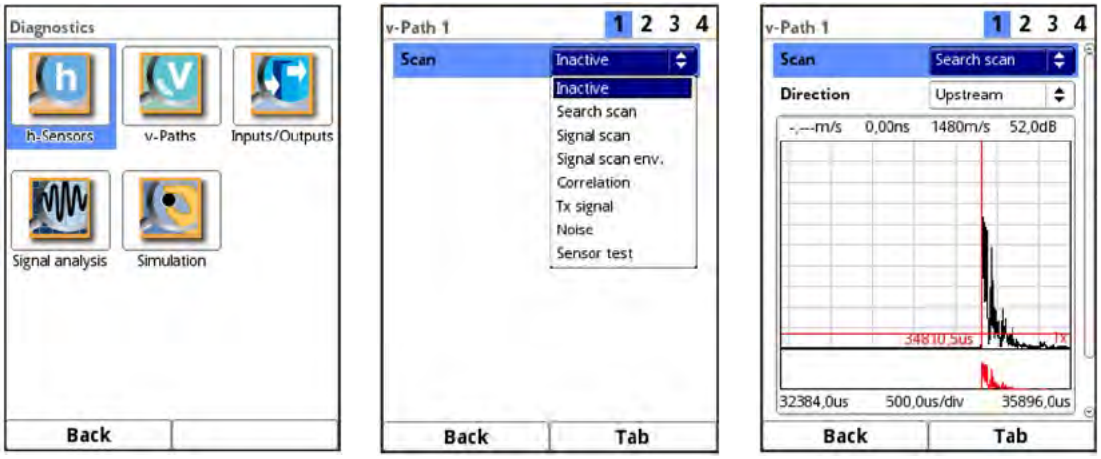


Fig. 44-1 Signal analysis Pulldown menu / search scan

Select from the options below:

- **>Inactive<**
  No signal scan/evaluation
- **>Search scan<**
  (Coarse) signal scan based on customer settings and possibly extended ranges.

  >Direction< (Fig. 44-1)

  - Upstream (towards flow direction)
  - Downstream (in flow direction)
  - Up-/Downstream

  >Scaling< of chart

  - Time
  - Distance

  >V-/H-Zoom< of chart
  Turn the rotary pushbutton to select the graphic and press to activate;
  Selection for V-Zoom: X1, X2, X5, X10, X20, X50 and X100
  Selection for H-Zoom: Reduces the actual displayed/enlarged area within the graphic; the small graphic below shows the respective area in relation to the overall image.

  >Block switchover<
  In multi-path systems, the display switches continuously from path to path for alignment purposes.
  Select the check mark to stop the currently selected path in order to align the signal.
- **>Signal scan<**
  More accurate signal indication

  >Direction<

  - Upstream (towards flow direction)
  - Downstream (in flow direction)
  - Up-/Downstream

>Scaling< of chart (Fig. 44-2)

- Time
- Distance

>V-/H-Zoom< of chart
Turn the rotary pushbutton to select the graphic and press to activate;
Selection for V-Zoom: X1, X2, X5, X10, X20, X50 and X100
Selection for H-Zoom: Reduces the actual displayed/enlarged area within the graphic; the small graphic below shows the respective area in relation to the overall image.

>Block switchover<
In multi-path systems, the display switches continuously from path to path for alignment purposes.
Select the check mark to stop the currently selected path in order to align the signal.

A check mark can be set with **>FFT<** (Fast Fourier Transform). The selection changes the scaling from the time domain to the frequency domain. The signal is thus broken down into its frequency components and can be better examined for disturbances.

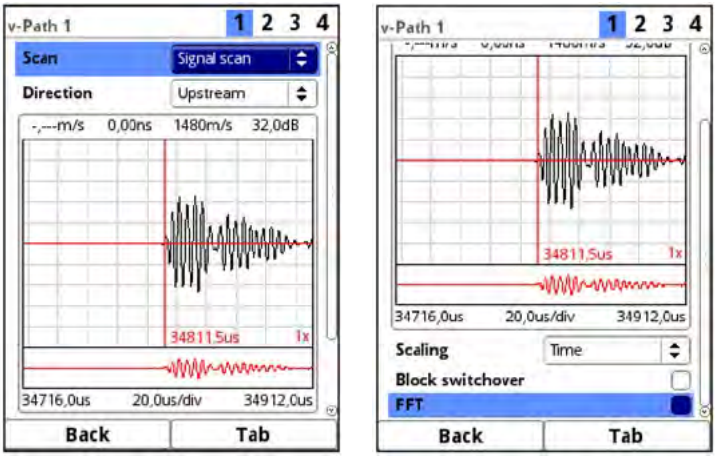


Fig. 44-2 Signal scan

- **>Signal scan env.<** (Fig. 44-3)
  Received signal envelope

  >Direction<

  - Upstream (towards flow direction)
  - Downstream (in flow direction)
  - Up-/Downstream

  >Scaling< of chart

  - Time
  - Distance

  >V-/H-Zoom< of chart
  Turn the rotary pushbutton to select the graphic and press to activate;
  Selection for V-Zoom: X1, X2, X5, X10, X20, X50 and X100
  Selection for H-Zoom: Reduces the actual displayed/enlarged area within the graphic; the small graphic below shows the respective area in relation to the overall image.

  >Block switchover<
  In multi-path systems, the display switches continuously from path to path for alignment purposes.
  Select the check mark to stop the currently selected path in order to align the signal.

