FLOW

# Instruction Manual

# Flow Measurement Transmitter NivuFlow 650


Firmware Revision: 2.06

Original Manual: German

**Instrumentation for Water Industry**
NIVUS GmbH • Im Taele 2 • D-75031 Eppingen • Internet: www.nivus.com
Phone: +49 (0) 72629191-0 • Fax: +49 (0) 72629191-999 • E-Mail: info@nivus.com

**NIVUS AG, Schweiz**
Hauptstrasse 49
CH - 8750 Glarus
Tel.: +41 (0)55 6452066
Fax: +41 (0)55 6452014
E-Mail: swiss@nivus.com
Internet: www.nivus.de

**NIVUS, Austria**
Mühlbergstraße 33B
A-3382 Loosdorf
Tel.: +43 (2754) 567 63 21
Fax: +43 (2754) 567 63 20
E-Mail: austria@nivus.com
Internet: www.nivus.de

**NIVUS, France**
14, rue de la Paix
F - 67770 Sessenheim
Tel.: +33 (0)3 88071696
Fax: +33 (0)3 88071697
E-Mail: info@nivus.fr
Internet: www.nivus.fr

**NIVUS Ltd., United Kingdom**
Wedgewood Rugby Road
Weston under Wetherley
Royal Leamington Spa
CV33 9BW, Warwickshire
Tel.: +44 (0)1926 632470
E-Mail: info@nivus.com
Internet: www.nivus.com

**NIVUS Service, United Kingdom**
1 Arisaig Close
Eaglescliffe
Stockton on Tees
Cleveland, TS16 9EY
Tel.: +44 (0)1642 659294
E-Mail: info@nivus.com
Internet: www.nivus.com

**NIVUS Sp. z o.o., Poland**
ul. Hutnicza 3 / B-18
PL - 81-212 Gdynia
Tel.: +48 (0) 58 7602015
Fax: +48 (0) 58 7602014
E-Mail: poland@nivus.com
Internet: www.nivus.pl

**NIVUS Middle East (FZE)**
Building Q 1-1 ap. 055
P.O. Box: 9217
Sharjah Airport International
Free Zone
Tel.: +971 6 55 78 224
Fax: +971 6 55 78 225
E-Mail: Middle-East@nivus.com
Internet: www.nivus.com

**NIVUS Korea Co. Ltd.**
#2502, M Dong, Technopark IT Center,
32 Song-do-gwa-hak-ro,
Yeon-su-gu,
INCHEON, Korea 406-840
Tel. +82 32 209 8588
Fax. +82 32 209 8590
E-Mail: korea@nivus.com
Internet: www.nivus.com

**NIVUS Vietnam**
21 Pho Duc Chinh, Ba Dinh,
Hanoi, Vietnam
Mobile (VN) 012 0446 7724
Vietnam@nivus.com

# Copyrights and property rights

This document and its contents are proprietary to NIVUS GmbH and are not to be reproduced or copied without the express written permission of NIVUS GmbH.

Violations oblige to compensation.

***Important Note***

*This instruction manual may exclusively - even in parts - be copied or translated in any other way with the express written consent of NIVUS GmbH*

**Translation**

If the device is sold to a country in the European Economic Area (EEA) this instruction handbook 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 handbook (German) must be consulted or the manufacturer contacted for clarification.

**Copyright**



**Names**

The use of general descriptive names, trade names, trade-marks and the like in this handbook does not entitle the reader to assume they may be used freely by everyone. They are often protected registered trademarks even if not marked as such.

## PARAMETER SETTING 60

# General

## 1 About this manual

***Note***

*READ CAREFULLY BEFORE USE!*

*KEEP IN A SAFE PLACE FOR LATER REFERENCE!*

This instruction manual is an original instruction for the flow measurement transmitter NivuFlow 650 and is for the intended use of the device. This manual is oriented exclusively to qualified expert personnel.

Read this instruction manual carefully and completely prior to installation and con-nection since it contains relevant information on this product. Observe the notes and particularly follow the warning notes and safety instructions.

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

If you should have problems to understand information contained within this instruction manual either contact the manufacturer or one of the distributors for further support. The manufacturer cannot be held responsible for damage to persons or material due to incorrectly understood information in this instruction.

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

### 1.1 Personnel requirements

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

- Expert personnel with relevant training an 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*

## 1.2 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 for transit time sensors
- Installation Instruction for transit time sensors

These manuals are provided with the auxiliary units or sensors.

## 1.3 Signs and definitions used

| Image | **Meaning** | **Remark** |
|---|---|---|
| ☞ | (action) step | Action to be performed by you.<br>Note the numbering of action steps. Observe the order of the working steps! |
| ⇨ | Cross-reference | Reference to further or detailed information |
| >Text< | Parameter or Menu | Indicates a parameter or a menu that is select or described |
|  | Reference to document | Refers to an accompanying documentation |

## 1.4 Abbreviations used

Colour code for wires, single conductors and components.

The abbreviations of colours, wire and components follow the international colour code according to IEC 757.

| | | | | | |
|---|---|---|---|---|---|
| BK | black | RD | red | TR | transparent |
| BU | blue | WH | white | GNYE | green/yellow |
| GN | green | YE | yellow | BN | brown |
| GY | grey | PK | pink | | |

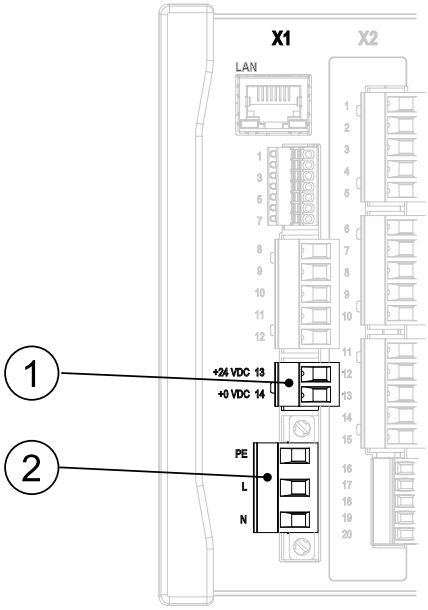
**Article description**

- NF NivuFlow Transmitter
- NIS- pipe sensors and wedge sensors in closed pipelines
- NOS- pipe sensors and wedge sensors for part and full filling

# 2 Connections and user elements

## 2.1 Power Supply

The connection for power supply is located on the lower part of the plug-in module X1.



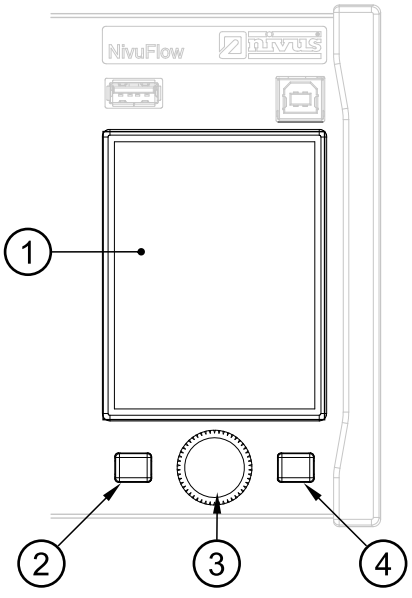

1 Power Supply DC
2 Power Supply AC and protective conductor

**Fig. 2-1 Electrical connections of power supply**

You can find a detailed connection plan on page 44.

## 2.2 NivuFlow control elements

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




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

**Fig. 2-2 Control elements**

## 2.3 Tasks of control elements

### Colour display

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

### Left function key

Initially, this key takes you to the menu. They key is also used to exit menus or sub-menus.

### Rotary pushbutton

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

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

### Right function key

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

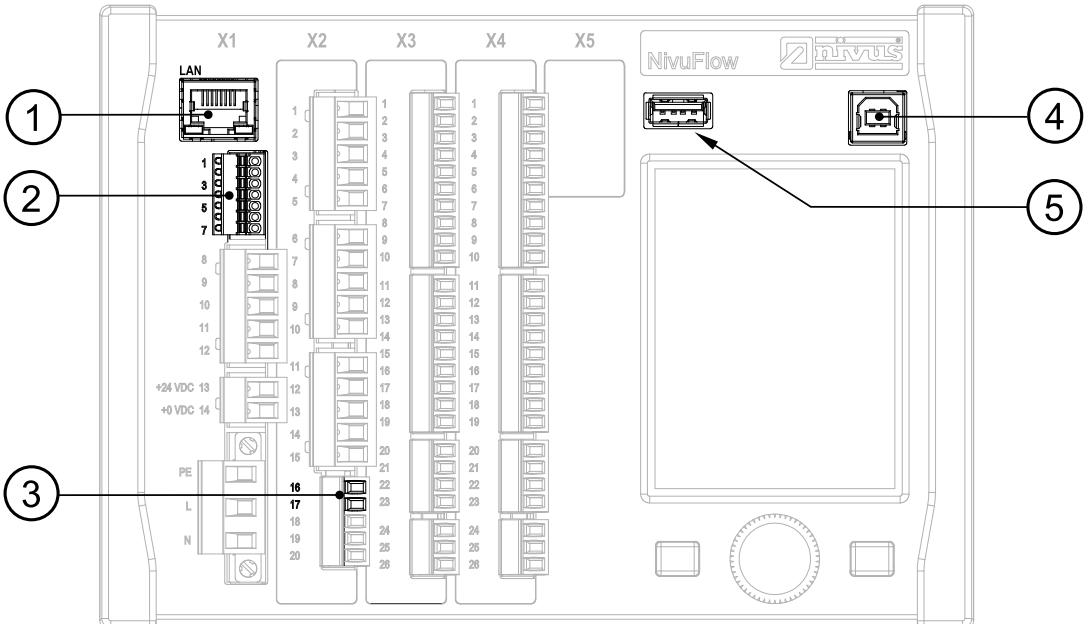
For some parameters the right function key can be used as >TAB< . This TAB function is active only with the settings below:

- Selecting several paths which are connected
- Selecting analog inputs
- Selecting analog outputs
- Selecting digital inputs
- Selecting digital outputs

⇨ You will find a description on how to use the control elements from page 46.

## 2.4 Interfaces

The transmitter has several interfaces on the front panel.




1 Network interface (LAN)
2 Bus interface (RS-485 / RS-232)
3 HART-interface (upon request)
4 USB-B-interface (Service)
5 USB-A-interface (data transfer)

**Fig. 2-3 Available interfaces**

⇨ Descriptions of the individual interfaces see parameter menu >Communication< on page 95.

# Safety Instructions

## 3 Used symbols and signal words

Das allgemeine Warnsymbol kennzeichnet eine Gefahr, die zu Verletzungen oder zum Tod führen kann. Im Textteil wird das allgemeine Warnsymbol in Verbindung mit den nachfolgend beschriebenen Signalwörtern verwendet.

**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.*

**Other signs and definitions**

**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 a damage of the product or an object in its environment.*

***Note***

*Contains information and facts.*

## 3.1 Warning notices on the product

***General warning label***

*This symbol is for operators to refer to this instruction manual. Observing the information contained therein is required in order to maintain protection measured 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..*

## 3.2 Safeguards and Precautions

**WARNING**

***Germ contamination***

*Please note that due to the operation in the waste water field the measurement system and cables may be loaded with dangerous disease germs. Respective precautionary measures must be taken to avoid damage to one's health.*

*Wear protective clothing.*

**WARNING**

***Observe occupational safety regulations***

*Before starting installation work, observing the work safety regulations need to be checked.*

*Disregarding may lead in 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 may lead in personal injury.*

**WARNING**

***Danger by electric voltage***

*Maintenance, cleaning and/or repairs (by qualified personnel only) may only be performed when deenergised.*

*Disconnect the systems from mains.*

*Disregarding may lead to electric shocks!*

***Important Note***

*Before starting installation work, observing the work safety regulations need to be checked.*
*It is strictly prohibited to disable the safety devices or to change the way they work.*

## 3.3 Liability disclaimer

The manufacturer reserves the right to change the contents of this document including this liability disclaimer without prior notice and cannot be held responsible in any way for possible consequences resulting from such changes.

For connection, initial start-up and operation as well as maintenance of the unit the following information and higher legal regulations of the respective country (e.g. VDE regulations in Germany) such as applicable Ex regulations as well as safety requirements and regulations in order to avoid accidents shall be observed.

All operations on the device which go beyond installation or connection measures in principle shall be carried out by NIVUS staff or personnel authorised by NIVUS due to reasons of safety and guarantee.

**Operate the Radar sensor only in technically perfect working order.**

**Improper Use**

Not being operated in accordance with the requirements may impair the safety.

The manufacturer is not responsible for failures resulting from improper use.

## 3.4 User's Responsibilities

***Important Note***

*In the EEA (European Economic Area) national implementation of the frame-work directive 89/391/EEC and corresponding individual directives, in particuar the directive 2009/104/EEC 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 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:

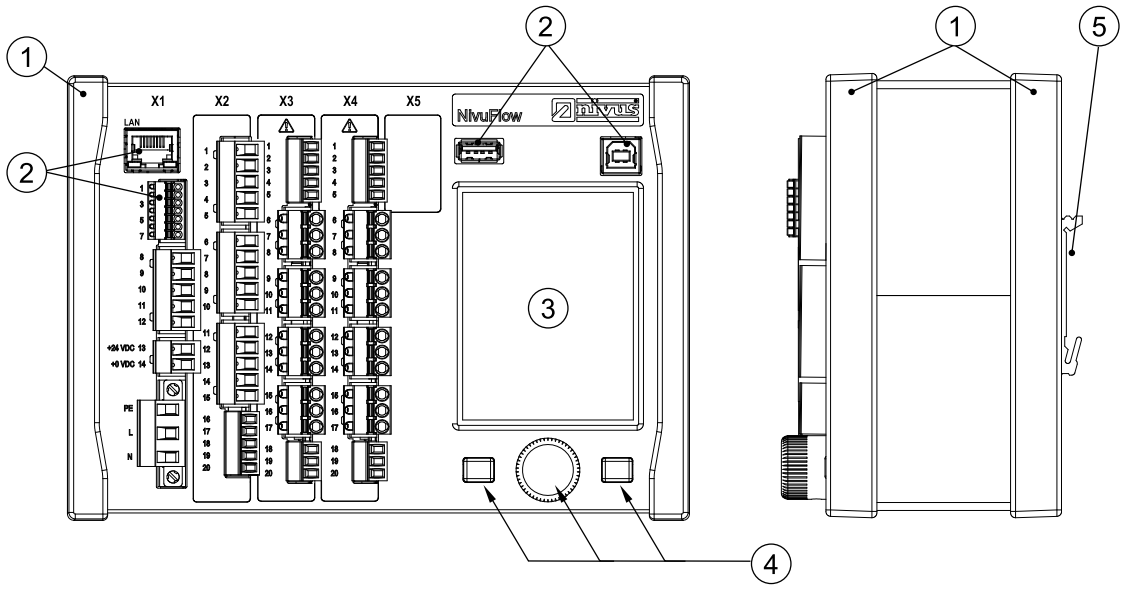
- Personnel safety (accident prevention regulations)
- Safety of work materials and tools (safety equipment and maintenance)
- Disposal of products (laws on wastes)
- Disposal of materials (laws on wastes)
- Cleaning (cleansing agents and disposal)
- Environmental protection

**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.

# Product specification

## 4 Product construction and overview




1 Trims / cover strips
2 Interfaces
3 Graphic display
4 Control Elements
5 DIN rail fastening

X1 Power supply, air ultrasonic sensor connection via RS485

(optional), Interface (LAN and Bus)

X2 Digital and analog inputs and outputs, 1x RS485

X3 DSP-Card: Connections of Transit Time Sensors (2-paths)

X4 aditional DSP-Card: Connections of Transit Time Sensors (4-paths)

**Fig. 4-1 Device setup NivuFlow 650**

⇨ A complete overview of the NivuFlow 600 individual components is on the last page of this manual.

## 4.1 Dimensions

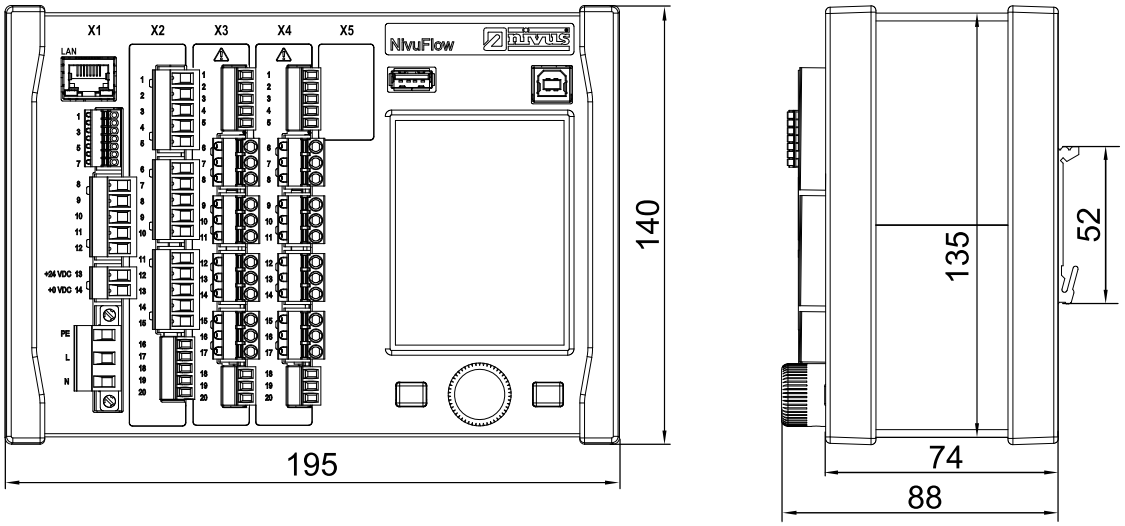
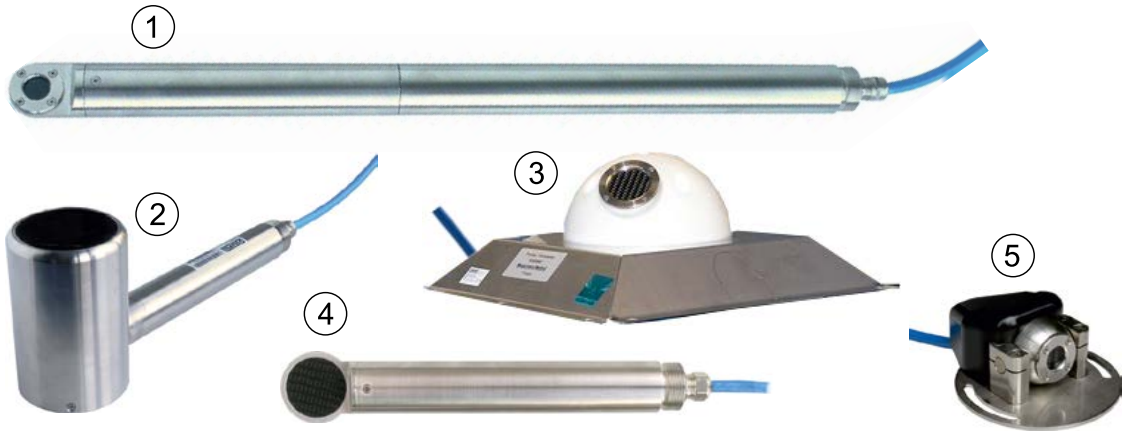



**Fig. 4-2 Transmitter dimensions**

## 4.2 Connectable sensors overview

The image below provides an overview on the connectable sensors.