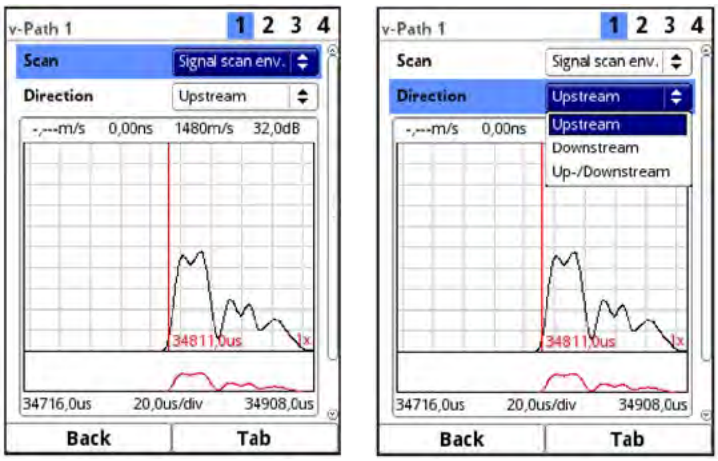


Fig. 44-3 Signal scan envelope

- **>Correlation<** (Fig. 44-4)
  Similarity and temporal shift of the received signals (delta t).

  >V-/H-Zoom< of chart
  Turn the rotary pushbutton to select the graphic and press to activate;
  Selection of V-Zoom: X1, X2, X5, X10, X20, X50 and X100
  Selection of H-Zoom: Reduces the actual displayed/enlarged area within the graphic; the small graphic below shows the respective area in relation to the overall image.

  >Block switchover<
  In multi-path systems, the display switches continuously from path to path for alignment purposes.
  Select the check mark to stop the currently selected path in order to align the signal.

- **>Tx signal<** (Fig. 44-4)
  Visual representation / signal shape

  >V-/H-Zoom< of chart
  Turn the rotary pushbutton to select the graphic and press to activate;
  Selection for V-Zoom: X1, X2, X5, X10, X20, X50 and X100
  Selection for H-Zoom: Reduces the actual displayed/enlarged area within the graphic; the small graphic below shows the respective area in relation to the overall image.

  >Block switchover<
  In multi-path systems, the display switches continuously from path to path for alignment purposes.
  Select the check mark to stop the currently selected path in order to align the signal.

  A check mark can be set with **>FFT<** (Fast Fourier Transform). The selection changes the scaling from the time domain to the frequency domain. The signal is thus broken down into its frequency components and can be better examined for disturbances.

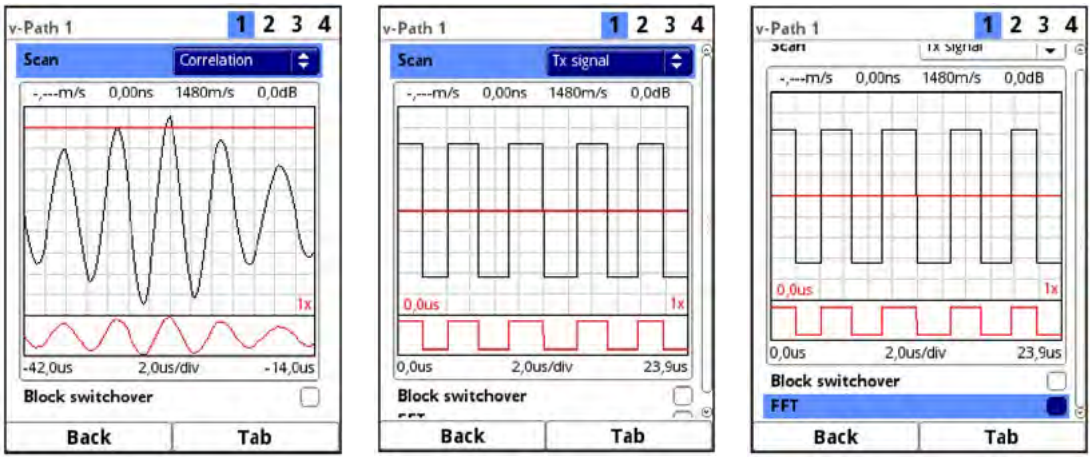


Fig. 44-4 Correlation / Tx signal

- **>Noise<** (Fig. 44-5)
  Display all noise (including noise interference) during signal analysis.

  >Direction<

  - Upstream (towards flow direction)
  - Downstream (in flow direction)
  - Up-/Downstream

  >V-/H-Zoom< of chart
  Turn the rotary pushbutton to select the graphic and press to activate;
  Selection for V-Zoom: X1, X2, X5, X10, X20, X50 and X100
  Selection for H-Zoom: Reduces the actual displayed/enlarged area within the graphic; the small graphic below shows the respective area in relation to the overall image.

  >Block switchover<
  In multi-path systems, the display switches continuously from path to path for alignment purposes.
  Select the check mark to stop the currently selected path in order to align the signal.

  A check mark can be set with **>FFT<** (Fast Fourier Transform). The selection changes the scaling from the time domain to the frequency domain. The signal is thus broken down into its frequency components and can be better examined for disturbances.

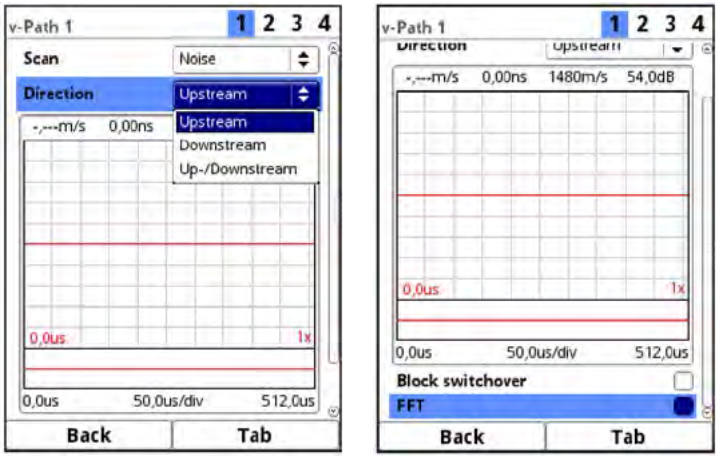


Fig. 44-5 Noise

- **>Sensor test<** (Fig. 44-6)
  Functional test (settling-time test; can also be performed in air) of the connected sensor. The data obtained is mainly used by the NIVUS customer service.

  >Direction<

  - Upstream (towards flow direction)
  - Downstream (in flow direction)
  - Up-/Downstream

  >Signal< (test procedure)

  - Dirac (very short signal)
  - Pulse (one signal period)
  - Search (search signal)
  - Measure (measurement signal)

  >V-/H-Zoom< of chart
  Turn the rotary pushbutton to select the graphic and press to activate;
  Selection for V-Zoom: X1, X2, X5, X10, X20, X50 and X100
  Selection for H-Zoom: Reduces the actual displayed/enlarged area within the graphic; the small graphic below shows the respective area in relation to the overall image.

  >Scaling< of chart

  - Time
  - Distance

  >Block switchover<
  In multi-path systems, the display switches continuously from path to path for alignment purposes.
  Select the check mark to stop the currently selected path in order to align the signal.

  A check mark can be set with **>FFT<** (Fast Fourier Transform). The selection changes the scaling from the time domain to the frequency domain. The signal is thus broken down into its frequency components and can be better examined for disturbances.

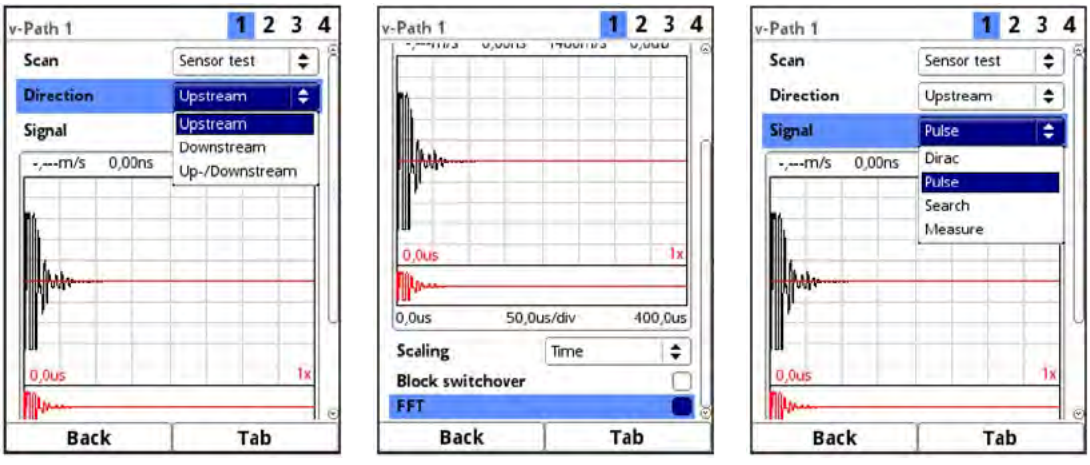


Fig. 44-6 Sensor test

45 Simulation

This menu allows the simulation of theoretical flow. Simulation is carried out by entering assumed values for velocity. These values do not really exist.

Using the dimensions of the programmed geometry as basis, the transmitter calculates the flow rate prevailing by using the simulated values.

This rate will be issued on the analog or digital outputs set previously.

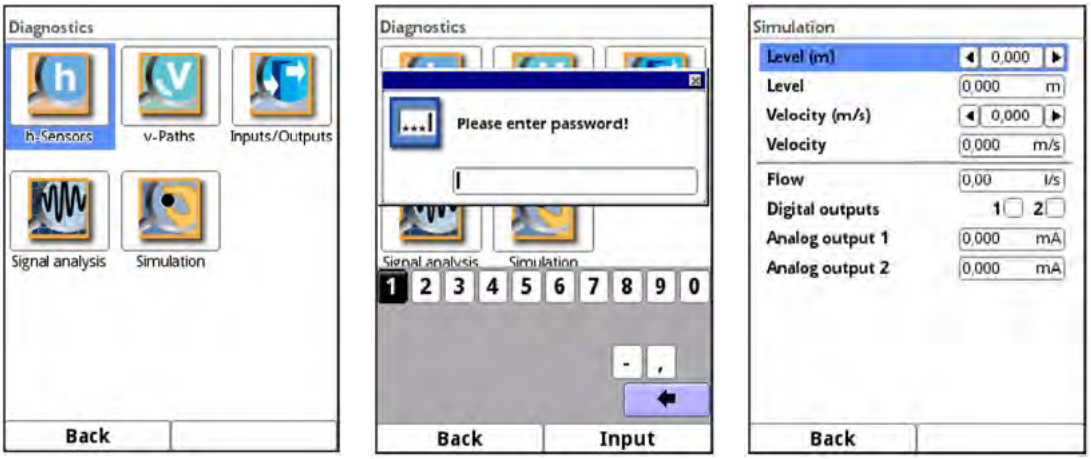


Fig. 45-1 Diagnostics / simulation

DANGER

Personal injury or property damage

The simulation of analog and digital outputs shall be executed by trained electricians only. The responsible expert personnel must have sound knowledge of the entire control procedures of the according facility.

Prepare the simulation process carefully:

- *Switch the subordinated systems to manual operation.*
- *Disable the actuation drives and similar or limit the according function.*

It is absolutely necessary to have a safety person available during execution!

Disregarding may lead to personal injury or damage your facility.

All legally associated companies and subsidiaries of NIVUS group herewith in advance refuse any responsibility for any possible damage to persons or objects at any extent due to the extremely high risk of danger and unforeseeable consequences in the event of incorrect or faulty simulation!

DANGER

Effects on plant sections

The simulation of NivuFlow outputs will directly affect any subordinated plant sections without any safety interlocking measures!