1 Rod sensor, type NOS-V20
2 Rod sensor, type NOS-V40
3 Hemispheric sensor, type NOS-V30B
4 Rod sensor, type NOS-V30
5 Ball sensor, type NOS-V20B

**Fig. 4-3 Connectable sensors**

## 4.3 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 the manufacturer
- CE lable
- Information on type and series, serial no. if available
- 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 device nameplate to ensure that the device is delivered according to your order. Check if the correct supply voltage is printed on the nameplate.*

You can find the declaration of conformity at the end of this manual.

**Nameplates**

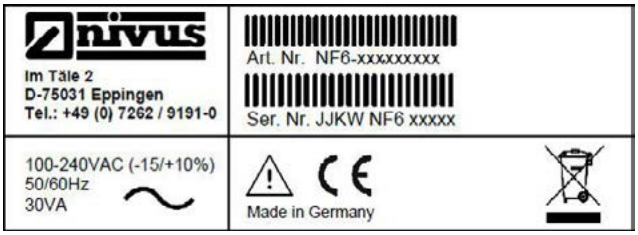



**Fig. 4-4 Nameplate AC version**

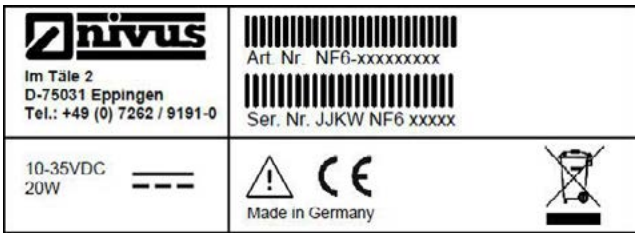



**Fig. 4-5 Nameplate DC version**

## 4.4 Intended use

***Important Note***

*The instrument is intended solely for the purpose described below.*

*Modifying or using the instruments for any other purposes without the manufacturer's written consent will not be considered as use in accordance with the requirements. The manufacturer cannot be held responsible for any damage resulting from improper use.*

*The user alone bears any risk..*

The permanent flow meter Type NivuFlow 600 including the accompanying sensors is designed for continuous flow measurement in slightly polluted to clear, clean water or equivalent media in part filled or full pipes, channels or water bodies.

The NivuFlow 650 is engineered and manufactured according to the current state of the art as well as to recognised safety regulations. Danger to persons or material, however, cannot be completely ruled out Strictly observe the maximum permissible limit values as specified in chapter 5.

Any case varying from these conditions which is not approved by NIVUS GmbH in written form is left at the owner's risk.

***Important Note***

*For installation and commissioning the conformity certificates as well as the test certificates issued by the respective authorities shall be followed.*

# 5 Specifications

| | |
|---|---|
| Power supply | 100 - 240 V AC, -15 % / +10 %, 47 to 63 Hz or 10 - 35 V DC |
| Supply connection | Plug with spring-cage terminal clamps |
| Max. power consumption | AC: 30 VA; DC: 20 W |
| Typ. power consumption | 1 relay energised, 230 V AC: (rounded) 14 W<br>up to 8 transit time sensors 1 MHz |
| Enclosure | Material: aluminium and plastic<br>Weight: approx. 1150 g |
| Protection | IP20, shock resistance IK08 |
| Operating conditions | - Protection class I<br>- Overvoltage category II<br>- Pollution degree 2<br>- 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 (AC and DC units) |
| Operating temperature | DC: -20 °C bis +70 °C<br>AC: -20 °C bis +65 °C |
| Storage temperature | -30 °C to +80 °C |
| Max. ambient temp. for installation and operation | +50 °C |
| max. humidity | 80 %, on-condensing |
| Display | TFT full graphic colour daylight display,<br>240 x 320 pixel, 65536 colours |
| Programming | Dialogue mode using rotary pushbutton and 2 function keys, in German, English, French, Swedish |
| Connection | Plug with spring-cage terminal blocks |
| Inputs | - 1x (Type T2 and T4) 4-20 mA for external level (2-wire-probe) or i-series sensor via HART<br>- 1x RxTx-Bus for NIVUS air ultrasonic sensors (OCL) with 12 Bit resolution for data storage from an external device, accuracy +/-0,4 % of measuring range final value (20 mA), load 91 Ohm<br>- 2 x (Type T2 and T4) digital input |
| Outputs | - 2 x (Type T2 and T4) 0/4-20 mA, Load 500 Ohm, with 12 Bit resolution, accuracy higher than ±0,1 % at 20 °C (highter than ±0,4 % at -20 °C … +70 °C)<br>- 1x (Type T2 and T4) bistable relay SPDT, maximum load 230 VAC / 2 A (cos φ 0,9), switching current 100 mA<br>- 1x (Type T2 and T4) relay (Wechsler), SPDT, maximum load up to 230 VAC / 2 A (cos φ 0,9), min. switching current 10 mA |
| Data memory | Internal 1.0 GB, for programming and readings memory via USB stick front side read out |
| Storage cycle | 30 seconds to 5 minutes |
| Communication | - Modbus TCP via networks (LAN/WAN, Internet)<br>- Modbus RTU via RS485 or RS232<br>- Internet via Ethernet (in preparation) |

# 6 Configuration

## 6.1 Device Types

The NivuFlow is available in different versions which mainly vary in terms of the number of connectable sensors.

The article number can be found on the nameplate (see Fig. 4-4 and Fig. 4-5).

| | | | | | | |
|---|---|---|---|---|---|---|
| **NF6-** | Flow velocity transmitter type NivuFlow | | | | | |
| | **Version** | | | | | |
| | **5** | for part filled and full filled pipes, channels and water bodies | | | | |
| | | **Type** | | | | |
| | | **T2E0** | up to 2 acoustic paths, 1 x air-ultrasound OCL, 2x DI, 2 x DO, 2 x AI, 2 x AO, construction: DIN rail / control cabinet installation | | | |
| | | **T4E0** | up to 4 acoustic paths, 1 x air-ultrasound OCL, 2x DI, 2 x DO, 2 x AI, 2 x AO, construction: DIN rail / control cabinet installation | | | |
| | | **T2W0** | up to 2 acoustic paths, 1 x air-ultrasound OCL, 2x DI, 2 x DO, 2 x AI, 2 x AO, construction: field housing | | | |
| | | **T4W0** | up to 4 acoustic paths, 1 x air-ultrasound OCL, 2x DI, 2 x DO, 2 x AI, 2 x AO, construction: field housing | | | |
| | | | **Power** | | | |
| | | | **A0** | 100 - 240 V AC | | |
| | | | **D0** | 9 - 36 V DC | | |
| | | | | **Firmware extensions** | | |
| | | | | **0** | none | |
| | | | | | **Number of measurement places** | |
| | | | | | **1** | 1 measurement place |
| | | | | | **2** | 2 measurement places |
| NF6- | | | | | | |

## 6.2 Delivery

The standard delivery of the NivuFlow contains:

- The instruction manual including the certificate of conformity and approvals. It contains any relevant information on how to operate the NivuFlow 600.
- a transmitter type NivuFlow 600 according to delivery paper

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

### 6.2.1 Receiving inspection

Check if your delivery is complete. 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 head office in Eppingen within 2 weeks.

***Note***

*Complaints received later shall not be considered!*

### 6.2.2 Transport

Protect the NivuFlow from heavy shocks or vibrations. Use the original packaging for transport.

### 6.2.3 Return

The units shall be returned at customer cost to NIVUS Eppingen using the original packaging.

Insufficiently franked shipments will not be accepted!

## 6.3 Installation of spare parts and parts subject to wear and tear

We herewith particularly emphasise that replacement parts or accessories not supplied by NIVUS moreover are not certified and approved by NIVUS too. Installation and/or the use of such products hence may negatively influence predetermined constructional characteristics of the measurement system or even lead to instrument failures.

NIVUS cannot be held responsible for any damage resulting due to the use of non-original parts and non-original accessories.

⇨ You can find original manufacturer spare parts or accessories on page 115.

# Functional Principle

## 7 Operating Range

The NivuFlow 650 is a non-portable measurement system for flow measurement. NivuFlow 650 is used in mostly part filled flumes, channels, pipes and water bodies with various shapes and dimensions. The unit is operated with at least one pair of sensors measuring the flow velocity.

The entire measurement system is designed for predominant use in the field of measuring of clear, homogeneous up to slightly polluted liquids of various compositions.

If there are too many particles in the media, the signal is severely reduced too much.

This can lead to incorrect or inaccurate measurements.

***Note***

*The measurement method for determining the flow velocity is based on the ultrasound transit time principle. Due to this reason it is indispensable for the system functionality 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.*

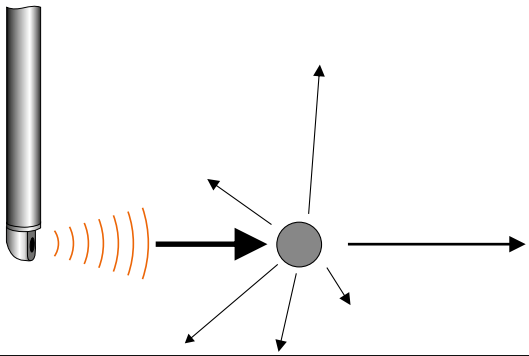


**Fig. 7-1 Signal damping by interfering particles**

### Connectable sensors

The NivuFlow 650 is designed for connecting the following NIVUS Sensors:

### Flow velocity sensors

- NIS-V200R
- NOS-V2
- NIS-V280K
- NIS-V300K
- NOS-20B
- NOS-V30B
- NOS-V40

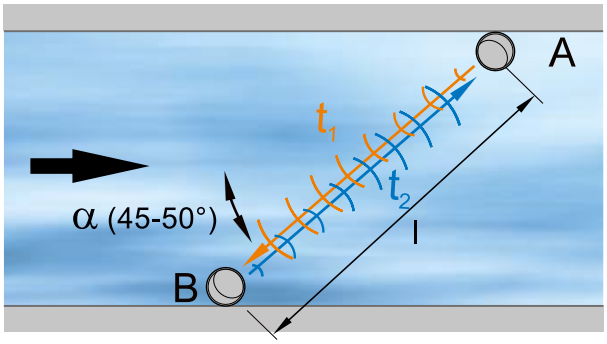
**Level sensors**

- OCL
- i-Series sensors (HART)
- External level sensors

# 8 Flow velocity detection

## 8.1 General

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




A= Sensor 1

B= Sensor 2

a= defined angle

t1= Time of the impulse towards direction of flow

t2= Time of the impulse with direction of flow

l= Transit Time

**Fig. 8-1 Single-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 flow 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 t1
- The downstream impulse needs a shorter time t2

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 as soon as both sensors receive the transmitted ultrasonic impulses simultaneously. There is no measurable flow available.

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. The propagation of sound will either be decelerated (upstream) or accelerated (downstream) depending on the flow direction of the medium.

| | |
|---|---|
| $L_{1-2}$ | Length of acoustic measurement path between sensors 1 and 2 |
| C | velocity of sound in medium |
| $\upsilon_{1-2}$ | average flow velocity between sensors 1 and 2 along the measurement path.. |

Assuming that the speed of sound C is significantly higher than the flow velocity υ within the medium (C>> υ1-2) it is possible to approximately determine the transit time difference Δt.

The main flow direction must be known.

Here the formula below is used:

$$\Delta t = \frac{2L_{1-2} \cdot \upsilon_{1-2}}{c^2}$$

More information on the flow velocity can be gained by using two paths for transit time measurement instead of one path.

The more paths are used and spread over the wetted cross-section, the more accurate flow rates can be determined.

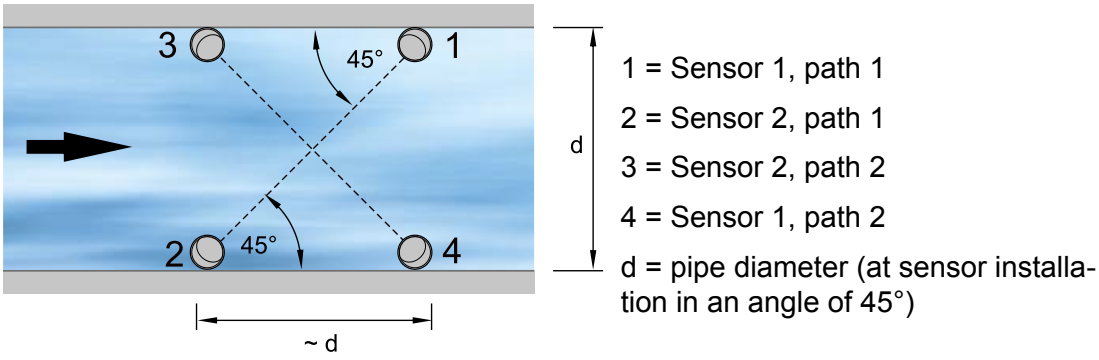



**Fig. 8-2 Two-path transit time measurement principle**

If the sensors are installed in an angle of 45° (recommended) the distance between sensor 2 and sensor 4 is equal to the inside pipe diameter.

If used in multi-path setups the angle of deviation “a” of the flow direction can be determined additionally by assuming identical flow velocities.

This angle can be calculated by comparing the measurement results of the individual paths.

## 8.2 Flow calculation

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

$Q = \upsilon_m \cdot A$

with

$\upsilon_m$ average flow velocity

A cross-sectional flow area

it is required to involve a velocity coefficient k in order to compensate the difference between measured velocity $\upsilon_g$ and average velocity $\upsilon_{average}$ within the cross-sectional area.

$$k = \frac{\upsilon_m}{\upsilon_g}$$

Using the transit time of the signal it is possible to calculate flow subsequently as described below:

$$Q = k \cdot A \cdot \upsilon_g = k \cdot A \cdot \frac{L_{1-2}}{2 \cdot \cos\Phi_{1-2}} \cdot \left( \frac{1}{t_{2-1}} - \frac{1}{t_{1-2}} \right)$$

## 8.3 Measurement Accuracy

The measurement accuracy for transit time flowmeters depends on the number of paths and the flow velocity. In the following table, the accuracy curve depending the number of paths and the flow velocity is evaluated.

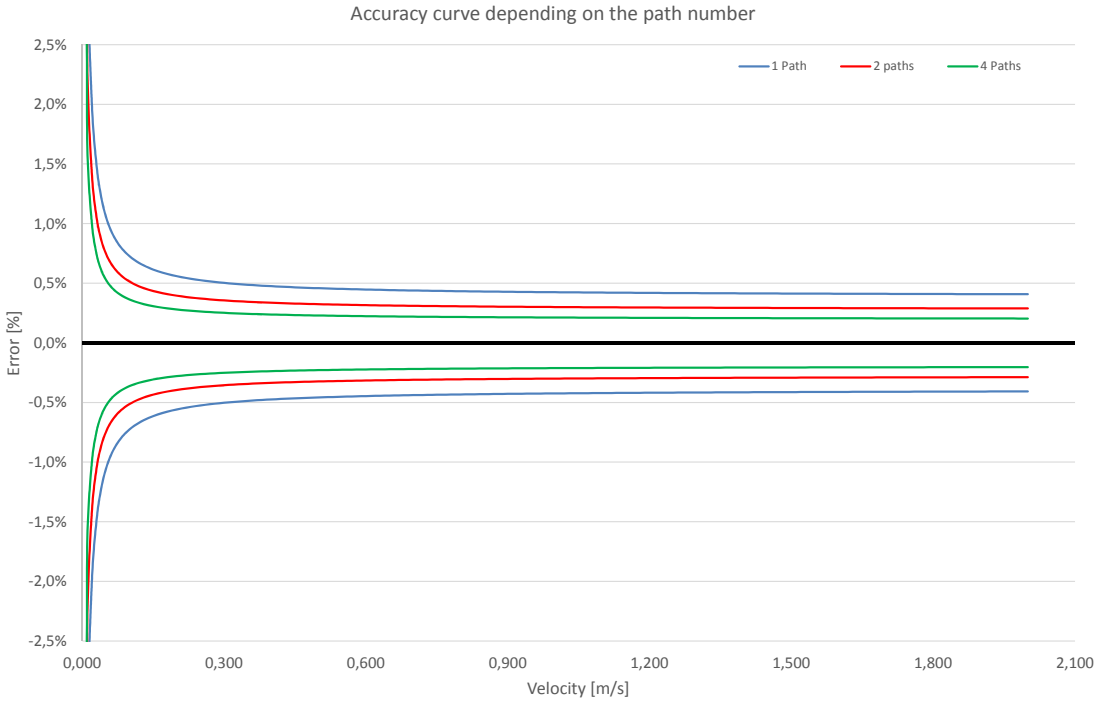



**Fig. 8-3 Measurement accuracy curve**

**Note**

The accuracy curve was established from measurement conducted for full pipes under laboratory conditions.

# Installation and connection

## 9 General installation conditions

During the installation, ensure that the following instructions regarding ESD and installation place.

☞ Never operate the device without the four blue plastic cover strips!

☞ Follow applicable legal or operational guidelines!

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

**WARNING**

***Danger from electrical current***

*Without the four blue plastic cover strips the protection against electrical shock is not guaranteed.*

*Do not operate the device without the four blue plastic cover strips.*

*Disregarding may result in personal injuries.*

### 9.1 Hints on how to avoid electrostatic discharge (ESD)

***ESD risks***

*Maintenance procedures which do not require power supply of the instrument shall not be executed 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. The manufacturer recommends 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

### 9.2 Choosing the installation place

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

☞ Pay attention for adequate ventilation at the installation place for example by ventilator or heat exchanger

☞ During installation make sure that possibly existing separating devices (power switch) remain to be easily accessible

The NivuFlow can be also installed in field enclosures or similar. Due to the protection degree, NivuFlow is not suitable to be installed directly on site without protective measures.

## 9.3 Installation instructions

For safe installation the measures below must be taken:

☞ Protect the device from direct sunlight. Install a sun protection if necessary

☞ Observe the permitted ambient temperature

☞ Do not subject the measurement transmitter to heavy shock and vibration

**Strictly avoid when installing the device:**

- Corrosive chemicals or gases
- Radioactive radiation
- Installation close to footpaths or travel ways

### 9.3.1 Fastening

***Note***

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

☞ For fastening use a DIN rail type TS35 according to EN 50022 with a mini-mum length of 140 mm.