Simulations are allowed to be executed exclusively by qualified expert personnel.

Observe the hints contained within the earlier warning!

Note

The simulation mode access is password protected due to the reasons of safety mentioned above.

Share your password with authorised and trained expert personnel only for reasons of personnel safety!

➲ To start the simulation proceed as follows:

1. Enter your password.
2. Turn the rotary pushbutton until level/velocity is highlighted blue.
3. Specify the desired level/velocity.
4. Confirm your entry with the right function key.
5. Press the left function key to exit the simulation menu.

The flow rate value and output values/states calculated with the entered simulation data are automatically displayed in the lower area.

Error Messages

46 Error message indicated, Cause of failure and Troubleshooting

#	Error message		Cause of failure	Troubleshooting
1	Q-Control	External setpoint	Setpoint received through analog input is invalid	(1) Ensure that the cable between transmitter and external setpoint generator is connected correctly. (2) Make sure that the analog input settings match the actual external setpoint spectrum.
2	Q-Control	Q invalid	Q-measurement is invalid, controller cannot work	Check speed and altitude measurement for correct parameterization and measured values.
3	Q-Control	Torque	Torque input is enabled; torque value measured by the controller application is too high	(1) Check digital input wiring; torque and measured value signal. (2) Check the parameterized torques in the transmitter. (3) Check the actual torque on the slide.
4	Analog input	Value too high	Analog input too high	Make sure that the settings for the analog input match the actual external setpoint spectrum. Maximum value: 20.5 mA
5	Analog input	Value too low	Analog input too low	Make sure that the settings for the analog input match the actual external setpoint spectrum. Minimum value: 3.75 mA with 4-20 mA
6	Air-ultrasonic sensor	Not supported	Wrong sensor type connected	(1) Make sure the air-ultrasonic sensor is intended for connection to the transmitter. (2) Make sure the air-ultrasonic sensor is correctly connected. (3) Check air-ultrasonic sensor and cable for visible damage. (4) Check whether the parameters of the air-ultrasonic sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).
7	Air-ultrasonic sensor	Communication	Sensor response telegram invalid	(1) Make sure the air-ultrasonic sensor is intended for connection to the transmitter. (2) Make sure the air-ultrasonic sensor is correctly connected. (3) Check air-ultrasonic sensor and cable for visible damage. (4) Check whether the parameters of the air-ultrasonic sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).

#	Error message		Cause of failure	Troubleshooting
8	Air-ultrasonic sensor	Logic	Sensor command invalid	(1) Make sure the air-ultrasonic sensor is intended for connection to the transmitter. (2) Make sure the air-ultrasonic sensor is correctly connected. (3) Check air-ultrasonic sensor and cable for visible damage. (4) Check whether the parameters of the air-ultrasonic sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).
9	Air-ultrasonic sensor	Faulty response	Sensor transmits error message (reset or similar)	(1) Make sure the air-ultrasonic sensor is intended for connection to the transmitter. (2) Make sure the air-ultrasonic sensor is correctly connected. (3) Check air-ultrasonic sensor and cable for visible damage. (4) Check whether the parameters of the air-ultrasonic sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).
10	Air-ultrasonic sensor	No communication	Sensor does not respond	(1) Make sure the air-ultrasonic sensor is intended for connection to the transmitter. (2) Make sure the air-ultrasonic sensor is correctly connected. (3) Check air-ultrasonic sensor and cable for visible damage. (4) Check whether the parameters of the air-ultrasonic sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).
11	2-wire level	Value too high	Analog input too high	Make sure that the settings for the external 2-wire level sensor match the actual external setpoint spectrum. Maximum value: 20.5 mA
12	2-wire level	Value too low	Analog input too low	Make sure that the settings for the external 2-wire level sensor match the actual external setpoint spectrum. Minimum value: 3.75 mA with 4-20 mA
13	Level fallback	All	Fallback level measurement invalid (overlap mode)	(1) Make sure the level sensors are correctly connected. (2) Check level sensors and cables for visible damage. (3) Check whether the parameters are correctly set for all connected level sensors. (4) Contact NIVUS Hotline (serial number and exact error message required).

#	Error message		Cause of failure	Troubleshooting
14	i-Sensor	No communication	Sensor does not respond	(1) Make sure the i-sensor is correctly connected. (2) Check i-sensor and cable for visible damage. (3) Check whether the parameters of the i-sensor are correctly set. (4) Restart the transmitter via >System< / >Service<. (5) Contact NIVUS Hotline (serial number and exact error message required).
15	Pressure sensor	Not supported	Wrong sensor type connected	(1) Make sure the pressure sensor is intended for connection to the transmitter. (2) Make sure the pressure sensor is correctly connected. (3) Check pressure sensor and cable for visible damage. (4) Check whether the parameters of the pressure sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).
16	Pressure sensor	Communication	Sensor response telegram invalid	(1) Make sure the pressure sensor is intended for connection to the transmitter. (2) Make sure the pressure sensor is correctly connected. (3) Check pressure sensor and cable for visible damage. (4) Check whether the parameters of the pressure sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).
17	Pressure sensor	Logic	Sensor command invalid	(1) Make sure the pressure sensor is intended for connection to the transmitter. (2) Make sure the pressure sensor is correctly connected. (3) Check pressure sensor and cable for visible damage. (4) Check whether the parameters of the pressure sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).
18	Pressure sensor	Faulty response	Sensor transmits error message (reset or similar)	(1) Make sure the pressure sensor is intended for connection to the transmitter. (2) Make sure the pressure sensor is correctly connected. (3) Check pressure sensor and cable for visible damage. (4) Check whether the parameters of the pressure sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).