1. Fasten the rail horizontally in the intended enclosure/switching cabinet by using at least two screws
2. Hook the NivuFlow into the DIN rail from below and then it snapped into place diagonally downwards by exerting slight pressure from the front

Now you can start with the electrical installation and connection of the sensors.

# 10 Electrical installation

**DANGER**

***Disconnect the unit from mains power***

*All work on electrical connections may only be carried out with the supply voltage turned off.*

*Observe electrical data specified on the nameplate*

*Disregarding may result in personal injuries.*

***Note***

*Observe the national installation instructions.*

For electric installation the regulations in the respective countries must be referred to.

For installation in wet environments or in areas featuring the risk of flooding it may be necessary to install extra protective measures such as a residual current device (RCD) if required.

☞ Check if the power supply of the units must be integrated into the facility's emergency shutdown conception.

Before feeding the rated voltage, transmitter and sensor installation must be correctly completed. Check that the installation is correct.

Observe that the installation shall be carried out by qualified personnel only. Further statutory standards (local), regulations and technical rulings have to be taken into account.

⇨ The connection of sensors is described starting at page 37, how to feed the supply power can be found on page 44.

## 10.1 Supply and relay connections

### 10.1.1 Connection clamp for protective earth conductor and AC power supply

**DANGER**

***Risk of electric shock***

*The terminal block X1 (connections 15-17) for connection of the earth conductor and AC power supply is as an integral part of the device. It is no plug connection. The device may only be operated if the terminal blocks are firmly screwed on the screw lange.*

*Disregarding may result in personal injuries.*

⇨ You can find the requirements for the connection of the terminal clamp block in chapter 14.2

### 10.1.2 DC Power supply

The DC version can be directly operated from the 24 V direct current network of a control cabinet. The input voltage available at the input clamps must not fall below 10.0 V at maximum load (20 W). The clamp voltage at no-load operation is not allowed to rise above a maximum of 35.0 V.

### 10.1.3 AC Power supply

**DANGER** ***Risk of electric shock***

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

*Disregarding may result in personal injuries.*

The AC version of NivuFlow 600 can be directly operated from the low-voltage network. The AC power supply requirements are described in chapter „Specifications“

The cross-sectional dimension of the power supply wires must be 0.75 mm² and must be in accordance to IEC 227 or IEC 245.

### 10.1.4 Relays

The reliability of the switching contact deteriorates if the minimum switching current is lower than specified.

⇨ Observe the connection and switching specifications in chapter 5 .

**DANGER** ***Risk of electric shock***

*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 protection 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 fault-current circuit breaker or similar.*

*Disregarding may cause personal injury.*

**DANGER** ***Risk of electric shock***

*The relay contacts of the instrument shall be protected using 6 A slow-blow fuses as soon as 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 from other circuit parts. DC units shall be equipped with an appropriate protective earth conductor in order to avoid dangerous voltages or currents.*

*Disregarding may cause personal injury.*

# 11 Sensor installation

This chapter describes the sensor types and where they are usually installed. You can find detailed installation instructions for the individual sensor types in the installation instruction for transit time sensors.

***Note***

*Always ensure compliance with the safety regulations during the installation work.*

The transit time difference method always uses 2 sensors per measurement path. These sensors shall be aligned to exactly face each other. Both sensors of a measurement path serve both as transmitter and receiver of ultrasonic signals. The sensor pairs are matched to each other per default. As a principle, the path sensors have the same cable length. Moreover the sensors within a path can be identified by the serial number.

## 11.1 Sensor installation basics

The sensor installation at the measurement place extremely depends on the conditions on site. Therefore always make sure that there are proper hydraulic conditions and an appropriate calming section available on site. Sensor type and sensor fastening need to be determined depending on the measurement place.

*Detailed information on how to select a calming section and the installation of sensors can be found in the >Installation Instruction for Transit Time Sensors<.*

For transit time measurement first the type of measurement place needs to be set. This setting determines whether sensors with medium contact or clamp-on sensors are used.

⇨ Information on how to set the type of measurement place can be found in chapter >PARAMETER SETTING< starting at page 63.

## 11.2 Installation of sensors for partial filling

***Note***

*The installation of wetted sensors shall be executed by a pipeline company or a plumber only.*
*The tightness of pipes must be guaranteed at all times.*

### 11.2.1 Possible sensors for partial filling

**Rod sensors**

Rod sensors are suited to measure the flow velocity of clear, clean water to slightly polluted media in open, rectangular canals. The rod sensors are manufactured in various lengths.

The sensors can be installed using special installation accessories.

⇨ Please find according accessories on page 115.

**Hemisphere sensor**

Such sensors are used for measurement in clean to slightly polluted media, in open part filled flumes and canals with varying shapes and dimensions.

The sensors can be installed in various angles and different layers (chordal) to measure in surface water bodies such as rivers, channels and similar.

**Ballhead sensor**

Ballhead sensors are conceived for use in smaller open and closed channels starting at diameters of 2 m. Thanks to flexible adjustment and alignment the sensor is well suited for multi-path measurement. The ballhead sensor is particularly suitable for use in large pipe diameters starting at DN 2000.

*Detailed information on the installation of the several sensors can be found in >Installation Instruction for Transit Time Sensors<.*

### 11.2.2 Parameter entry

Before you can enter sensor positions and sensor arrangement it is necessary to enter some parameters.

The parameters below are required to set up the measurement place:

- Pipe outside diameter, internal pipe diameter or pipe circumference
- Pipe wall thickness
- Wall material
- Medium to be measured

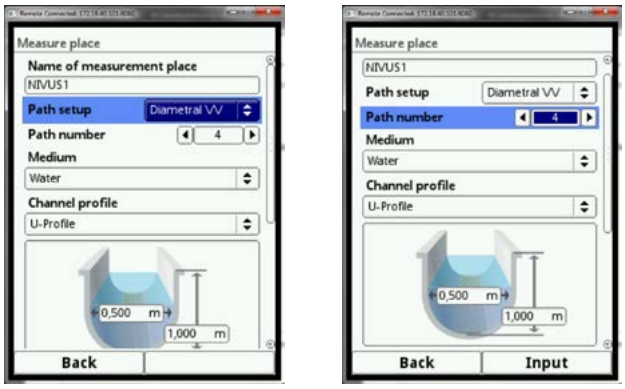



**Fig. 11-1 Selection path setup and path numbers**

Set the parameters for the measurement place in the corresponding menu. By simply entering the height and the width of the channel most of the parameter settings are easily done.


**Fig. 11-2 Entering channel dimensions, standard profile**

### User channel shapes

Since mostly older channel systems very often feature special shapes NivuFlow provides options to set dimensions or areas of symmetric and asymmetric canals in a table using this menu.

The parameters of water beds can be set here too. To do so the measurement place must be previously measured completely and the banks need to be fortified accordingly.

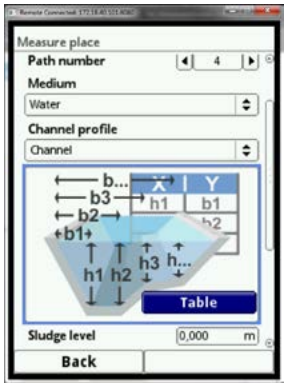



**Fig. 11-3 Entering channel dimensions, water bed**

Sensor positions can be entered for each path separately. To move to the next path press the right-hand function key (Tab).

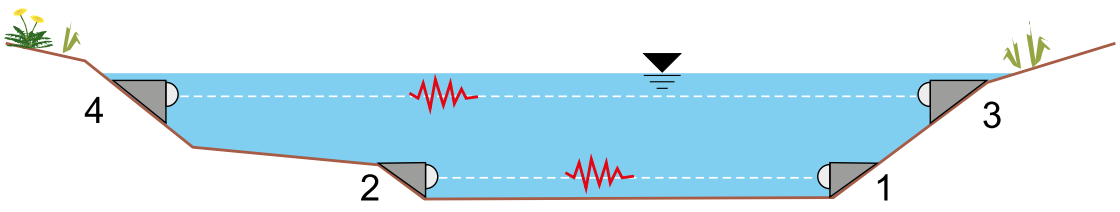



**Fig. 11-4 Example positioning sensors in a river**

# 12 Sensor connection

**CAUTION**

***Operate the device only with the clamping connections plugged***

*During operation on the terminal clamps for piezo sensors (X3 connections 6 to 16) voltages of up to 85 V are present.*

*Make sure to use appropriate touch protection while installing the sensors. The unit shall be operated only if the accompanying four plug sockets for the sensor connections X3 contacts 6 to 17 are plugged.*

*Disregarding may result in personal injuries.*

## 12.1 Cable for sensor connection

The sensors of a measurement path basically have the same cable length.
The signal cable (cable type: Twinax 2 x AWG 20) os firmly connected to the sensor.

It is not allowed to extend or shorten the sensor cable.

The signal cable fixed on the sensor is not designed to be laid in the ground permanently. If you wish to lay signal cables into soils, concrete or similar, use additional protective pipes or hoses with sufficient inner diameters

### 12.1.1 Sensor connection 1-path measurement

*Wiring diagrams for the sensors can be found in the >Technical Description for transit Time Sensors<.*

Following flow velocity sensors can be connected to the NivuFlow 650:

- NOS-V2005 Rod sensor
- NOS-V20B Adjustable ballhead sensor
- NOS-V3005 Rod sensor
- NOS-V30B Hemispheric sensor
- NOS-V4005 Rod sensor with bis sensor head
- NIS-V280K Wedge sensor
- NIS-V200R Rod sensor

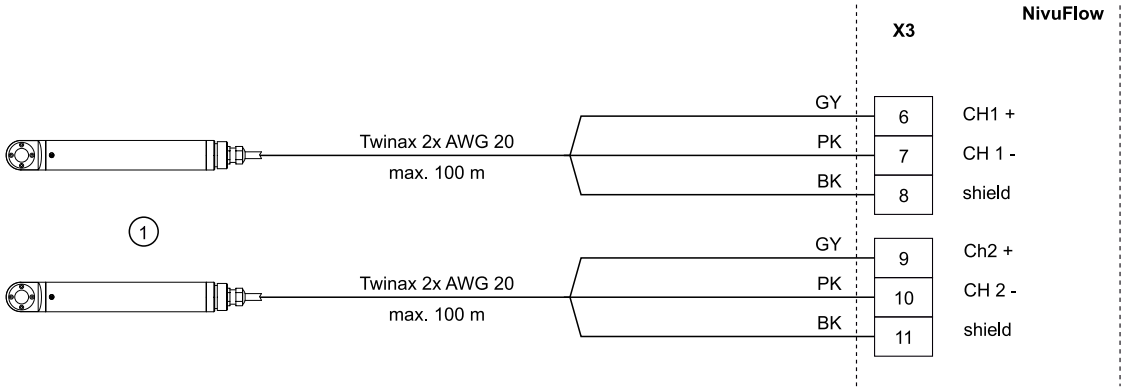
The NivuFlow 650 offers the possibility to connect additional level sensors:

- 2-wire level sensor (e.g pressure probes)
- NMI i-series sensor
- OCL air ultrasonic level sensor

Further settings:

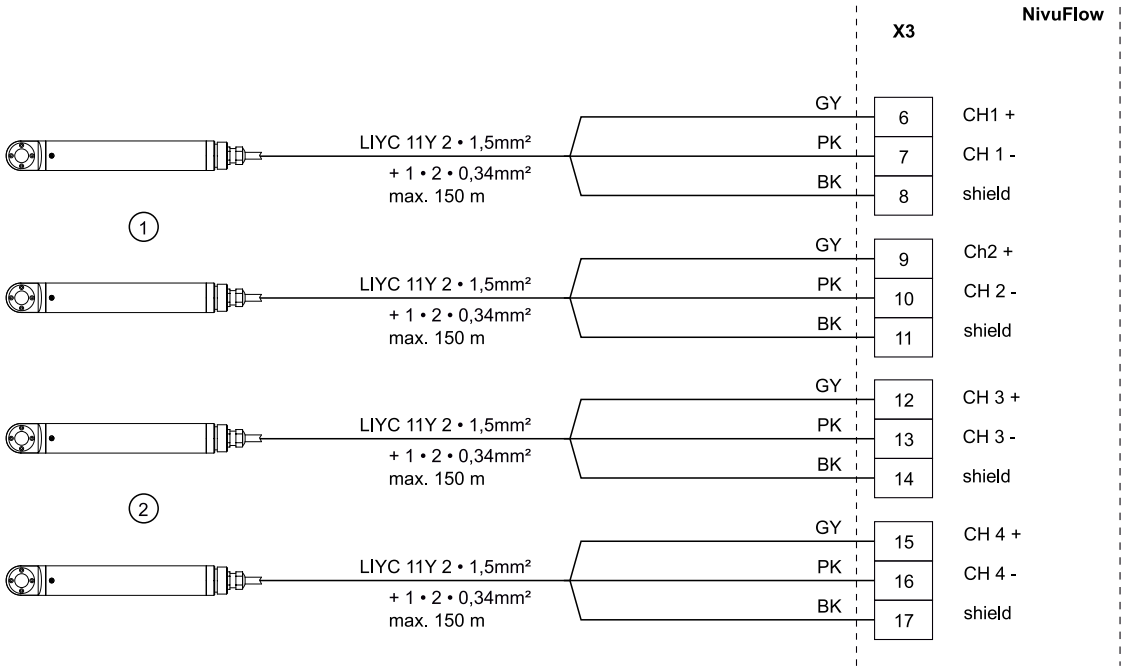
- Level via Modbus
- Level defined fvia ixed value

### 12.1.2 Sensor connection of path measurement




1 = connectable sensors

**Fig. 12-1 Connecting 1 pair of rod sensors to NivuFlow**




1 + 2 = sensor pair per path

**Fig. 12-2 Connecting 2 pairs of rod sensors to NivuFlow**

# 13 Overvoltage protection

For effective protection of the NivuFlow transmitter it is necessary to protect power supply as well as mA-output using overvoltage protection devices.

NIVUS recommends surge arrestors types EnerPro 220Tr, EnerPro 24Tr (for 24 V DC) for the mains supply, as well type DataPro 2x1 24/24Tr for mA-inputs and mA-outputs.

The used NIVUS sensors are internally protected against overvoltage. If higher voltages are expected to occur they can be protected by combining the types DataPro 2x1 12/12-11µH-Tr (N) as well as SonicPro 3x1 24 V/24 V.

***Note***

*The line resistance is 0.3 Ohm/wire. This resistance must be taken into account considering the allowed total resistance (see >Technical Instructions for Transit Time Sensors< for details).*

***Note***

*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!*

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

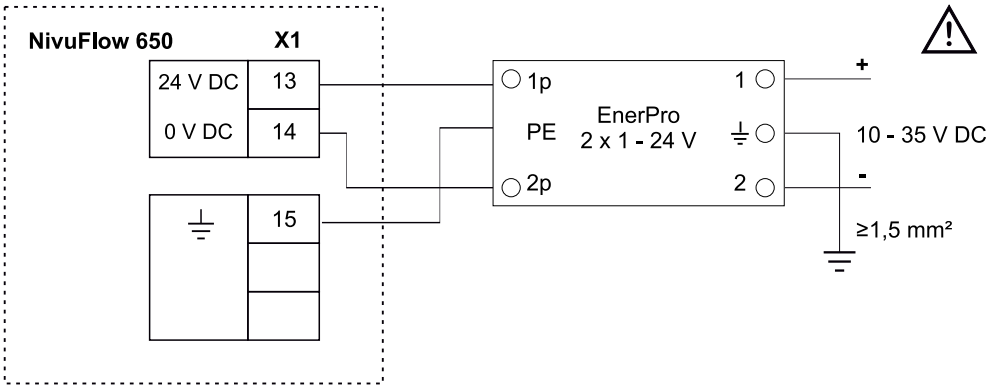



**Fig. 13-1 Overvoltage protection for power supply AC**

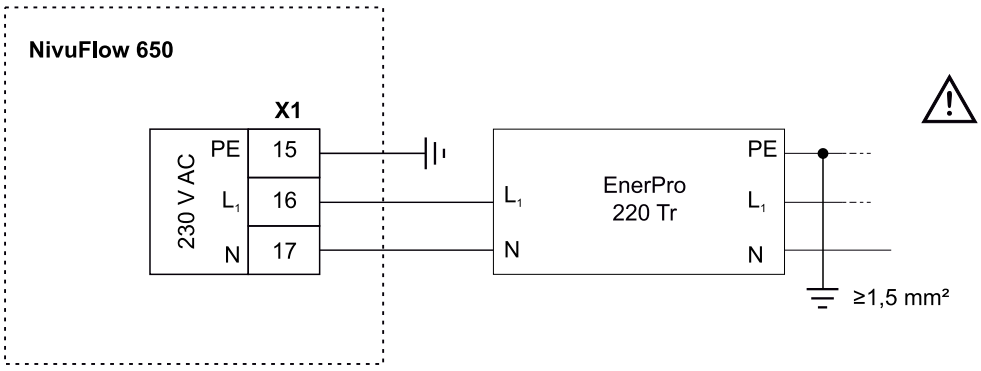



**Fig. 13-2 Overvoltage protection for power supply DC**

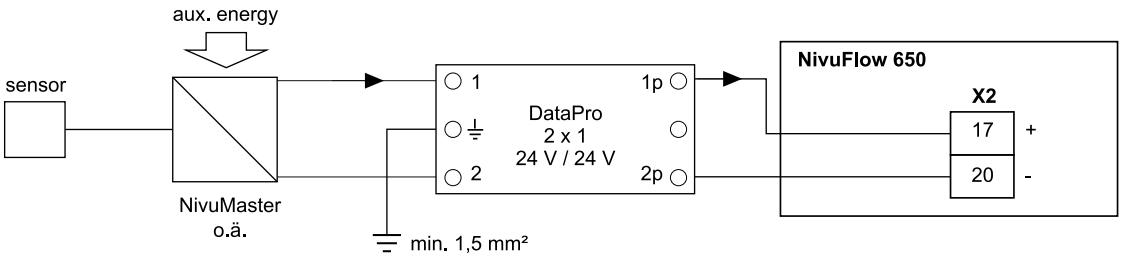



**Fig. 13-3 Overvoltage protection analog input from external transmitter**

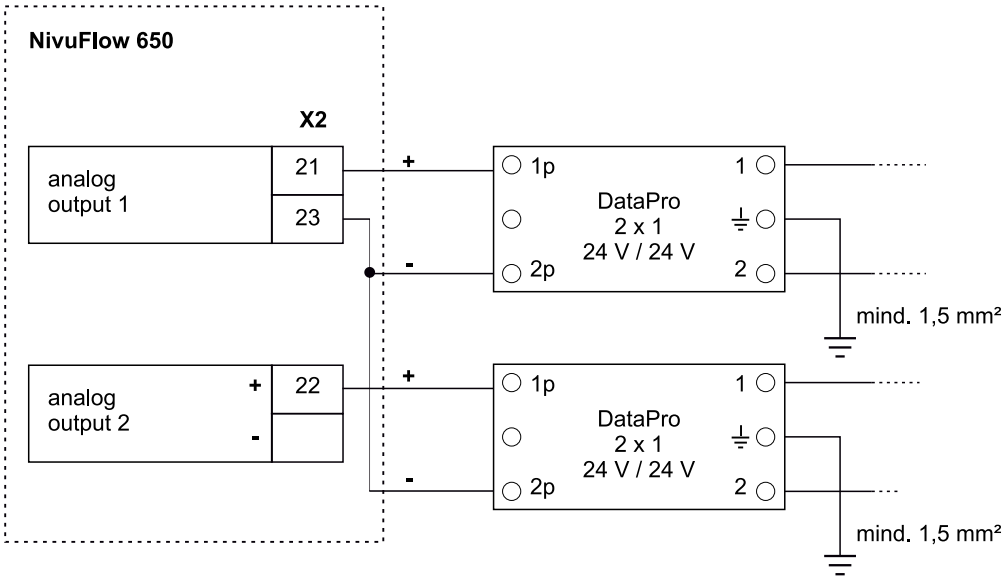



**Fig. 13-4 Overvoltage protection analog outputs NivuFlow 600, type M3**

# 14 Transmitter connection

## 14.1 Types of measurement transmitter

The NivuFlow 650 measurement transmitter is available in 2 different versions:

- Type T2 - Standard version each for 2 paths, one level sensor and the option to additionally connect an external level sensor
- Type T4 - Connection for up to 4 paths, one level sensor and the option to additionally connect an external level sensor

Both versions have the same clamp designations. These blocks are functionally assigned to the different connection areas. The transmitter type T4 has additional terminal blocks.

## 14.2 Connection to the terminal blocks

All NivuFlow transmitters are equipped with plug-in spring-cage terminal blocks. The use of these plug-in spring-cage terminal blocks enables an easy pre-installation of the transmitter. This allows a possible revision of individual sensors, input signals and output signals etc. Also a fast transmitter exchange is possible.

The spring-cage terminal blocks are suitable for the connection of single-wire and multiple wire copper cables. These cables are vibration-proof.

To open the contacts on the terminals, proceed as follows:

☞ Press with a slot screwdriver on the front-side orange elements

☞ Observe to not exert too much pressure

Screw terminals are used for connecting the power supply.

To connect the power supply, use a slot screwdriver with a blade width of 3.0 or 3.5 mm. Insert and remove the terminals only in de-energised condition.

| Terminal block | Power supply | Bus-/ Network | Terminals A/I etc. | Air-US-sensor OCL as well as v-sensors |
|---|---|---|---|---|
| wire cross section, rigid cables [mm²] | min. 0,2<br>max. 2,5 | min. 0,2<br>max. 0,5 | min. 0,14<br>max. 1,5 | min. 0,2<br>max. 2,5 |
| wire cross section, flexible cable [mm²] | Only for DC connections:<br>min. 0,2<br>max. 2,5 | min. 0,2<br>max. 0,5 | min. 0,14<br>max. 1,5 | min. 0,2<br>max. 2,5 |
| wire cross section flexible with ferrule blank [mm²] | Only for DC connections:<br>min. 0,25<br>max. 2,5 | min. 0,25<br>max. 0,5 | min. 0,25<br>max. 1,5 | min. 0,25<br>max. 2,5 |
| wire cross section flexible with ferrule w. plastic sleeve [mm²] | min. 0,25<br>max. 2,5 | Keine Angaben | min. 0,25<br>max. 0,5 | min. 0,25<br>max. 2,5 |

## 14.3 Connection diagrams

**DANGER**

***Risk of electric shock***

*Never remove the terminal block from board X1 (connections 15-17).*

*This terminal block is for the connection of the protective conductor as well as the AC power supply and is a fixed component of the instrument. The instrument shall be operated only with the terminal block screwed on tightly.*

*Disregarding may cause personal injury.*

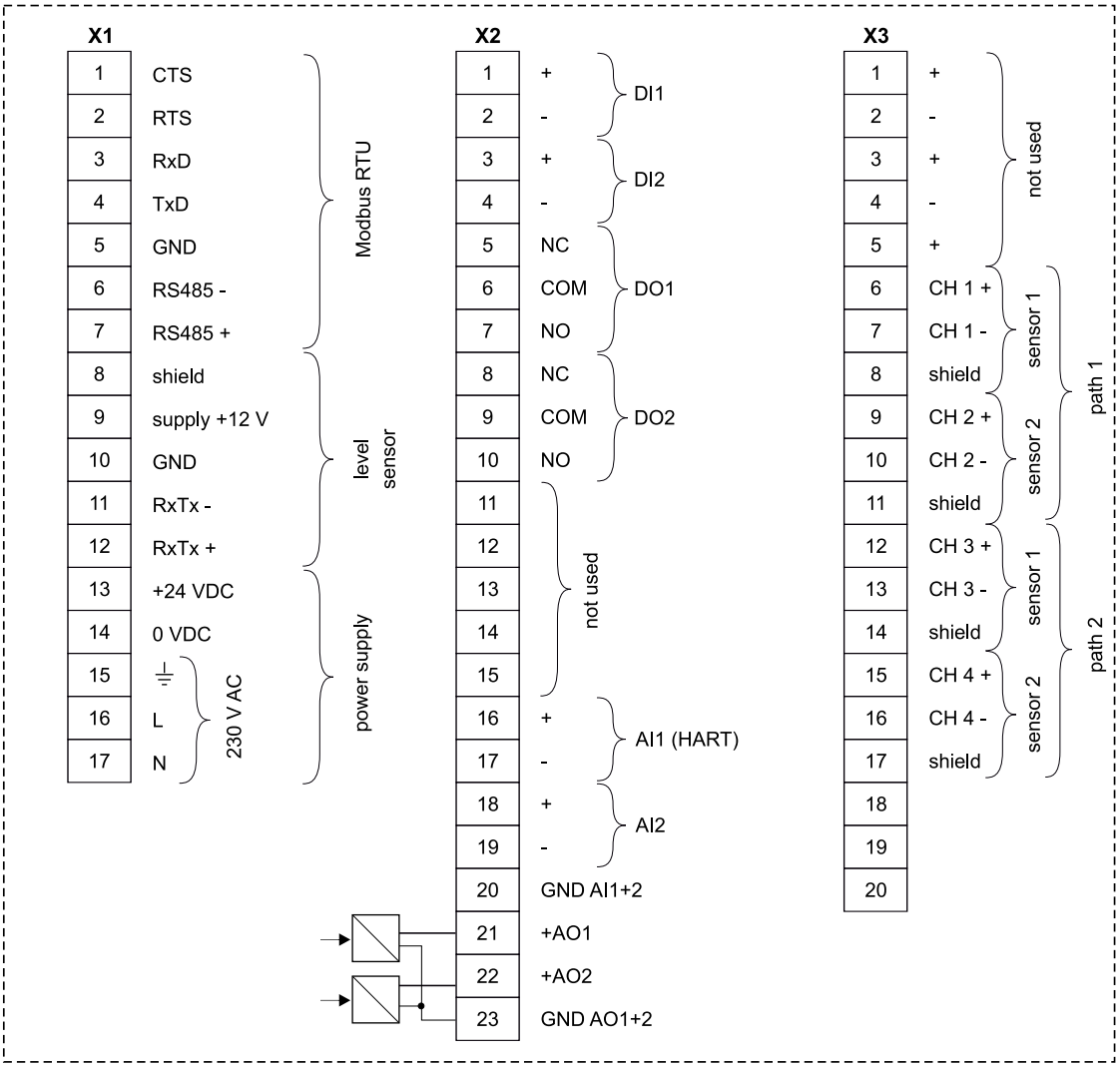



**Fig. 14-1 General connection diagram, NivuFlow 650, type T2**

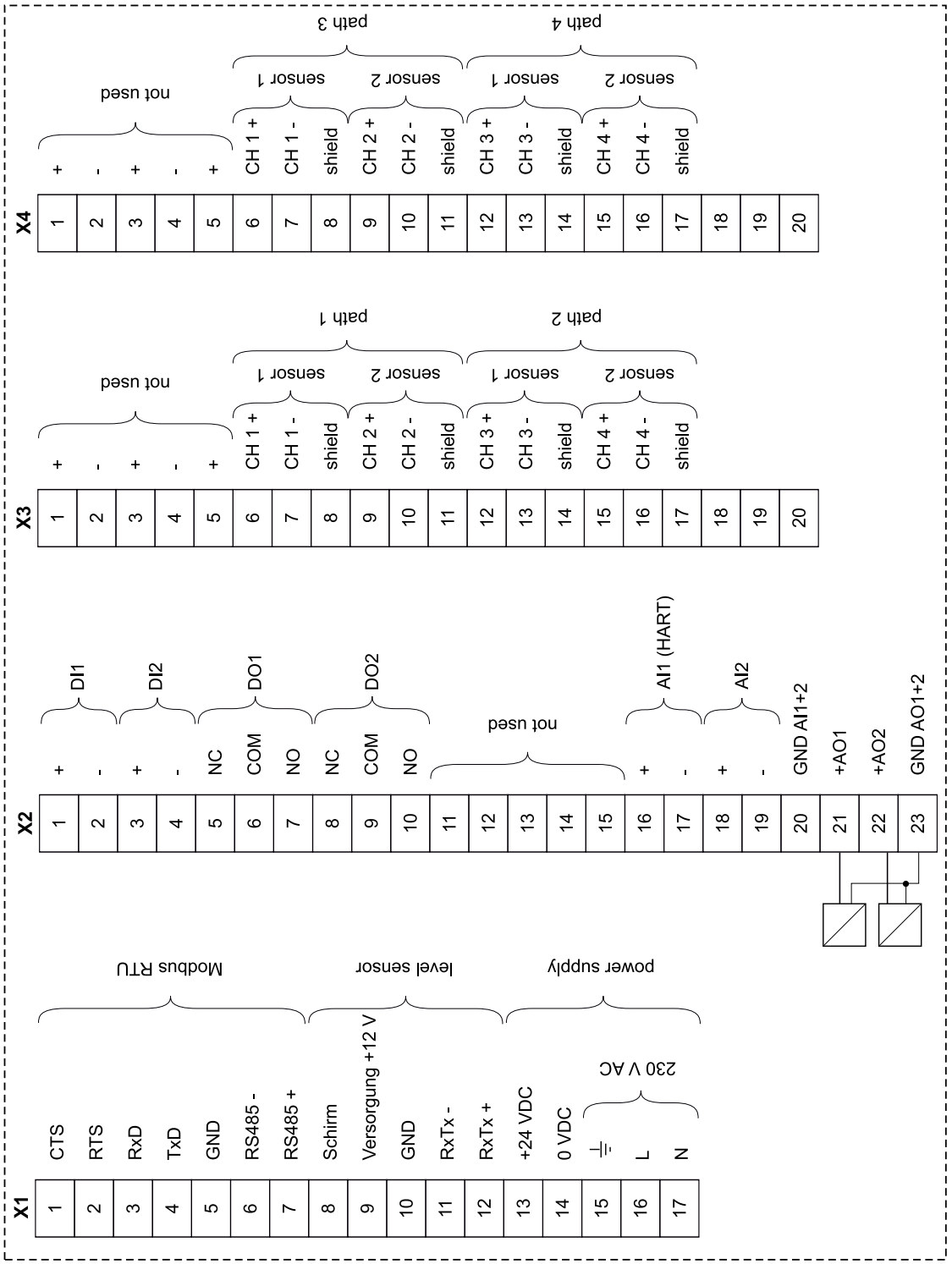
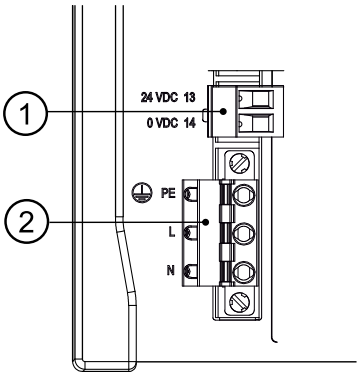



**Fig. 14-2 General connection diagram - NivuFlow 650, type T4**

## 14.4 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 of type NivuFlow
2 230 V AC connection of type NivuFlow

**Fig. 14-3 Electrical Connections of power supply NivuFlow**

⇨ **Note the warning on page 42!**

***Note***

*The series resistance is 0.3 Ohm/wire. This resistance shall be added to the permissible total resistance; see >Technical Description for Transit Time Sensors<.*

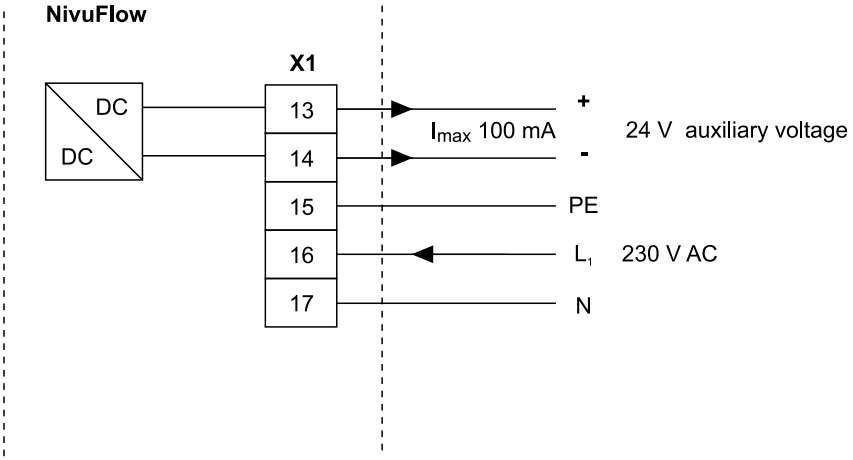



**Fig. 14-4 AC connections of power supply**

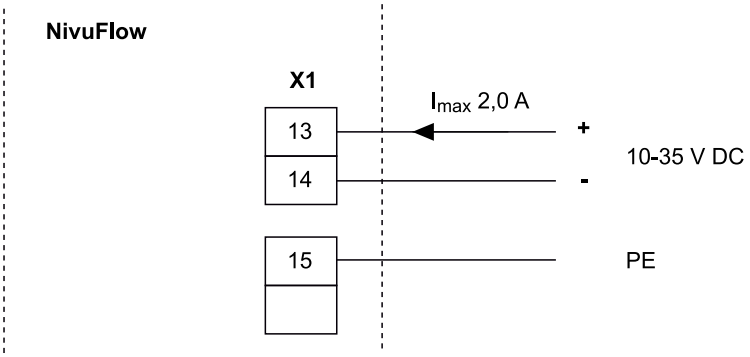



**Fig. 14-5 DC connections of power supply**

# Putting into Operation

## 15 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 technically qualified personnel. Appropriate knowledge in the areas of measurement systems, automation technology, control engineering, information technology and wastewater hydraulics are preconditions for putting the NivuFlow into operation.

Read this instruction manual carefully in order to guarantee proper function of the NivuFlow. The NivuFlow shall be wired according to the wiring diagram in chapter 15.3. 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 entry wheel, function keys and display.

The connection of transmitters and sensors (according to chapter 15.3) s 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
- display units
- span and function of analog and digital outputs

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

In case of the following requirements let either the manufacturer or an expert company authorised by the manufacturer set the parameters:

- Extensive programming tasks
- Difficult hydraulic conditions
- Special channel shapes
- Expert personnel
- If the service specification requires a protocol on settings and errors

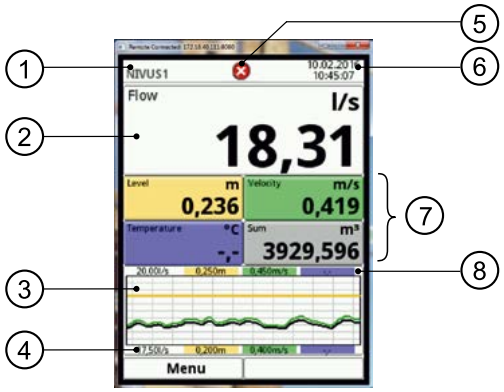
# 16 Operation Basics

The complete operation of the NivuFlow is handled via control 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 display provides information on where you currently are within the menu structure and which entries you are about to modify.

## 16.1 Display Overview



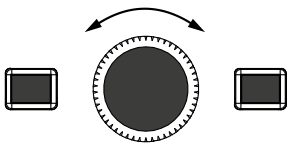

1 Display area 1 (Output field 1)
2 Display area 2 (Output fields 2-5)
3 Display area 3
4 Functions
5 Name of measurement place
6 Date / time
7 Error message sent or display for active service mode

**Fig. 16-1 Display overwiev**

## 16.2 Using the Control elements

☞ First, select the >main menu<. Press the right hand function key.

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



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

Here you can enter names or numbers in parameters..

⇨ also see page 47

**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. 16-2 Confirmation after parameter setting**

☞ Confirm the entry with >YES<.

The password query for the parameter settings appears:


**Fig. 16-3 Password query for parameter settings**

☞ Enter the password (Default setting described on

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

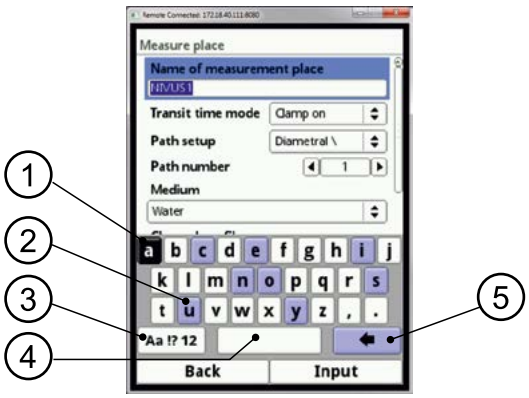
## 16.3 Use / Entry using the Letter block

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.

**Detailed information on how to use the keypad can be found here. Later sections of this manual will merely prompt you to enter names or designations.**

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

1. Turn the rotary pushbutton to scroll to 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 (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 name is on the display.




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

**Fig. 16-4 Keypad**

A shift key ban be found at the bottom left of the keypad (3).

☞ Activate this shift key by rotating the rotary pushbutton until the shift key is highlighted black.

**The functions of the shift key are:**

- Upper case
- Lower case
- Special characters
- Digits

This settings allow individual names of the measuring place almost without limitations.

## 16.4 Use / Entry using the numeric Keypad

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

**The use of the number field has the same structure as the keypad. Later in the manual, you will only be prompted to enter dimensions or numerical values.**

☞ 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
2. 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.