#	Error message		Cause of failure	Troubleshooting
19	Pressure sensor	No communication	Sensor does not respond	(1) Make sure the pressure sensor is intended for connection to the transmitter. (2) Make sure the pressure sensor is correctly connected. (3) Check pressure sensor and cable for visible damage. (4) Check whether the parameters of the pressure sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).
20	Level range	Value too low	Level measurements too far apart from each other (overlap mode)	(1) Check whether the parameters are correctly set for all connected level sensors. (2) Execute level adjustment if required. (3) Contact NIVUS Hotline (serial number and exact error message required).
21	Level range	Value too high	Level measurements too far apart from each other (overlap mode)	(1) Check whether the parameters are correctly set for all connected level sensors. (2) Execute level adjustment if required. (3) Contact NIVUS Hotline (serial number and exact error message required).
22	Water-ultrasonic sensor	Not supported	Wrong sensor type connected	(1) Make sure the water-ultrasonic sensor is intended for connection to the transmitter. (2) Make sure the water-ultrasonic sensor is correctly connected. (3) Check water-ultrasonic sensor and cable for visible damage. (4) Check whether the parameters of the water-ultrasonic sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).
23	Water-ultrasonic sensor	Communication	Sensor response telegram invalid	(1) Make sure the water-ultrasonic sensor is intended for connection to the transmitter. (2) Make sure the water-ultrasonic sensor is correctly connected. (3) Check water-ultrasonic sensor and cable for visible damage. (4) Check whether the parameters of the water-ultrasonic sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).

#	Error message		Cause of failure	Troubleshooting
24	Water-ultrasonic sensor	Logic	Sensor command invalid	(1) Make sure the water-ultrasonic sensor is intended for connection to the transmitter. (2) Make sure the water-ultrasonic sensor is correctly connected. (3) Check water-ultrasonic sensor and cable for visible damage. (4) Check whether the parameters of the water-ultrasonic sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).
25	Water-ultrasonic sensor	Faulty response	Sensor transmits error message (reset or similar)	(1) Make sure the water-ultrasonic sensor is intended for connection to the transmitter. (2) Make sure the water-ultrasonic sensor is correctly connected. (3) Check water-ultrasonic sensor and cable for visible damage. (4) Check whether the parameters of the water-ultrasonic sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).
26	Water-ultrasonic sensor	No communication	Sensor does not respond	(1) Make sure the water-ultrasonic sensor is intended for connection to the transmitter. (2) Make sure the water-ultrasonic sensor is correctly connected. (3) Check water-ultrasonic sensor and cable for visible damage. (4) Korrekte Parametrierung des Wasserultraschallsensors überprüfen. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).
27	Hardware	Battery (3V)	Voltages too high or too low (device battery)	Contact NIVUS Hotline (serial number and exact error message required).
28	Hardware	Power adaptor (15V)	Voltages too high or too low	(1) Ensure that the power supply is stable on the mains side. (2) Disconnect the transmitter from the mains for ten minutes and then reconnect. (3) Contact NIVUS Hotline (serial number and exact error message required).
30	Hardware	System (5V)	Voltages too high or too low	(1) Ensure that the power supply is stable on the mains side. (2) Disconnect the transmitter from the mains for ten minutes and then reconnect. (3) Contact NIVUS Hotline (serial number and exact error message required).

#	Error message		Cause of failure	Troubleshooting
31	Hardware	Logic (3.3V)	Voltages too high or too low	(1) Ensure that the power supply is stable on the mains side. (2) Disconnect the transmitter from the mains for ten minutes and then reconnect. (3) Contact NIVUS Hotline (serial number and exact error message required).
32	Hardware	Logic (1.8V)	Voltages too high or too low	(1) Ensure that the power supply is stable on the mains side. (2) Disconnect the transmitter from the mains for ten minutes and then reconnect. (3) Contact NIVUS Hotline (serial number and exact error message required).
33	Hardware	DRAM (0.9V)	Voltages too high or too low	(1) Ensure that the power supply is stable on the mains side. (2) Disconnect the transmitter from the mains for ten minutes and then reconnect. (3) Contact NIVUS Hotline (serial number and exact error message required).
34	Hardware	I²C	Communication error in plug-in cards	(1) Ensure that the power supply is stable on the mains side. (2) Disconnect the transmitter from the mains for ten minutes and then reconnect. (3) Contact NIVUS Hotline (serial number and exact error message required).
35	Hardware	Slot Power-down	Plug-in card was restarted because of too many errors (defective)	Contact NIVUS Hotline (serial number and exact error message required).
41	Internal memory	Persistent	Memory error in PseudoRam on SD card	(1) Disconnect the transmitter from the mains for ten minutes and then reconnect. (2) Contact NIVUS Hotline (serial number and exact error message required).
42	Internal memory	Persistent Backup	Memory error in PseudoRam on SD card	(1) Disconnect the transmitter from the mains for ten minutes and then reconnect. (2) Contact NIVUS Hotline (serial number and exact error message required).
43	Internal memory	Archive	Memory error in archive system on SD card	(1) Disconnect the transmitter from the mains for ten minutes and then reconnect. (2) Replace SD card with an equivalent one. (3) Contact NIVUS Hotline (serial number and exact error message required).
44	System	Reboot	Device was manually booted (also update)	No action necessary, because no error
45	System	Hardfault	Restart after program error	Contact NIVUS Hotline (serial number and exact error message required).
46	System	Watchdog	Restart after program error	Contact NIVUS Hotline (serial number and exact error message required).
47	System	Bootloader	Bootloader error	Contact NIVUS Hotline (serial number and exact error message required).