## 16.5 If typed wrong:

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.
4. Write subsequently until the complete name or dimension arrears in the display.
5. 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.

## 16.6 Menus

All menus are described in a logical programming order in chapter “Parameter Setting”.

There are six basic menus available which can be viewed and selected by pressing the right hand function key.

**The menus are:**

| | |
|---|---|
| **Application** | This is the most comprehensive menu of the NivuFlow. It guides the commissioning personnel through the entire setting of parameters for the dimensions of measurement places, selection of sensors and paths, analog and digital inputs and outputs, control functions and diagnostics. |
| **Data** | This menu allows to visually indicate charts on flow rate, level and average flow velocity. There are tables on 24-hour day totals available. Moreover this menu can be used to save data and parameters as well as to load parameters.<br>An USB stick can be formatted using this menu.<br>It is possible to modify storage cycles and totals here as well. |
| **System** | This menu can be used to recall basic information on the transmitter such as serial no., version, art.-no. and many more. You will need this information in the event of queries from the manufacturer.<br>Settings such as language, time and data format can be modified in the country settings. System time as well as time zones can be found in the Time/Date sub-menu. Error messages are available in the according sub-menu.<br>The service level is not described in more detail here. |
| **Communication** | This menu contains parameters for all communication interfaces available on the NivuFlow. |
| **Display** | Here more basic parameters such as contrast, backlight and display dimming can be adjusted. Moreover the format of the output fields (text, decimal places...) can be set. |

# Start-up examples

***Important Note***

*To measure in open channels or water bodies the measurement place shall be selected according to applicable regulations and EN ISO 748.*

This chapter demonstrates three programming examples step by step. The examples are typical NivuFlow 650 applications.

**All parameter setting examples described below provide that dimensions and shapes of the channels are known.**

## 17 Measurement in open channels

NIVUS rod sensors are preferably used to measure in open rectangular canals. Use the NIVUS GmbH sensor holders to install rod sensors on vertical river banks or canal walls.

⇨ Please find appropriate sensor holders in chapter 36.

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

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

All measurement place parameters are indicated on the graphic display.

*Observe to prepare the measurement section as described in >Installation Instruction for Transit Time Sensors<.*

## 17.1 Parameters of a system with multiple crossed paths

To set the parameters of a multi-path measurement it is necessary to enter all measurement place data into the transmitter.

**Familiarise with the operation basic described in chapter 16.2 first.**

### 17.1.1 Application in rectangular channel

**Application situation:**

- 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
- X-path arrangement, 2 paths
- Level monitoring, standard level 2 m
- Position and mounting height of level sensor (3.30 m) due to conditions on site

NIVUS rod sensors are used. The sensors are installed prior to setting the parameters.

*Follow the mounting instructions described in >Installation Instruction for Transit Time Sensors <.*

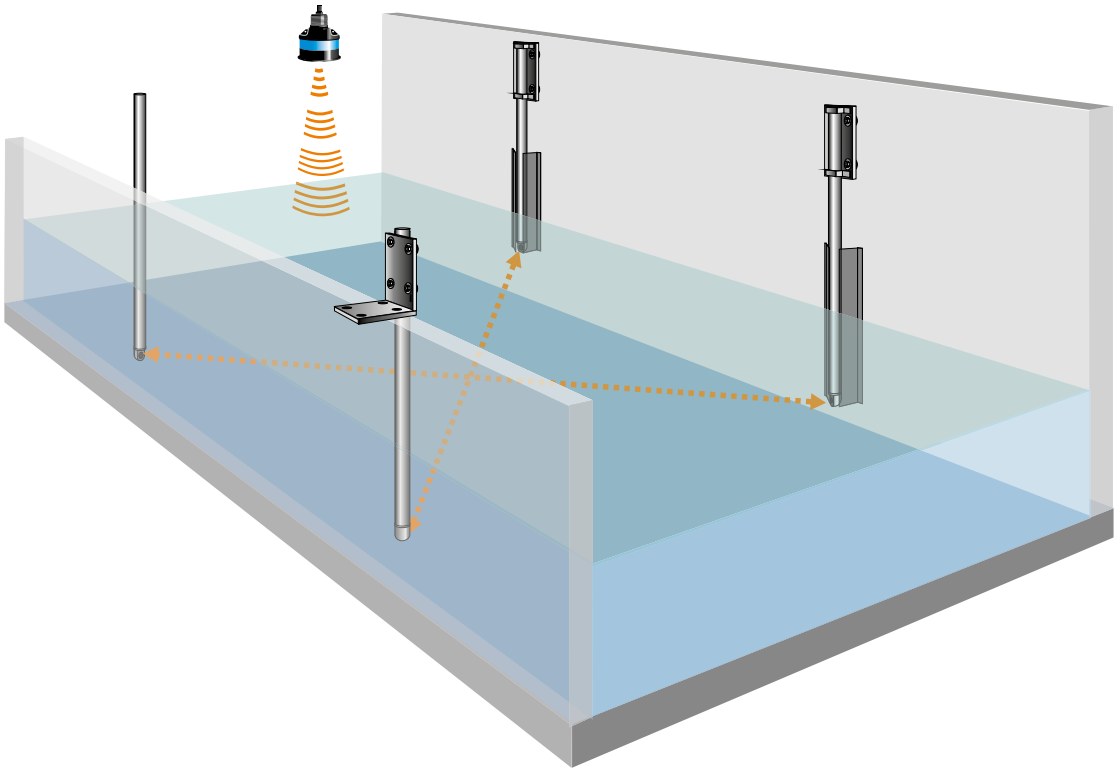


**Fig. 17-1 Application example rectangular channel with 2 measurement paths**

☞ First open the >Application< menu.

**Measurement place data**

The symbol >Measurement Place< takes you to the measurement place parameter settings.

☞ Start entering your parameters.

1. First enter the desired name in >Name of Measurement Place<. Use the keypad to enter the name (input procedure described on page 46).
2. Set path arrangement (Chordal X) and the number of paths (2 paths).

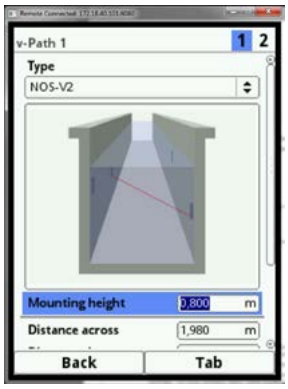



**Fig. 17-2 Choosing path arrangement**

***Note on Media***

*Choose >Q=f(h)< if your medium is not water (= User defined). This action opens up another menu point which prompts you to enter e.g. the medium sound velocity.*

⇨ *Websites listing sound velocities can be found in the Internet.*

3. Use the dropdown menu to select the appropriate medium (water)
4. Then set the channel profile >Rectangle<

The graphics section now shows a rectangle including two input fields. By simply entering width and height of the channel the parameters are set easily.

This application does not require to enter - following parameters (dry weather flume, sludge level,...) remain to default setting.

Below the graphics section it is possible to set the parameters for a channel featuring a center dry weather flume.

⇨ This procedure is described in chapter >Extended parameter setting with Dry Weather Flume on page 55.

After entering all relevant parameters in >Measurement Place< menu it is necessary to re-initialise the path arrangement. Path lengths and sensor positions can be recalculated and indicated graphically this way.

**Exit the menu >Measurement Place< to adjust the sensor settings.**

☞ Go back to the main menu.

The following message is shown on the display:


**Fig. 17-3 Accept modified parameters**

☞ Confirm the modified measurement place parameters.

After confirmation with >Yes< a display message provides information on recalculation and re-initialisation of paths.

☞ Confirm the message with >Ok<.

**Selecting the level sensor:**

☞ Select >h-Sensors< menu symbol

The field >h-Sensor Types< contains a selection of level sensors. In the application example we use an i-Sensor.

☞ Select sensor type >i-Sensor<

**Parameters above the preview picture remain at default settings.**

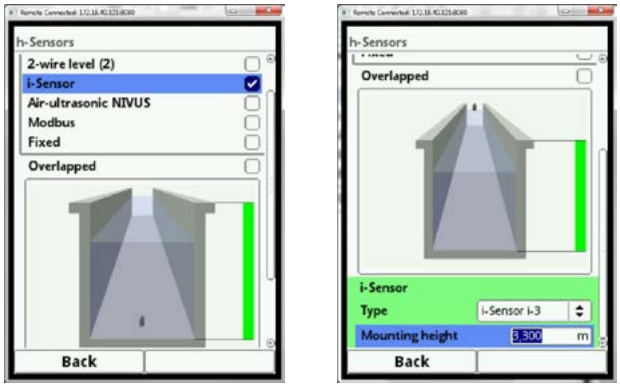



**Fig. 17-4 Selecting/Positioning the Level Sensor**

Initially, the preview shows the level sensor at any position within the canal. Sensor and mounting height can now be set underneath the canal picture.

☞ To do so, enter the sensor type (i-Series i-6) and the mounting height (3.30 m).

The preview indicates the correct sensor position as soon as the mounting height has been confirmed. The visual verification option makes possible programming errors instantly visible.

**Selecting Flow Sensors:**

Exit the >h-Sensors< menu in order to set paths, flow sensors and the according mounting positions.

☞ Go back to the main menu

☞ Select the >v-Paths< menu symbol

1. Select the type of sensor you are using for your measurement. In the application example we use rod sensors (NOS-V2).
2. As mounting height enter the position of the sensor head. The path level should be around 40 % of the filling level. The parameters are set to meter per default.
3. The fields >Distance lengthwise< and >Distance crosswise< provide information on the computed sensor positions. The indicated distance is always the clearance between both sensors.
4. Modifications of the sensor positions due to constructional conditions can be adjusted here.
5. The path length is calculated automatically but can be corrected manually here.

***Important Note***

*Observe that changing the distances will completely change the calculation. Thus, all distances and path lengths need to be adjusted manually.*

⇨ *See chapter >Parameter Setting<*

☞ Finally confirm your entries with the right function key.

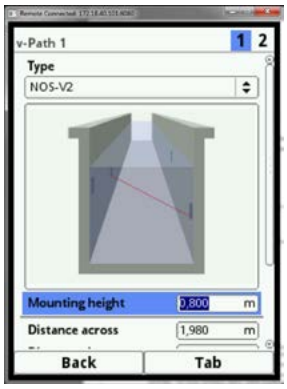



**Fig. 17-5 Entering Sensor position data in Path 1**

☞ Use the right-hand function key >Tab< to move to the 2nd path.

☞ Then enter the mounting position of the 2nd sensor pair (2nd path) as well.

☞ The fields >Distance lengthwise< and >Distance crosswise< provide the same information as described in path 1.

**Save the parameters as soon as all required specifications have been entered.**

☞ Use the left function key to exit the menus step by step until >Save Parameters?< is shown on the display.

☞ Select >YES<

☞ Then enter the password (see chapter page 60)

The NivuFlow 650 is now ready for operation and uses the parameters you have entered.

### 17.1.2 Extended parameter setting with Dry Weather Flume

**Further requirements of this example:**

- Dry weather flume, width 20 cm
- Sedimentation in the flume (3 cm sludge)

**Example**

The rectangular channel has vertical walls and a dry weather flume. The flume contains sedimentation with a height of 3 cm.

First unfold parameter >Dry weather flume< and check the >Active< box. This will open up a submenu providing further options.

Select the parameters below to adjust the settings of the dry weather flume:

- Height
- Diameter

Then use parameter >Sludge Level< to enter the sedimentation height (0.03 m). The default setting here is METER too.

Choosing the 3D preview shows the set profile on the display as graph and hence allows you to verify your settings visually.

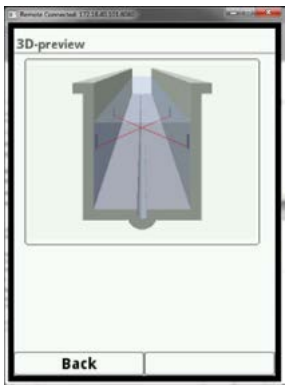



**Fig. 17-6 Verification of entries - 3D preview**

# 18 Measurement in Open Waters

For measurement in open waters NIVUS hemisphere sensors are preferably used. Such sensors are well suited for inclined installation on river banks or non-vertical canal walls. The banks should be stable without the risk of deformation.

The measurement place should have a defined and consistent flow cross-section.

*Observe to prepare the measurement section as described in >Installation Instruction for Transit Time Sensors<.*

***Important Note***

*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.*

## 18.1 Setting Parameters of a Multi-Path System in >Water Bed<

**This example describes how to set the parameters of a system with 4 crossed paths.**

The path arrangement allows alternate measuring of the transit time in paths 1-2 and 3-4.

### 18.1.1 Requirements of this application:

- Open water body: width 5 m
- Stable inclined banks
- No sedimentation on the channel bottom
- X-path arrangement, 4 paths
- Determine filling level, mounting height due to constructional conditions

***Important Note***

*Prior to installing sensors and setting parameters necessarily make sure that the measurement place is accurately measured and documented.*

☞ First open >Application Menu<

Using the symbols >Application< followed by >Measurement Place< takes you to the section to enter the measurement place parameters. Start entering your values.

1. First enter the desired name in >Name of Measurement Place< by using the keypad.
2. Set path arrangement (Chordal X) and the number of paths (4 paths)
3. Use the drop-down menu to choose the measurement medium (water)
4. Then set the channel profile to >Water Bed<

The graphics section now shows an undefined profile with a selection field >Table<.

☞ Open >Table<

Use the table elements >Distance< and >Depth< to enter the dimensions of the water bed. These specifications can be taken from the measurement plans of the site.

Starting point for the setting of parameters is a previously determined reference point.

Points such as the water surface or the side wall height of fortified banks can be used as appropriate reference.

☞ Enter the reference point as the first point into the table (b1 = 0).

**Each value must be confirmed by using the left function key >Enter<.**

Rotating the rotary pushbutton takes you to the next measure within the table.

☞ Measured from the first distance now enter the depth (h1) of the water body at this point.

☞ Repeat these steps (b2, h2, b3, h3...) until the entire cross section of the water body is entered.

The lower the distances in the lines of the table, the more accurate the indication of the water body cross section.

An example of a programmed water bed is shown in the figure below.

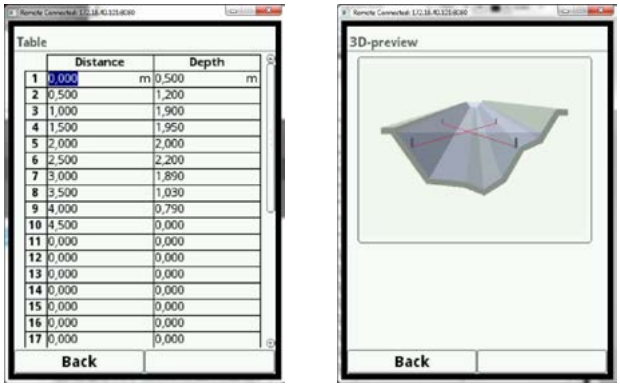



**Fig. 18-1 Entering Water Bed Dimensions with Preview**

Exit the table using the left-hand function key after entering all dimensions.

☞ Use the 3D-preview to indicate the profile on the display. This representation helps you to visually verify your entries.

The other parameters below the graph remain at default setting.

To adjust the sensor settings exit the >Measurement Place< menu by using the left function key.

☞ Go back to the main menu

The following query is shown on the display:


**Fig. 18-2 Accepting the modified measurement place parameters**

☞ Confirm the modified measurement place parameters

After confirming >Yes< a message appears on the display showing that the paths have been re-initialised and recalculated.

☞ Confirm >Ok<

**Selecting Level Sensors:**

☞ Choose symbol >h-Sensors<

The field >h-Sensor Types< provides a selection of level sensors.
In the application example an i-Sensor is used.

☞ Select sensor type i-Sensor

The following parameters above the graph remain at default setting.

You can now program the sensor and set its mounting height below the channel graph. In this example the mounting height is set to 3 m above the channel bottom.

☞ Enter sensor type and mounting height

☞ Confirm your entry with the right function key

You can see the sensor position in the channel graph as soon as you have confirmed the mounting height. This graph makes possible programming errors instantly visible.

**Selecting Flow Sensors:**

Exit the >Measurement Place< menu in order to adjust the settings of paths, flow sensors and the according positions.

☞ Go back to the main menu

☞ Select symbol >v-Paths<

1. Choose the sensor type you are using for your measurement.
2. Then enter the mounting height of the 1st path's sensor head. The according units are set to meter per default.
3. Use the fields >Distance lengthwise< and >Distance crosswise< in the display to read the calculated sensor positions. The indicated distance is always the clearance between both sensors.
4. Modifications of the sensor positions due to constructional conditions can be adjusted here.
5. The path length is calculated automatically but can be corrected manually here.
6. Finally confirm your entries with the right-hand function key.

☞ Use the right function key >Tab< to go to the 2nd path

☞ Subsequently enter the mounting positions of the 2nd sensor pair (2nd path) as well. Use >Distance lengthwise< and >Distance crosswise< right as described under path 1.

The graph is setting the entered dimensions and sensor positions in relation to each other. This allows you to visually verify whether your entries are correct.

**Weighting**

As soon as two or more paths are used it is necessary to specify the significance of each path regarding the computed average total velocity.

Use the field "Weighting" to enter the specification in %.

**The default setting is 100 %.**

**After all necessary parameters for the measurement place have been entered your entries shall be saved.**

☞ Use the left function key to exit the menus step by step until >Save Parameters?< is shown on the display.

☞ Choose >YES<

☞ Then enter the password

NivuFlow 650 is now ready for operation and uses the parameters you have specified.

# Parameter setting

## 19 Parameter Principles

In principle, modified parameters do not become effective before the have been saved. The unit is checking whether parameters have been changed when you exit menus. Finally you will be prompted to eventually save modified parameters.

- >yes<: modified parameters are accepted and saved
- >no<: parameter modifications are rejected and the unit will exit the menus
- >Abort<: you will exit the prompt. The parameters remain to be modified, however will not become effective and will not be saved.

### 19.1 Save parameters

If you wish to accept and to save modified parameters it is necessary to enter a valid password first. Enter the new password in the New password field.

**The default setting for the password is 2718.**

### 19.2 Change Password

You can change the default password at any time. However observe that changing the password will protect all changes of transmitter settings. The input is limited to 10 digits.

**To change the password, proceed as follows:**

☞ Open the menu >System<.

1. Select submenu >Service<
2. Activate the options >change password<
3. Enter the existing password using the number field
4. Enter the new password in the new password field (max. 10 characters)

The transmitter will accept the new password and saves all settings on the NivuFlow 650.

***Important Note***

*Never give the password to any unauthorised persons!*

*If you need to note down this password, keep it in a secure places.*

*If the password should get lost contact the manufacturer.*

# 20 Parameter Functions

## 20.1 Main menu

The complete parameter settings of the NivuFlow 650 are possible via six setup menus. The individual menus are described in chapter 21. The options can be found in the main menu as described in the figure below:


**Fig. 20-1 Main menu display**

⇨ Please note the general procedure for parameter settings on page 46.

## 20.2 Functions on the first menu level

### 20.2.1 Menu - Application

This is one of the most relevant basic menus when it comes to setting parameters. The Application Menu contains four sub-menus where shapes and dimensions of measurement places can be set. It is used to define the flow velocity sensors used as well as to set mounting position data.

Moreover the required analog and digital inputs and outputs can be defined here:

- Functions
- Measurement ranges
- Measurement spans
- Limit values

This this menu also contains the diagnostic possibility of:

- The sensors
- The inputs and outputs
- The complete system

Use this menu to enter or change:

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

### 20.2.2 Menu - Data

The data menu contains all internal stored measurement values.

Following functions are available:

- Graphical representation of the measured values
- List of the 100 last 24 h-sum values
- Communication and transmission of internal files
- Formatting of the external USB stick
- Transfer of adjusted parameters of measurement place parameters to and from the USB stick
- Various options for setting and erasing the internal data memory
- Storing cycle settings

### 20.2.3 Menu - System

This menu contains transmitter information:

- Firmware
- Article number
- Serial number

Additional the menu contains setting options:

- Language
- Units
- Date and time correction

You can also see the internal error storage displayed. The error message memory can be reset from here as well.

The service menu, deposited here, is intended exclusively for service personnel.

### 20.2.4 Menu - Communication

This menu includes options for various communication interfaces to connect with other communication systems:

- TCP/IP
- Server
- HART (in preparation)
- Modbus

### 20.2.5 Menu - Display

You can adjust the backlight level of the display. Possible corrections of the five output fields of the main menu.

# 21 Parameter Description

**The following sections describe the general procedures for the setting of parameters.**

Parameters for measurements using wet or clamp-on sensors are set in different ways. The parameter setting procedures for the submenus >Measurement Place< and >v-Paths< vary depending on the transit time mode.

Due to this, both submenus will be described separately.

**Accept Measurement place parameters**

After being set completely, the parameters for the respective measurement place need to be saved. The memory is password-protected.

☞ Enter the password on the numeric keypad.

**The factory default for the password is 2718.**

☞ First open the >Application menu<.


**Fig. 21-1 Application menu**

## 21.1 Measurement place settings

The sub-menu >Measurement place< is one of the most relevant basic menus used in parameter setting. The parameter settings of a measurement site contains basic settings for:

- Name of measurement place
- Type of channel profile and channel dimensions
- Medium and Pipe material
- Possible solid sediments settings
- Low-flow suppression
- Measurement damping and stability

### 21.1.1 Name of measurement place

Enter the desired measurement place name here. Your entry is limited to 256 characters.

**The default name is “NIVUS1“.**

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

☞ Write subsequently until the complete name is in the text box.

☞ Confirm the entry with the right hand function key.

The name of measurement place is taken to the main menu and is displayed there.

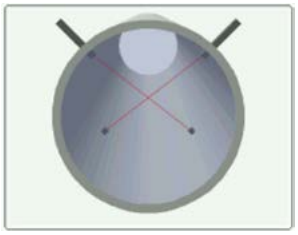
### 21.1.2 Path setup

The path setup to choose depends on the channel profile set. Therefore first specify the **channel profile before** you choose the according path setup.

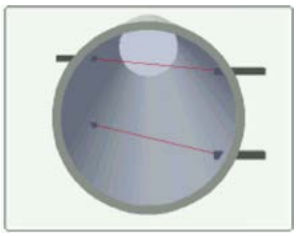
The >Diametral< path setup can only be selected with the closed channel profile >Pipe< available.

All other path setups can only be specified as >Chordal<.

**Diametral (only when pipe is selected)**



**Chordal**



☞ Enter the number of paths after selecting the path setup.

### 21.1.3 Path Number

By turning the rotary push button you can set the number of measurement paths.

- In the version >T2< a maximum of two paths can be programmed.
- In the version >T4< up to four paths are available.

☞ Confirm with „Enter“.

### 21.1.4 Medium

These information are necessary for the NivuFlow to calculate the sound propagation time of the measurement.

***Note on Media***

*Choose >Q=f(h)< if your medium is not water (= User defined). This action opens up another menu point which prompts you to enter e.g. the medium sound velocity.*

*Websites listing sound velocities can be found in the Internet.*

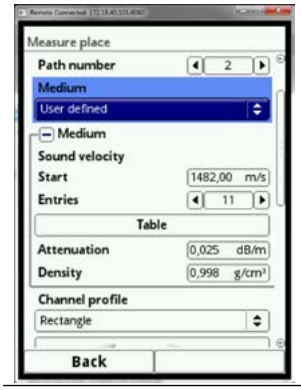



**Fig. 21-2 Measurement Medium Selection**

### 21.1.5 Channel Profile

The NivuFlow 650 is designed for partly filled profiles.

Choose between 2 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)

Since particularly older channel systems often have special shapes, the NivuFlow 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.

☞ After choosing the appropriate profile enter the dimension values digit by digit.

☞ Observe the measurement unit (decimal places). Per default the channel profile dimensions are set to METER.

**Pipe**

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

☞ Enter the pipe diameter.

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.

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

Ovoid profiles feature different radii in bottom and crown.

☞ Enter both profile dimensions of the ellipsoid profile.

**Ovoid profile (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 e.g. Q=f(h).

When setting the ovoid profile parameters only the maximum channel width needs to be entered. The measurement 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 center dry weather flume.

**Rectangle with dry weather flume**

1. Select the parameter >dry weather flume<.
2. Select the checkbox >Active< to open two more input fields.
3. Enter the >height< and >diameter< of the dry weather flume.
4. Select the 3D-preview to verify correct dimensions input.

### 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 0.5 x channel width should be created as free profiles.

### Trapezoid

This selection allows to set 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.

Also for trapezoids a dry weather flume can be added as extra option

### Trapezoid with dry weather flume

☞ Proceed in the same way as in the rectangle profile on page 66.

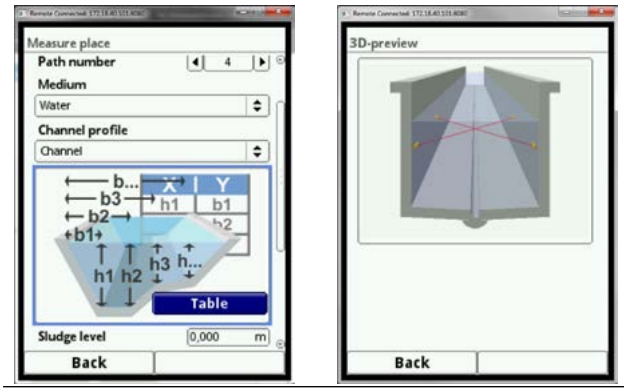



**Fig. 21-3 Trapezoid profile with vertical walls and dry weather flume**

Fig. 21-3 shows an example of settings for a trapezoid profile with vertical walls and a dry weather flume as rectangular channel with sloped berms.

***Notes on parameter >Channel< (Water bed)***

*Setting channel/water bed parameters requires sound knowledge and experience on the NivuFlow 650 functions as well as hydrologic margin conditions.*

*We recommend programming to be carried out by the NIVUS commissioning service NIVUS or an expert company authorized by NIVUS.*

### Channel

You can determine the reference point/zero point for this profile yourself. In most cases the maximum level or the water surface on one side of the river or channel is determined as zero point.

Here you can save the channel profile of a certain channel section determined through local measurements in the transmitter.

☞ Enter the freely determined measurement sections successively into the table.

For reference points with **Ordinance Datum** (official level) select the profile >Channel (local datum)<.

### Channel (Local Datum)

This profile is used if the level zero point (gauge datum) is to be applied as reference value on the measurement place.

The value of the level zero point is determined by the level operator. The level zero point is mostly located below the lowest measured water level.

☞ For programming a water bed including level zero point, contact the NIVUS start-up service.

### Symmetric profile using height-width

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.

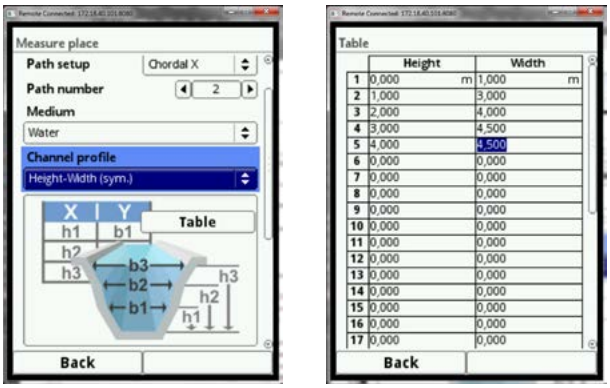



**Fig. 21-4 Setting parameters using free symmetric height-width profile**

Necessarily use a true to scale drawing for parameter setting.

Follow these steps:

☞ Draw a vertical auxiliary line onto the drawing from the lowest point of the channel to the top.

☞ Starting at this line, draw horizontal auxiliary lines from the distinct points of profile changes to the left and to the right.

☞ Measure the distances of each of these auxiliary lines and convert the results true to scale.

☞ Start at height >0< to define a channel start point.

☞ Enter 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 NivuFlow 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.

☞ Verify the dimension settings by using the 3D preview. Wrong dimension programming is visualised.

**Asymmetric profile using height-width**

In practice asymmetric profiles with unusual shapes can be found occasionally. This is where the programming options for asymmetric profiles are used.

☞ Necessarily use a true to scale drawing as described before in the symmetric profiles section.

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 center 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
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. Channel height, channel width to the left, channel width to the right

***Important Note***

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

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 NivuFlow 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. Bad programming is visualised.

☞ Verify the dimension settings by using the 3D preview. Wrong dimension programming is visualised.

**Height-area profile**

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.

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

**Function Q=f(h)**

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 in 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 NivuFlow linearises between individual breakpoints.

### 21.1.6 Sludge level

In horizontal pipelines sedimentation may occur on the pipe bottom depending on measurement medium and flow velocity.

This parameter allows you to specify a fixed sedimentation level within the pipe as >Sludge Level<. The calculation algorithm will treat the sludge level entered as non-moving partial area of the channel on the bottom featuring a horizontal surface. This level is subtracted from total wetted hydraulic area prior to flow calculation.

### 21.1.7 Velocity evaluation

The kb-Factor (correction factor bottom) is a factor to determine the average velocity along the first measurement section (bottom). This value will be used for the flow calculation according to the Mid-section method (ISO 6416).

Usually the kb-Factor is between 40 % and 80 %.

**Factory default: 80 %**

This value does not need to be changed.

### 21.1.8 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 or an elevated sensor installation may push this level even higher.

This level is referred to as h-crit.

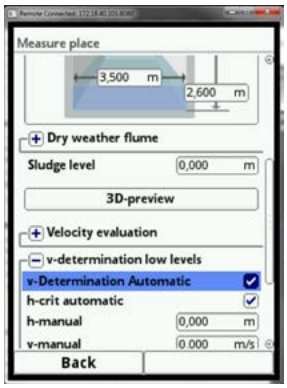



**Fig. 21-5 Submenu: v-determination low levels**

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 NivuFlow 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.

### 21.1.9 v-Determination Automatic

**In the default setting the selection box is activated. That means that the function is active.**

As soon as the level reaches h-crit (critical level), the latest measured flow velocity reading is saved automatically as a calculation basis for lower levels. This calculated flow velocity value then is used to compute the flow rate if the level continues to fall. Should the level first rise above h-crit and then fall below h-crit again, the newly determined velocity value is used as a calculation basis for the flow rate calculation to come.

If >v-Determination Automatic< is disabled and the level should fall below h-crit, the system uses the flow velocity value set under v-manual to calculate the flow rate.

Disable >v-Determination Automatic< box as soon as you expect very low flow levels and backwater within your channel. Deactivation makes sense too as soon as in the event of flow rate zero a small amount of the medium is supposed to stand still.

☞ Set the value in >v-manual< to ZERO. The system then does not compute any flow rates at very low flow levels.

### 21.1.10 h-crit automatic

**In the default setting the selection box is activated. That means that the function is active.**

This automatic calculation method includes the specification of the sensor type and the mounting height parameters. The lowest possible level required to measure flow velocities is automatically determined by the NivuFlow.

If this option is disabled the system utilises the value set in >h-manual< as h-crit.

Per default >h-manual< Is set to >0<.

**h-manual**

This input box is used to manually enter the level. This level is related to the flow velocity value >v-manual<. The >h-manual< value must not be lower than >h-crit< since otherwise readings might get lost.

>h-manual< is active only if >h-crit automatic< is disabled.

**v-manual**

Use this input box to manually enter a flow velocity value. This value is related to >h-manual<.

The required flow velocity value for the according level can be computed e.g. by using hydrologic software. >v-manual< Is active only if >v-Determination Automatic< is disabled.

**h-crit**

This input box is used for v/h-calculation. To do so, enter the level as from which the system is desired to utilise v/h-calculation. >h-crit< is active only if >h-crit automatic< is disabled. The value entered in >h-crit< must not be higher than the value in >h-manual<.

>h-crit< is active only if >h-crit automatic<.

**v-crit**

This menu is conceived for measurements in low levels < h-crit. The system will switch over to a calculated value (Manning-Strickler) as soon as the velocity falls below the minimum value

### 21.1.11 Low-flow suppression

This parameter is to suppress lowest movements or apparent flow volumes. The main area of use is the measurement of overflow volumes in buildings with permanent dam-up.

☞ Place a check mark in the box >Active<

It opens another input option. Here you can enter the value you wish to suppress e.g. in case of lowest discharge rates.

The low-flow suppression is used to avoid the detection of lowest velocity variations. These variations may cause apparently high fluctuations of the measurement volumes over long periods.

Flow velocities lower than the parameter value set will be “suppressed” and hence no volume is detected. The NivuFlow does not store the values.

Only positive values are allowed to be set.

**>Q supressed<**

Enter a flow rate value. As soon as the current, calculated readings are lower than the entered value, the system will automatically set the readings to >0<.Only positive values are allowed to be set. These values are going to be considered as absolute values and therefore affect positive as well as negative velocities!

**>v supressed<**

Low-flow volumes in applications with large profiles and filling levels can be suppressed by means of this parameter. Very low velocity variations over long periods may cause apparently high volume fluctuations which cannot be hidden by using the >Q suppressed< function. The system will set the readings automatically to >0< as soon as the flow velocities are lower than the parameter set for this function.

This is why the calculated volume is >0< as well.

Only positive values are allowed to be set. These values are going to be considered as absolute values and therefore affect positive as well as negative velocities!

### 21.1.12 Damping

This menu enables to adjust the display and analog output damping in seconds. Damping relates to all flow velocity values which are available as input. Damping relates to all flow velocity values which are available as input.

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. This average value is used for further calculation of the flow rate.

The input occurs in five-second steps.

**Factory default: 30 s**

### 21.1.13 Stability

The stability parameter defines the period the NivuFlow bridges values without having valid measurement events available. During this period the NivuFlow 650 operates using the latest valid reading. If the specified period is exceeded without detecting a correct value the NivuFlow goes back to reading >0< considering the damping set.

The NivuFlow does not store the values (invalid value).

The input occurs in seconds.

**Factory default: 30 s**

## 21.2 Setting parameters in menu >h-Sensors<

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.

### 21.2.1 h-Sensor types

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

☞ Open parameter >h-Sensor types<.

☞ Select the type of sensor connected to the NivuFlow 650.

In very most cases it is sufficient to choose one level sensor.

☞ Tick each used sensor if the application uses more than one sensor (e.g. i-Sensor and 2-wire level (2)) .

The number of selected sensors is equal to the number of individual level ranges over the entire measurement cross-section. Only on level sensor at a time can provide a valid value for the measurement. The instrument will not accept faulty and useless combinations.

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

Set the sensor measurement ranges in the area below the channel graph.


**Fig. 21-6 Level Sensor Selection**

***Note***

*The transmitter cannot detect which type of sensor the 2-wire level transducer is. Thus, the sensor indicated in the display is not relevant for the measurement range. The transmitter indicates the 2-wire level sensor as ultrasonic sensor from the top as standard.*

**Example using two level sensors (with expected submerging):**

This setup is primarily used as soon as it is possible that the level sensor may be submerged - e.g. if used in 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. 0.350 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 0,320 m and is to cover the range up to full filling.

As you can see, both measurement ranges overlap by 0.030 m.

⇨ see description >Overlapped<

☞ Enter the level measurement range (level min. / max.), set the offset to >0< (4 mA) and the measurement span to 1 m (20 mA)

☞ Set the i-Sensor parameters now (level min. / max.)

☞ Choose the i-Sensors type and enter the mounting height

☞ Use the coloured bars on the right-hand margin of the graph to verify whether the measurement ranges are correctly set

The overlap range of 0.030 m is highlighted in the graph.

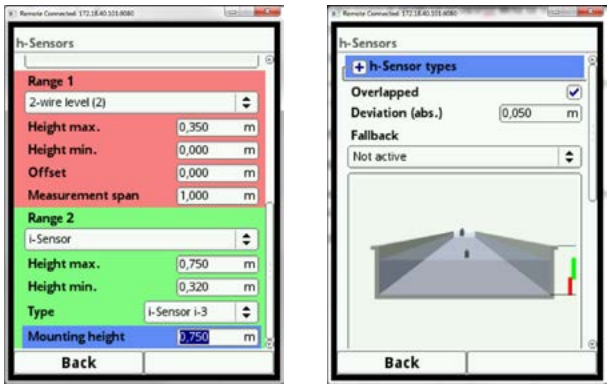



**Fig. 21-7 Entering the Level Sensor Measurement Ranges**

NivuFlow verifies whether each active measurement value is within the measurement range. The measurement will only then be accepted as “valid”.

The parameter >Deviation< is set to 5 cm per default and should not be modified. This value has been specified to ensure the measurement validity. Values out of the deviation indicate e.g. level sensor failure.

**Overlapped:**

This parameter is active (ticked) per default as soon as more than one level sensor is selected. The result is a “smooth transition” between the measurements with the 2nd sensor added. Particularly in the real level area the switchover to sensor 2 would result in sudden value jumps 2.

Set the sensor measurement ranges in the area below the channel graph.

☞ Enter the measurement range for each level measurement separately (level min. / max.)

Values are accepted for calculation only if the measurements are within the according range. Coloured bars right of the graph indicate the measurement ranges set.

**Fallback**

Use this function if a level measurement covers a part of the measurement range while the 2nd sensor covers the entire measurement range.

In the example the i-Sensor would be used as >Fallback<.

If the 2-wire level for some reasons should miss a value for calculation, the transmitter uses the >Fallback< function to fall back to the i-Sensor. This sensor is set to cover the entire measurement range, however.