#	Error message		Cause of failure	Troubleshooting
48	System	Startup	Cold start (power on)	No action necessary, because no error
49	System	Time changed	Time was set	No action necessary, because no error
50	System	Time server (SNTP)	Time was set via network protocol	No action necessary, because no error
51	System	NFE-Box	NFE does not respond	(1) Make sure that the cables/connectors between transmitter and NFE are correct. (2) Ensure parameters are set correctly in the transmitter. (3) Restart the transmitter via >System< / >Service<. (4) If the error message appears again, contact the NIVUS hotline (serial number and exact error message required).
52	Air temperature	Not supported	Wrong sensor type connected	(1) Make sure the air temperature sensor is intended for connection to the transmitter. (2) Make sure the air temperature sensor is correctly connected. (3) Check air temperature sensor and cable for visible damage. (4) Check whether the parameters of the air temperature sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).
53	Air temperature	Communication	Sensor response telegram invalid	(1) Make sure the air temperature sensor is intended for connection to the transmitter. (2) Make sure the air temperature sensor is correctly connected. (3) Check air temperature sensor and cable for visible damage. (4) Check whether the parameters of the air temperature sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).
54	Air temperature	Logic	Sensor command invalid	(1) Make sure the air temperature sensor is intended for connection to the transmitter. (2) Make sure the air temperature sensor is correctly connected. (3) Check air temperature sensor and cable for visible damage. (4) Check whether the parameters of the air temperature sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).

#	Error message		Cause of failure	Troubleshooting
55	Air temperature	Faulty response	Sensor transmits error message (reset or similar)	(1) Make sure the air temperature sensor is intended for connection to the transmitter. (2) Make sure the air temperature sensor is correctly connected. (3) Check air temperature sensor and cable for visible damage. (4) Check whether the parameters of the air temperature sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).
56	Air temperature	No communication	Sensor does not respond	(1) Make sure the air temperature sensor is intended for connection to the transmitter. (2) Make sure the air temperature sensor is correctly connected. (3) Check air temperature sensor and cable for visible damage. (4) Check whether the parameters of the air temperature sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).
57	Water temperature	Not supported	Wrong sensor type connected	(1) Make sure the water temperature sensor is intended for connection to the transmitter. (2) Make sure the water temperature sensor is correctly connected. (3) Check water temperature sensor and cable for visible damage. (4) Check whether the parameters of the water temperature sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).
58	Water temperature	Communication	Sensor response telegram invalid	(1) Make sure the water temperature sensor is intended for connection to the transmitter. (2) Make sure the water temperature sensor is correctly connected. (3) Check water temperature sensor and cable for visible damage. (4) Check whether the parameters of the water temperature sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).

#	Error message		Cause of failure	Troubleshooting
59	Water temperature	Logic	Sensor command invalid	(1) Make sure the water temperature sensor is intended for connection to the transmitter. (2) Make sure the water temperature sensor is correctly connected. (3) Check water temperature sensor and cable for visible damage. (4) Check whether the parameters of the water temperature sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).
60	Water temperature	Faulty response	Sensor transmits error message (reset or similar)	(1) Make sure the water temperature sensor is intended for connection to the transmitter. (2) Make sure the water temperature sensor is correctly connected. (3) Check water temperature sensor and cable for visible damage. (4) Check whether the parameters of the water temperature sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).
61	Water temperature	No communication	Sensor does not respond	(1) Make sure the water temperature sensor is intended for connection to the transmitter. (2) Make sure the water temperature sensor is correctly connected. (3) Check water temperature sensor and cable for visible damage. (4) Check whether the parameters of the water temperature sensor are correctly set. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).
62	v-Path	Communication	DSP card responds with invalid telegram	(1) Restart the transmitter via >System< / >Service<. (2) Contact NIVUS Hotline (serial number and exact error message required).
63	v-Path	Logic	Invalid DSP card	(1) Restart the transmitter via >System< / >Service<. (2) Contact NIVUS Hotline (serial number and exact error message required).
64	v-Path	Faulty response	DSP card error message (reset or similar)	(1) Restart the transmitter via >System< / >Service<. (2) Contact NIVUS Hotline (serial number and exact error message required).
65	v-Path	No communication	DSP card not responding	(1) Restart the transmitter via >System< / >Service<. (2) Contact NIVUS Hotline (serial number and exact error message required).

#	Error message		Cause of failure	Troubleshooting
66	v-Path	Value too high	Path check, measured value deviates significantly	(1) Check the cable / transmitter connectors and check the cables for damage. (2) Make sure that the cables have not been manually increased in length. (3) Check the parameterized offset values using the cable information. (4) Check whether the sensor position deviates from the parameterized position. (5) Contact NIVUS Hotline (serial number and exact error message required).
67	v-Path	Value too low	Path check, measured value deviates significantly	(1) Check the cable / transmitter connectors and check the cables for damage. (2) Make sure that the cables have not been manually increased in length. (3) Check the parameterized offset values using the cable information. (4) Check whether the sensor position deviates from the parameterized position. (5) Contact NIVUS Hotline (serial number and exact error message required).
68	v-Path	Invalid	Path check; value invalid (from DSP card)	(1) Make sure that the sensors connected in pairs actually belong to the same path in the installation. (2) Check all sensors and cables for visible damage. (3) Check operability (are transients visible) of all sensors in >Application< / >Diagnostics< / >v-Path< / >Sensor test<. (4) Check the parameterization of the measurement point and the system sensors. (5) Restart the transmitter via >System< / >Service<. (6) Contact NIVUS Hotline (serial number and exact error message required).

Maintenance and Cleaning

WARNING ***Disconnect instrument from mains power***

Disconnect the instrument from mains power and safeguard the higher system against restart before you begin maintenance works.

Disregarding may lead to electric shocks.

WARNING ***Germ contamination***

Some parts of the measurement system may be contaminated by hazardous germs especially if the sensors are installed in wastewater. This is why precautionary measures shall be taken while being in contact with cables and sensors.

Wear protective clothing.