## 21.3 Setting parameters in menu v-Paths

Following the measurement place, setting the flow velocity sensor's parameters is another important point. This menu includes apart from the sensor type the spatial position. Specifications in this sector refer to shape and spatial dimensions of the defined canal (see chapter 21.1).

☞ Open menu v-Paths.

### 21.3.1 Select sensor type

A maximum of 8 flow velocity sensors (4 paths) can be connected to a NivuFlow 650 transmitter. The number of connectable sensors depends on the transmitter type.

- NivuFlow 650 Type T2 - 4 flow velocity sensors (2 paths)
- NivuFlow 650 Type T4 - 8 flow velocity sensors (4 paths)

Select the type of sensor connected to NivuFlow.

Transmitter Type T4 shows a selection field including the numbers 1-2 in the top right corner of the display. Use this field to set the parameters for all connected flow velocity sensors (paths) successively.

**Default setting is path 1.**

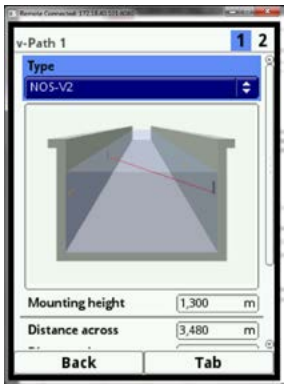



**Fig. 21-8 Selecting the flow velocity sensors**

☞ Press the right function key (Tab) to move to v-Path 2

The path of which the parameters are currently adjusted is highlighted in colour. Other available paths are just represented as outlines.

### 21.3.2 Sensor mounting positions

***Important Note***

*All parameters in this menu shall bet set for each path separately!*

**Mounting height:**

It is an advantage in terms of mounting height if the expected filling level is known. In this case the optimum mounting height is at 40 % of the known filling level.

**Factory default: 50 %**

**Distance across and Distance along**

The transmitter computes these distances automatically based on the data provided by the set measurement place parameters. Here the distances are calculated assuming an installation angle of 45°.

The path length is calculated automatically as well taking the selected sensor as calculation basis.

**Normally, these values do not need to be changed.**

Modification of >Distance across< and >Distance along< may become necessary as soon as mounting conditions have changed due to installation reasons.

***Important Note***

*If a value (such as Distance lengthwise) needs manual adjustment due to altered mounting conditions the complete sensor geometry shall be verified and adjusted.*

*All distances and path lengths shall be verified and re-entered.*

**v-Minimum and v-Maximum**

Both parameters normally do not need any adjustment and are used to fine-tune the transmitter. Use the parameters to specify the permissible maximum negative and positive velocity values.

A typical scenario is to avoid processing negative flow velocities (backflow). In such cases set the maximum value for negative flow velocities to >0<.

## 21.4 Inputs/Outputs (analog)

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 menu input/output via main menu.

The input/output menu is subdivided in four parts:

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

### 21.4.1 Analog inputs

The number of analog inputs is depending on the device type. For device type T2 and T4 there are two analog inputs available for each.

The available analog inputs are indicated in the top right corner of the display. By pressing the right-hand >Tab< function key you can select the analog inputs successively. The selected input is shown as clear text message in the top right display corner.

**In the default setting the analog inputs are inactive.**

Currently the analog inputs can be used as external readings only. Therefore, the NivuFlow 650 can be used as an extra data logger for readings from external systems. This however does not influence the unit's capabilities as flow meter.

After activating the analog inputs the input range can be either set to 0-20 mA or 4-20 mA.

The units are indicated in a text box. You may also specify individual units.

**The number of characters describing the unit must not exceed a maximum of 5 characters.**

The further programming procedures are described in chapter 21.1.1.

☞ Finally set the scale to save.

### 21.4.2 Analog outputs

The number of analog outputs is depending on the device type. 2 analog inputs becomes available for the device type T2 and T4.

The available analog outputs are indicated in the top right corner of the display. By pressing the right-hand >Tab< function key you can select the analog outputs successively. The selected input is shown as clear text message in the top right display corner.

**In the default setting the analog outputs are inactive.**

Various functions can be assigned to the analog outputs. Here it is possible to assign the same function in different measurement ranges to 2 analog outputs.

**Example**

- Analog output 1 = Flow rate 4 - 20 mA corresponds to 0 - 100 l/s,
- Analog output 2 = Flow rate 4 - 20 mA corresponds to 0 - 5000 l/s

**Following functions of the analog output are possible:**

- **Output inactive**
  not usable
- **Flow**
  Output of the application flow rate (calculated from average flow velocity and wetted cross-section) at the selected analog output.
- **Flow velocity**
  The calculated average flow velocity (calculated even from 2 or more paths) used to compute the current flow rate is available at the selected analog output.
- **Water temperature**
  The calculated medium temperature is available at the selected analog output.
- **External reading**
  Possibly linearised readings available at the analog input are available here again as output.
- **Path velocity**
  In the event of using multiple paths and if the average flow velocity of the individual measurement paths is to be determined, the desired path can be selected here.
  The measuring value is output in analog form.
- **Modbus Slave**
  The analog output can be used via Modbus to output controlled signals from other systems. After enabling the function select the output range of 0-20 or 4-20 mA. This output range can be programmed in the Modbus parameter; according to the scaling

### 21.4.3 Digital inputs

The number of digital inputs is depending on the device type. For device type T2 and T4 there are two digital inputs available for each.
The available digital inputs are indicated in the top right corner of the display. By pressing the right-hand >Tab< function key you can select the digital inputs successively. The selected input is shown as clear text message in the top right display corner.

**In the default setting the digital inputs are inactive.**

☞ Enable the desired digital inputs.

**The following functions can be assigned to the digital inputs:**

- **Block v-measurement**
  By using an external contact the flow measurement can be blocked as long as a signal is available at the am digital input. If this function is selected the logic can be additionally modified as follows:
  - non-inverted
  - inverted

- **Hold measurement**
  The value is on hold as long as the input is switched active.

- **Runtime**
  The system detects and saves the duration of the ongoing signal at the digital input. Such records can be used e.g. for pump run times or unit run times.
  If this function is selected the logic can be additionally modified as follows:
  - non-inverted
  - inverted

- **Impulse counter**
  The system detects and saves the number of the ongoing signals at the digital input. The counter simply counts the status changes detected at the digital input (1->0 or 0->1).
  If this function is selected determine if the rising edge (status change >0< to >1<) or the falling edge (status change >1< to >0<) Is used for evaluation

- **Logging**
  Incoming signals are recorded and saved including start and stop times (time stamp). The areas of use are:
  - access control
  - recording of events
  - run times … etc.

  If this function is selected the logic can be additionally modified as follows:
  - non-inverted
  - inverted

### 21.4.4 Digital outputs

The number of digital outputs is depending on the device type. For device type T2 and T4 there are two digital outputs available for each.

The available digital outputs are indicated in the top right corner of the display. By pressing the right-hand >Tab< function key you can select the digital outputs successively. The selected outputs is shown as clear text message in the top right display corner.

**In the default setting the digital outputs are inactive.**

☞ Enable the desired digital output.

**The following functions can be assigned to the digital outputs:**

- **Sum impulse**
  The parameters below can be set here:
  - Logic (normally closed / normally open)
  - Negative sum impulse (as a check mark)
  - Volume (impulses per volume)
  - Duration (relay energised/de-energised)
  The duration can be set to a period between 100 ms and 5000 ms.

If in the event of sharply increasing flow rates the output frequency of the impulse output should be lower than the frequency of the flow rate, the sum impulses which have not been output yet are saved internally until the calculated flow volume falls below the impulse frequency again. After that, the sum impulses will be output additionally.

- **Limit contact flow**
  In >Threshold off< and >Threshold on< set one flow limit value for each point. A digital signal will be output if this flow limit value is exceeded. If the flow should fall below the second flow limit value the digital signal will be reset = hysteresis function to avoid output flutter.
  If this function is selected the logic can be additionally modified as follows:
  - Normally closed
  - Normally open

- **Limit contact level**
  The limit contact level is used in the same way as limit contact flow.
  Set a value for the level limit.
  For calculation the level is used, which is active for the current altitude range in the menu >Application / h sensors<.
  A freely selectable level sensor can not be used.
  If this function is selected the logic can be additionally modified as follows:
  - Normally closed
  - Normally open

- **Limit contact velocity**
  The digital signal in the event of exceeding an adjustable velocity limit value will be issued here. Proceed as described in >Limit contact flow<.

  The transmitter uses the calculated average flow velocity (calculated even by using 2 or more paths).
  If this function is selected the logic can be set as follows:
  - Normally closed
  - Normally open

- **Limit Contact Water Temperature**
  The digital signal in case of exceeding an adjustable water temperature limit value is put out here.

☞ Proceed as described in >Limit contact flow<.

The transmitter uses the calculated average water temperature (calculated even by using 2 or 4 paths).
If this function is selected the logic can be set as follows:
- Normally closed
- Normally open

- **Limit Contact External Reading**
  The digital signal in case of exceeding an adjustable external limit value is put out here.

☞ Proceed as described in >Limit contact flow<.

The transmitter uses the calculated average value of the external reading. If this function is selected the logic can be set as follows:
- Normally closed
- Normally open

- **Error message**
  You can assign individual error types to the digital output.

☞ To do this enable the according selection boxes.

If this function is selected the logic can be set as follows:
- Normally closed
- Normally open

***Note***

*Digital output 2 is inappropriate as error output. Digital output 2 is designed as bistable relay. The relay will remain in its last position after being de-energised.*

*This digital output cannot be used for error messages.*

- **Modbus Slave**
  The digital output can be used via Modbus to output controlled signals from other systems. >Logic< is selectable.

### 21.4.5 Diagnostics

The diagnostics menu is a menu used for indication and simulations. Here among other things it is possible to simulate individual analog outputs.

The output simulation procedure does affect following plant sections.

**Simulation shall be executed by trained expert personnel only!**

⇨ You can find a detailed description of the diagnostics menu in chapter >Diagnostics< on page 103.

# 22 Parameter Menu Data

The data menu contains all internally saved readings and is subdivided in 4 submenus.


**Fig. 22-1 Parameter menu data**

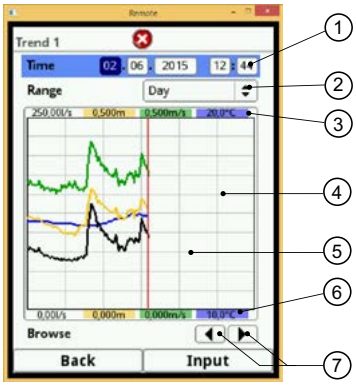
## 22.1 Trend

The trend graph is a representational recorder function. Selecting the trend graph provides access to the data previously saved (history).

☞ Select the desired data time range.

The selected data time range is shown. The data will not be updated automatically while viewing.

The current data can be viewed in the bottom third of the main screen. Therefore press the left-hand function key 3 times to return to the main screen.




1 Selection Date / time
2 Indication period
3 Scaling max. range
4 Display with grid lines
5 Date time line
6 Scaling 0-point
7 Browse previous / next

**Fig. 22-2 Trend graph details**

In the top area of the screen the date/time selection can be found. The line is highlighted blue and therefore active.

☞ If you wish to select a certain point in time (historical data) proceed as described below:

1. Press the rotary pushbutton - the first time range (day) is enabled
2. Change the day number by rotating the rotary pushbutton
3. Press the rotary pushbutton again as soon as the desired day is selected
4. Repeat this procedure for month, year and time until the desired point in time is set completely
5. Confirm your entry with the right-hand function key

After successful confirmation the selected data time range is shown. The vertical red line in this case indicates the selected point in time (Fig. 22-2, number 5)

The selected period is indicated from the left to the right display edge.

☞ Press the left-hand function key (Back) if you wish to cancel your entry.

The range within data is to be shown can be modified. Make your settings using >Range<.

☞ Go to >Range< input parameter and select the following periods:

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

☞ Confirm your entry.

The red vertical line indicates the selected point in time. The display grid is permanently set internally.

If **>1 Hour<** is selected as period, the indication starts on the left-hand side at minute “0“ and ends on the right-hand side at minute “59“.

***Note***

*For better reading the display with setting >1 hour< is subdivided by 3 vertical auxiliary lines. These subdivisions represent a period of 15 minutes each.*

*Other display settings use more red lines to subdivide time periods accordingly. This will be described in the following section.*

**The >Browse< function can be found below the time display.**

Use the arrow buttons to move forward or back one our per key action.

If **>4 Hours<** is selected as period, the start of the indication on the left-hand side depends on the point in time selected.

Indication therefore starts at::

- 00:00 o’clock or
- 04:00 o’clock or
- 08:00 o’clock or
- 12:00 o’clock or
- 16:00 o’clock or
- 20:00 o’clock

The indication range ends on the right-hand side exactly 4 hours later. This screen features 3 vertical grid lines too. The distance between each of them is equal to 1 hour.

Use the >Browse< function as described above to move back and forth by 4 hours.

If **>1 Day<** is selected as period, the indication starts on the left-hand side at hour “0“ and ends on the right-hand side at hour “24“.

To improve readability the screen is subdivided by five vertical grid lines. Each of the resulting segments represents a period of 4 hours.

Use the >Browse< function as described above to move back and forth by 1 day.

If **>1 Week<** is selected as period, the indication starts on the left-hand side on Monday at 00:00 o’clock and ends on the right-hand side on Sunday at 24:00 o’clock.

To improve readability the screen is subdivided by six vertical grid lines. Each of the resulting segments represents a period of 1 day.

Use the >Browse< function as described above to move back and forth by 1 week.

If **>4 Weeks<** is selected as period, the indication starts on the left-hand side on Monday at 00:00 o’clock and ends on the right-hand side on Sunday at 24:00 o’clock. The time reference mark for the 4-weeks indication is the 29.12.1969, 00:00 o’clock.

To improve readability the screen is subdivided by three vertical grid lines. Each of the resulting segments represents a period of 1 week.

Use the >Browse< function as described above to move back and forth by 4 weeks.

***Note***

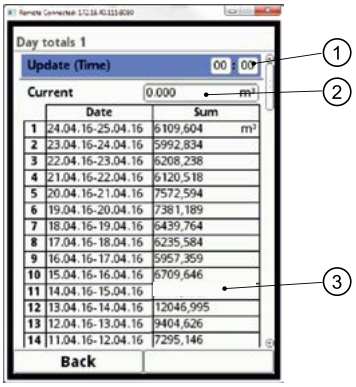
*Selecting the period of 4 weeks may take a few seconds to completely load the required data.*

## 22.2 Day totals

This menu is to view flow rate totals in a table. Each of the indicated values represents 24 hours.

Per default the start screen shows the first 14 days.

A maximum of 100 totals (=100 days) will be saved. Starting with total 101, always the oldest value will be overwritten (ring-type memory).




1 Time of totalising. The point in time can be modified
2 Subtotal since latest totalising event
3 No values available between two totalising events

**Fig. 22-3 Display 24-hours totals**

Scroll up and down within the value table by using the rotary pushbutton. It is possible to view older day values as well. The prerequisite to show older values is that the instrument has been operated for a longer period.

**Example: 98 values - The unit has been in operation for minimum 98 days.**

Otherwise only day values are readable, when the NivuFlow has been working.

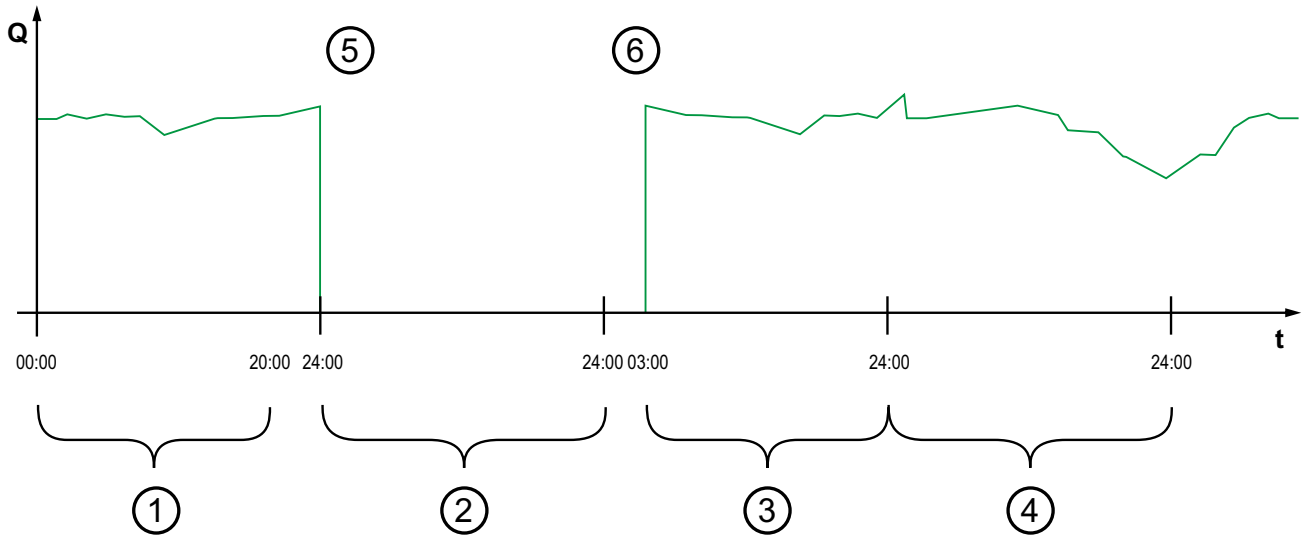
If the NivuFlow is shut down between two summing procedures a (sub)total is computed nevertheless.

The flow rate totals of this period are missing during the shut-down time.

As soon as the NivuFlow is shut down before the next summing time and remains to be off until the next summing time, no totals will be created for this 24-hours period ( , number 3).

Neither a sum = 0 or a date is stored.

One line in the table appears to be missing.




1 Sum 1st day: sum of 20 hours
2 2nd day: power failure - no summing executed
3 Sum 3rd day: sum of 21 hours
4 Sum 4th day: sum of full 24 hours
5 Voltage drop
6 Power available again

**Fig. 22-4 Diagrams of sum**

Per default the summing time is between 00:00 o'clock and 24:00 o'clock. This means that the day totals are always created between 00:00 o'clock and 24:00 o'clock.

**The default summing time is 00:00 h.**

The time of summing can be modified.

The >Update (Time)< option must be highlighted blue and hence is active.

1. Enter the desired starting time for summing (e.g. 08:00) and move on to the minutes-section
2. Enter the minutes
3. Confirm the values with the right-hand function key >Enter<

You have changed the summing time to 08:00 o'clock. The 24-hours value now will be created using the period from 08:00 o'clock until 08:00 o'clock the next day.

The >Current< indicator box shows the subtotal cumulated since the previous summing event.