47 Maintenance

47.1 Maintenance Interval

The Type NivuFlow transmitters are conceived to be virtually free of calibration, maintenance and wear.

NIVUS, however, recommend having the entire measurement system inspected by the NIVUS customer service once per year.

The maintenance intervals may vary depending on the use case.

Extent and intervals of maintenance depend on the following conditions:

- Material wear
- Process liquid and hydraulic conditions
- General regulations for the operators of the measurement facility
- Ambient conditions

In addition to the annual inspection NIVUS recommends a complete maintenance of the measurement system by one of the legally associated companies and subsidiaries of NIVUS group **after ten years at the latest**.

In general, the inspection of instruments/sensors is a basic measure which helps to increase operational safety as well as the lifetime.

47.2 Customer Service Information

For annual inspection of the entire measurement system or complete maintenance after ten years at the latest contact our customer service:

NIVUS GmbH - Customer Service
Phone +49 7262 9191 - 922

Customercenter@nivus.com

48 Cleaning

48.1 Transmitter

WARNING ***Disconnect instrument from mains power***

Observe to disconnect the transmitter from mains power.

Disregarding may induce the risk of electrical shocks.

Important Note

- *Do not remove the **blue plastic rails** to clean the enclosure.*
- *Do not use a damp cloth to wipe over the **terminal clamp blocks**.*

Clean the transmitter enclosure if required using a dry, lint-free cloth.

For stubborn dirt the enclosure can be cleaned using a damp cloth. Do not use caustic cleansing agents or solvents. Light household cleaners or soapy water can be used.

48.2 Sensors

The hints on how to maintain and clean the sensors shall be necessarily observed. These hints can be found in the respective Technical Instruction and/or Instruction Manual.

This (these) document(s) is (are) part of the standard sensor delivery.

49 Dismantling/Disposal

Improper disposal may be harmful to the environment.

➲ Always dispose of equipment components and packaging materials according to applicable local regulations on environmental standards for electronic products:

1. Disconnect the unit from mains power.
2. Use appropriate tools to remove the connected cables from the faceplate of the instrument.
3. Remove the transmitter from the DIN rail.
4. Remove the buffer battery and make sure that the buffer battery will be disposed of separately.

EC WEEE-Directive logo

This symbol indicates that the Directive 2012/19/EU on waste electrical and electronic equipment requirements shall be observed on the disposal of the equipment. NIVUS GmbH supports and promotes the recycling and environmentally friendly, separate collection/disposal of waste electrical and electronic equipment in order to protect the environment and human health. Observe the local disposal regulations and laws.

NIVUS GmbH is registered with the EAR, therefore public collection and return points in Germany can be used for disposal.

The unit contains a buffer battery (Lithium coin cell), which must be disposed of separately.

50 Installation of spare parts and parts subject to wear and tear

We hereby particularly emphasise that replacement parts or accessories not supplied by NIVUS are not certified and approved by NIVUS.
Installation and/or the use of such products hence may negatively influence predetermined design characteristics of the measurement system or even lead to instrument failures.

The legally associated companies and subsidiaries of NIVUS group cannot be held responsible for any damage resulting from the use of non-original parts and non-original accessories.

⇨ A selection of NIVUS GmbH accessories can be found in Sect. “51 Accessories”. Further information on spare parts and accessories can be obtained from your local representative/regional office or directly from NIVUS GmbH.

51 Accessories

ZUB0 NFWx	Field enclosure in various designs to protect the NivuFlow outdoors
ZUB0 SPSYS 08	Clamping system for clamp-on measurements, consisting of tensioning belt, width 8 mm (length 10 m for 2x 5 m) and two turnbuckles for fastening of two sensors; incl. coupling paste
ZUB0 CORA x	Mounting system (for clamp-on sensors) in different versions
ZUB0 KOP 100	3 pairs of coupling pads; transparent; 0.5 mm thick
ZUB0 SPx	Endless clamp belt and head; 12.7 mm wide
BSL0 x	Various surge protection devices for power supply, sensors and data lines for the NivuFlow 650
ZUB0 USB 08	8 GB USB stick for readout of parameters and readings
SW0 NS PRO	Evaluation software, NivuSoft Professional with matched functions: documentation of measurement sites, output as graphs and tables, creation of statistics/reports etc.

Table 51-1 Accessories for transmitter NivuFlow 650

Further information on spare parts and accessories can be obtained from your local representative/regional office or directly from NIVUS GmbH.

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Credits and Licenses

52 List of references of the licenses and codes used

The transmitter type NivuFlow uses code of the following Open Source Projects:

- Freetype (http://www.freetype.org)
- Libharu (http://libharu.org)
- Libjpeg (http://www.ijg.org)
- Libpng (http://www.libpng.org)
- Zlib (http://www.zlib.net)
- Mini-XML (http://www.msweet.org)
- Nano-X/nxlib (http://www.microwindows.org)
- FLTK (http://www.fltk.org)
- Appendix1: LGPL
- Appendix2: MPL

Questions concerning licenses

If you have any questions concerning licenses refer to opensource@nivus.com

Approvals and Certificates

DE / EN / FR

EU Konformitätserklärung

EU Declaration of Conformity

Déclaration de conformité UE

NIVUS GmbH
Im Täle 2
75031 Eppingen

Telefon: +49 07262 9191-0
Telefax: +49 07262 9191-999
E-Mail: info@nivus.com
Internet: www.nivus.de

Für das folgend bezeichnete Erzeugnis:
For the following product:
Le produit désigné ci-dessous:

Bezeichnung:	**Durchflussmessumformer stationär mit internem 2G/3G/4G Modem zur Datenfernübertragung NivuFlow 6xx**
Description:	*Permanent flow measurement transmitter with internal modem for remote data transmission*
Désignation:	*Transmetteur de débit stationnaire avec modem intégré pour transmission de données*
Typ / Type:	**NF6-…**

erklären wir in alleiniger Verantwortung, dass die auf dem Unionsmarkt ab dem Zeitpunkt der Unterzeichnung bereitgestellten Geräte die folgenden einschlägigen Harmonisierungsvorschriften der Union erfüllen:
we declare under our sole responsibility that the equipment made available on the Union market as of the date of signature of this document meets the standards of the following applicable Union harmonisation legislation:
nous déclarons, sous notre seule responsabilité, à la date de la présente signature, la conformité du produit pour le marché de l'Union, aux directives d'harmonisation de la législation au sein de l'Union:

- 2014/53/EU
- 2011/65/EU

Bei der Bewertung wurden folgende einschlägige harmonisierte Normen zugrunde gelegt bzw. wird die Konformität erklärt in Bezug auf die nachfolgend genannten anderen technischen Spezifikationen:
The evaluation assessed the following applicable harmonised standards or the conformity is declared in relation to other technical specifications listed below:
L'évaluation est effectuée à partir des normes harmonisées applicable ou la conformité est déclarée en relation aux autres spécifications techniques désignées ci-dessous:

- EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019
- EN 61326-1:2013
- Draft ETSI EN 301 489-52 V1.2.1
- EN 301 908-1 V15.2.0 (UMTS/3G, LTE/4G)
- EN 301 908-13 V13.2.1 (LTE/4G)
- EN 62311:2008
- EN 301 489-1 V2.2.3
- EN 301 511 V12.5.1 (GSM/2G)
- EN 301 908-2 V13.1.1 (UMTS/3G)

Diese Erklärung wird verantwortlich für den Hersteller:
This declaration is submitted on behalf of the manufacturer:
Le fabricant assume la responsabilité de cette déclaration:

NIVUS GmbH
Im Taele 2
75031 Eppingen
Germany

abgegeben durch / *represented by / faite par:*
Ingrid Steppe (Geschäftsführerin / *Managing Director / Directeur général)*

Eppingen, den 21.10.2022

Gez. *Ingrid Steppe*

UK Declaration of Conformity

NIVUS GmbH
Im Täle 2
75031 Eppingen

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Telefax: +49 07262 9191-999
E-Mail: info@nivus.com
Internet: www.nivus.de

For the following product:

Description:	**Permanent flow measurement transmitter with internal modem 2G/3G/4G for remote data transmission NivuFlow 6xx**
Type:	**NF6-…**

we declare under our sole responsibility that the equipment made available on the UK market as of the date of signature of this document meets the standards of the following applicable UK harmonisation legislation:

- SI 2017 / 1206 The Radio Equipment Regulations 2017
- SI 2012 / 3032 The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

The evaluation assessed the following applicable harmonised standards or the conformity is declared in relation to other technical specifications listed below:

- BS EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019
- BS EN 61326-1:2013
- Draft ETSI EN 301 489-52 V1.2.1
- BS EN 301 908-1 V15.2.0 (UMTS/3G, LTE/4G)
- BS EN 301 908-13 V13.2.1 (LTE/4G)
- BS EN 62311:2008
- BS EN 301 489-1 V2.2.3
- BS EN 301 511 V12.5.1 (GSM/2G)
- BS EN 301 908-2 V13.1.1 (UMTS/3G)

This declaration is submitted on behalf of the manufacturer:

NIVUS GmbH
Im Taele 2
75031 Eppingen
Germany

represented by:
Ingrid Steppe (Managing Director)

Eppingen, 21/10/2022

Signed by *Ingrid Steppe*

DE / EN / FR

EU Konformitätserklärung

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E-Mail: info@nivus.com
Internet: www.nivus.de

Für das folgend bezeichnete Erzeugnis:

For the following product:

Le produit désigné ci-dessous:

Bezeichnung:	**Durchflussmessumformer stationär NivuFlow 6xx**
Description:	*permanent flow measurement transmitter*
Désignation:	*convertisseur de mesure de débit fixe*
Typ / Type:	**NF6-…**

erklären wir in alleiniger Verantwortung, dass die auf dem Unionsmarkt ab dem Zeitpunkt der Unterzeichnung bereitgestellten Geräte die folgenden einschlägigen Harmonisierungsvorschriften der Union erfüllen:

we declare under our sole responsibility that the equipment made available on the Union market as of the date of signature of this document meets the standards of the following applicable Union harmonisation legislation:

nous déclarons, sous notre seule responsabilité, à la date de la présente signature, la conformité du produit pour le marché de l'Union, aux directives d'harmonisation de la législation au sein de l'Union:

- 2014/30/EU
- 2014/35/EU
- 2011/65/EU

Bei der Bewertung wurden folgende einschlägige harmonisierte Normen zugrunde gelegt bzw. wird die Konformität erklärt in Bezug die nachfolgend genannten anderen technischen Spezifikationen:

The evaluation assessed the following applicable harmonised standards or the conformity is declared in relation to other technical specifications listed below:

L'évaluation est effectuée à partir des normes harmonisées applicable ou la conformité est déclarée en relation aux autres spécifications techniques désignées ci-dessous:

- EN 61326-1:2013
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Internet: www.nivus.de

For the following product:

Description:	**Permanent flow measurement transmitter NivuFlow 6xx**
Type:	**NF6-…**

we declare under our sole responsibility that the equipment made available on the UK market as of the date of signature of this document meets the standards of the following applicable UK harmonisation legislation:

- SI 2016 / 1091 The Electromagnetic Compatibility Regulations 2016
- SI 2016 / 1101 The Electrical Equipment (Safety) Regulations 2016
- SI 2012 / 3032 The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

The evaluation assessed the following applicable harmonised standards or the conformity is declared in relation to other technical specifications listed below:

- BS EN 61326-1:2013
- BS EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019

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