### 22.2.1 USB Transfer

**USB stick requirements:**

- The USB stick used must support USB 2.0.
- The USB stick used must be FAT 32 formatted (FAT 12 or FAT 16 is also possible).
- The maximum permissible memory size of the USB stick is 32 GB.

**Using the USB stick**

☞ Plug the USB stick into the USB port above the display!

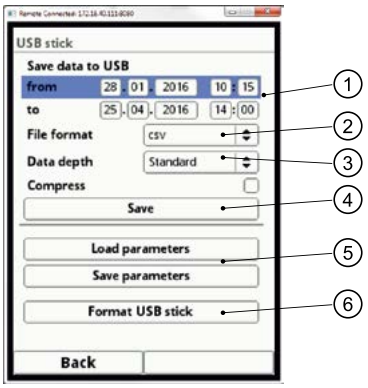
The USB stick is used for the following functions:

- Transfer of readings to USB stick
- Backup of parameters on USB stick
- Re-transfer of parameter backups from USB stick to instrument
- Formatting of USB stick

The NivuFlow has an internal data memory. It is possible to transfer either portions of your data or all saved readings to an USB stick.

This section allows you to determine the desired transmission period.

Per default the NivuFlow is set as to transfer the data containing the period between the latest previous data transmission and the current time.




1 Set the extension period
2 File format of the data
3 Adjust data depth
4 Save command for measurement data
5 Parameters form USB stick
6 Parameters to USB stick

**Fig. 22-5 Save data on USB memory stick**

☞ Save the data on USB stick as described in chapter “Trend“.

1. Enable the first number field (day) >from< (see above drawing, Nr. 1)
2. Change the starting time by rotating the rotary pushbutton
3. After the desired day is selected, press the rotary pushbutton
4. Repeat the procedures for month, year and time until the desired date and time have been set
5. Confirm your entries by pressing the right-hand function key >Enter<
6. To enter the stop time >to< proceed the same way

You now have defined the data period to be transferred to the USB stick.

☞ Select the desired data format subsequently.

1. Open the selection menu
2. Confirm the data format

Then select from:

- txt
- csv

**The data depth adjustable here comprises 3 possible options:**


**Fig. 22-6 Data depth selection**

### Standard

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

- Date and time
- Totaliser
- Calculated flow volume
- Average flow velocity
- Water temperature

Current values as well as the accordingly calculated values of enabled analog inputs and digital inputs

**Extended**

This option is appropriate for the verification of critical, important applications and is required mainly for servicing personnel.

Data sets are saved including:

- Date and time
- Totaliser
- Calculated flow volume
- Average flow velocity
- Air temperature (if an air ultrasonic measurement is used)
- Water temperature
- Current values as well as the accordingly calculated values of enabled analog inputs and digital inputs
- Average flow velocities of v-path(s) 1, 2, etc. (if used)

**Expert**

This option should be used only by trained service personnel or the manufacturer's developers. Such data sets may become very large very quickly.

***Note***

*The >Compress< function makes sense only for the transmission of large amounts of data.*

*In this case the selected files are compressed creating a ".gz" format file.*

*>Compress< is enabled by ticking the box.*

*These files can be unzipped by using the free "7-ZIP" application..*

After having defined transmission period, data format and data depth you are ready to save your data on USB stick.

☞ Enable the >Save< box.

☞ Press the rotary pushbutton to save the data on the USB stick

Use the >Load parameters< command to load parameter sets previously saved back from USB stick to the transmitter. The >Save parameters< function is to save measurement place parameters to USB stick. This option creates and saves 3 files.

**The files have the formats below:**

- XXXX_DOC_AABBCCDDEE.csv
  This file is for documentation purposes and contains basic settings as well as parameter changes.
- XXXX_DOC_AABBCCDDEE.xml
  This file is for future use with the >NivuSoft< application and includes basic settings and parameter changes.
- XXXX_PAR_AABBCCDDEE.xml
  This file contains the entire transmitter parameter settings and is used as backup of the current parameter settings

**File name remarks:**

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

Unformatted or incorrectly formatted USB can be formatted correctly directly on the instrument:

☞ Therefore select the parameter >Format USB stick<.

***Note***

*Remember that all data are lost during reformatting the USB stick!*

## 22.3 Data storage (internal)

This sub-menu allows to modify the storage cycle and to delete the internal memory. The storage cycle options are:

- 30 seconds
- 1 minute
- 2 minutes
- 5 minutes

The storage cycle is set to 1 minute per default.

ALWAYS the average value covering the selected cycle is saved instead of the current value at the moment of saving.

***Important Note***

*Deleted data cannot be restored !*

The complete contents of the internal memory can be deleted. The data however are password-protected to prevent from unintentional deletion.

⇨ see „change password“ on page 60.

☞ Enter the password to delete the data.

☞ Confirm the password entry with the right-hand function key.

# 23 Parameter menu System

This menu System contains general information about the Measurement transmitter.

## 23.1 Information

This menu is a display menu. It provides the device information below:

- Serial No. And Article No.
- MAC address
- Transmitter firmware version

Moreover you can find here extra information on activated DSP-Cards.
The screen shows:

- DSP firmware version
- FPGA Core versions

## 23.2 Region Settings

In this menu you can make country-specific settings as well as the language setting:

- Operating language
- Date format
- Units for measurement values.

Here, a distinction between displayed and stored measurement values is possible..

### 23.2.1 Operating language

You can work with 14 different operating languages.

### 23.2.2 Date format

The following date formats can be set:

- dd.mm.yyyy (day/month/year)
- mm/dd/yyyy (month/day/year)

### 23.2.3 Units

A list to select from can be found in the >Units< parameter. Open the units tree by pressing the rotary pushbutton. The sign will change from PLUS to MINUS.

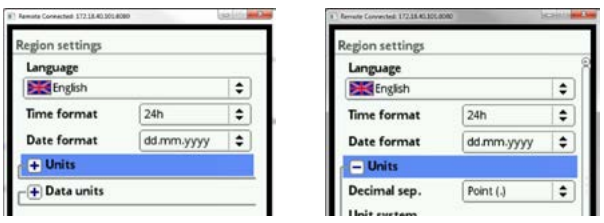



**Fig. 23-1 Unfold the selection menu >Units<**

☞ First select the decimal separator (comma or dot)

The decimal separators determined here are used only for indication on the NivuFlow display.

☞ Next, determine the unit system. Select from:

- Metric
- English
- American

Depending on the unit system selected the units below can be chosen:

- In the metric system (e.g. Litre, cubic meter, cm/s etc.)
- In the English system (e.g. ft, in, gal/s, etc.)
- In the American system (e.g. fps, mgd, etc.)

Now set the units used for display indication:

- Flow
- Velocity
- Level (fixed value)
- Total

### 23.2.4 Data units

To set the >Data units< proceed right as described under >Units<. Open the units tree >Data units<.

**In >Data units< the readings are converted and saved according to the selected unit.**

Choose between >Comma< or >Dot< As decimal separator.

***Important Note***

*Specifying the decimal separator is relevant for correct data import. Particularly in case of using foreign software applications (such as foreign Excel) to evaluate readings, observe to specify the correct decimal separators.*

## 23.3 Time/Date

Use this sub-menu to modify the current date and the transmitter system time.

This function is required for.

- Change between summer time and winter time
- The internal buffer battery is exhausted
- After mains power failure

If the transmitter is operated for a long time internal clock deviations must be expected. The deviations can be corrected here.

***Important Note***

*Changing the system time has an effect on the storage of data. If the data storage option is enabled, duplicate data or data gaps may occur after the system time has been modified.*

Here you can set the current system time as well as the time difference (UTC or GMT) relative to the zero meridian.

## 23.4 Error Messages

Use this menu to recall the currently active queued error messages. This sub-menu however can be used to delete the error message memory too.

Before you can delete the error storage, you need to enter the password.

⇨ See page 60.

The password prevents unauthorized or unintentional deletion.

## 23.5 Service

This sub menu contains the following functions:

- Activating access to service level
- Changing password
- Reboot of the system

## 23.6 Service level

The service level is reserved for NIVUS customer service or authorised companies.

This is why the setting will not specified here.

Systemically relevant changing as well as special settings for special applications must be set here.

**Change password**

The default setting for the password is >2718<. You can change this password if desired.

⇨ See „change password“ on page 60.

**Reboot**

A transmitter reboot interrupts the currently active measuring process. The system will boot using the newly set parameters. After booting, the system behaves as if restarted (like a PC).

This option hence eliminates the need to actually shut down and restart the system. All parameters, counters and saved data remain.

**Parameter reset**

During a parameter reset all parameters are reset to their default settings. Counter readings, changed passwords and saved readings will not get lost.

The actual parameter reset will not be executed before you exit the parameter menu (back to main menu) and confirm the storage. Therefore, it is still possible to abort the process.

# 24 Parameter menu communication

This menu comprises the settings for various communication interfaces with other communication systems:

- TCP/IP
- WEB server
- HART (in preparation)
- Modbus

Integration into networks demands to have already knowledge about such procedures. This is why no further details will be described in this respect here.

**If you should not have basic knowledge on network integration, such tasks should be left to IT experts or NIVUS commissioning personnel.**

### TCP/IP

The TCP/IP menu allows to set options for data transport in a decentralised network.

For data transport in this menu the network interface (LAN) on the unit front plate is used.

⇨ See >Interfaces< on page 15.

### WEB server

The internal WEB browser is currently not supported.

### HART

This function is already “in preparation”. In future the NivuFlow 650 can be used as a HART slave subordinated systems.

### Modbus

The NivuFlow 650 can be integrated into other systems via Modbus. If required, the Modbus protocol is available upon request. Please contact the NIVUS GmbH head office in Eppingen

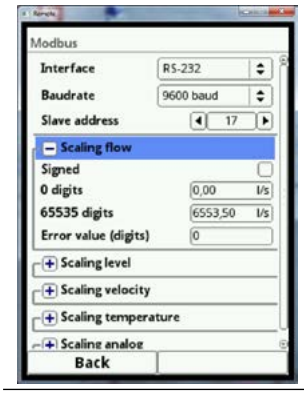



**Fig. 24-1 Display Modbus settings**

Here the following features are available:

- Slave address (1 to 247)
- TCP Port settings
- Interface selection (RS232 or RS485)
- Baud rate selection (between 9600 and 115200)
- Parity
- Stop bits (1 - 247)

In addition you can adjust the scaling:

- Scaling flow
- Scaling velocity
- Scaling temperature
- Scaling analog

Use the BUS interface on the device faceplate.

⇨ See >Interfaces< on page 15.

## 24.1 Interfaces

NivuFlow 650 has four hardware interfaces on its faceplate.

⇨ You can find an overview in menu >Interfaces< on page 15.

The utilisation of the individual interfaces is divided into several submenus.

**Network interface (LAN)**

This interface is for data transfer and can be accessed from the >Communication< parameter menu.

**BUS interface (RS-485 / RS-232)**

This interface can be used to integrate the NivuFlow 650 into other systems. You can access the interface from the >Communication< parameter menu.

⇨ Continued on page 95.

**USB-A interface**

This interface is to transfer data to an USB stick. Programmed device parameters e.g. can be saved on USB stick. Can be accessed from the >Data< parameter menu.

⇨ Continued on page 87.

**USB-B interface**

This interface is reserved for extended access for authorised service personnel only and will therefore not be described in detail here.

# 25 Parameter menu Display

Use the display menu to change the following settings:

- Backlight
- Labels of the 5 main display output fields
- Decimal digits of individual values

### Backlight

The backlight intensity can be changed in 10 steps.

Adjust the backlight according to the ambient conditions. Avoid setting the display too bright.

### Dim backlight

NIVUS recommend to use automatic backlight dimming. Dimming protects the display and helps to extend display life. The display will be dimmed automatically if not in use over a certain period. The delay time can be determined in advance.

As soon as settings are made on the NivuFlow 650 (e.g. if a key is pressed) the display instantly switches over to standard brightness.

**Time to start dimming is set to 2 minutes per default.**


**Fig. 25-1 Setting display backlight and dim**

The 5 main display output fields (Flow, Level, Velocity, Temperature and Sum) can be defined freely regarding name as well as decimal digits.
The output field colours correspond to the value colours in the main display.
Unfold an output field to change its label.

☞ Untick >Default label<.

☞ Enter a new name.

You are free to use any desired name up to a maximum of 16 characters.
The entered name however does not influence or change the values indicated in the main display output fields in any way.

***Important Note***

*It is NOT POSSIBLE to modify the assignment of output fields and values.*

*Example:*

*The "Flow" field will ALWAYS output flow values, no matter if the label has been set to >Temperature< or similar.*

The number of decimal digits can be modified the same way as described before.
A maximum of 5 decimal digits can be specified.

***Important Note***

*Observe if the number of decimal digits in relation to the used measurement units.*

## 26 Connections

This sub-menu is not used in this version.

# Main Display

**Quick access**

You can directly access the main setup parameters by using the Mail screen.

## 27 General overview

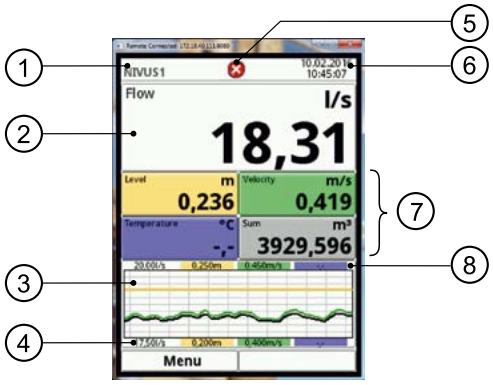
When in operation mode, the NivuFlow 650 indicates the following important readings:

- Flow quantity
- Fill level depend on geometry (for calculation)
- Velocity (calculated average flow velocity)
- Medium temperature
- Sum

The following information can be found in the top display line:

- Name of measurement place
- Date
- Time

The red full circle with white cross in the top display line indicates current malfunctions of system or individual sensors.
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 Flow display
3 Display hydrograph
4 Lower scaling range
5 Error message (acknowledged, pending)
6 Date / Time
7 Display for single measurement values
8 Upper scaling range

**Fig. 27-1 Main screen**

The menu allows to directly access the most relevant settings and information.

☞ Rotate the rotary pushbutton until the desired section is highlighted in black.

☞ Press the rotary pushbutton - the according section will open a dialogue window.

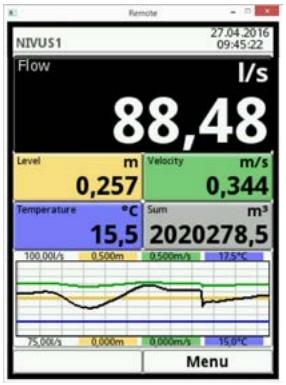



**Fig. 27-2 Flow volume section selected**

## 27.1 Flow screen

You can access the individual sections directly after the dialogue window is activated.

☞ Press the rotary pushbutton to reach the access possibilities.

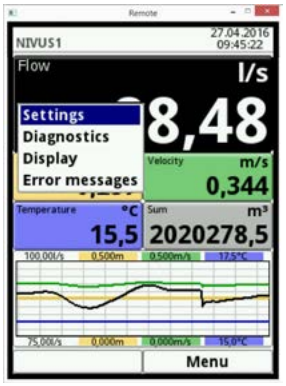



**Fig. 27-3 Possible access options**

### Settings

The flow volume screen allows to directly access the measurement place settings below:

- Measurement place names
- Number of paths and path settings
- Channel profile type and dimensions
- Sludge level input
- Low flow suppression
- Stability
- Damping

Parameter settings can be modified here directly.

**Diagnostics**

By directly accessing the diagnostic menu you can instantly carry out verifications within the limits of the application programmed:

- Connected sensors
- Physical condition of analog and digital inputs
- Output command to the analog and digital inputs
- Simulation of any flow value
- Indication of the prevailing flow profile

**Display**

Use the display menu as quick access to modify the settings below

- Dim the backlight
- Change the words of the 5 output fields
- Decimal places of measurement values

Once the system-specific parameters have been changed the settings need to be saved.

**Error messages**

A table indicating the wording of the current error message will come up as soon as the >Error messages< option is activated.

## 27.2 Display Level

This dialogue allows to directly access the settings of the programmed level sensors. The level sensors can be selected individually. The dialogue shows:

- Firmware version
- Article number
- Serial number

The current echo profiles of used NIVUS ultrasonic sensors can be assessed here.

## 27.3 Display flow velocity

This dialogue allows to directly access the settings of the programmed flow velocity sensors.

The following parameters can be edited here:

- Settings of the programmed flow velocity sensors
- Sensor constructions
- Installation positions and directions
- Correct reviews
- Modify limitations of flow evaluation

The dialogue of the velocity display shows:

- Article no. and serial no. of individual sensors
- Firmware version of transmitter and used DSP
- Calculated average flow velocity
- Transit-time difference
- Time on fight

**Diagnostics**

By directly accessing the diagnostic menu you can verify the sensor alignment (paths).

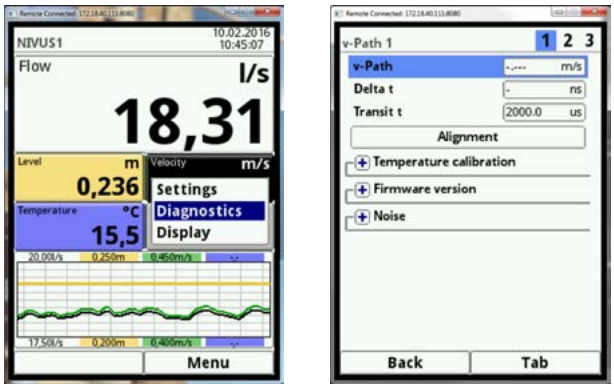



**Fig. 27-4 Information on the flow velocity sensor**

## 27.4 Temperature and sum screen

The temperature is calculated from the transit time and the value is displayed. The sum is calculated mathematically using the current flow volume integrated during a certain period. That is why both values neither can be edited nor can they be used for diagnostic options. Selecting temperature or sum takes you back to the general display menu.

# 28 Display Trend/Hydrograph

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.

**The >browse< function is located below the display.**

Browse next or back within the selected period using the arrow keys.

⇨ The procedure of the adjustable trend display, see chapter 22.1.

# Diagnostics

## 29 Diagnostics menu Principles

The Diagnostics menu can be found in the >Application< menu. The diagnostics menu is subdivided in 5 submenus.


**Fig. 29-1 Submenues >Diagnostics<**

The diagnostics menu is a menu used for indication and simulations.

The settings below can be verified or checked here:

- Path functions
- Sensor software versions
- Inputs and outputs
- Simulation

***Important Note***

*It is essential to follow the safety instructions regarding simulation page 112.*

# 30 Diagnostics v-Paths

**This menu is required for analytic only.**

In case of errors or uncertainties with transit time measurements various factors can be used here to investigate the reasons.

## 30.1 v-Path

This is a display parameter.

- v-Paths shows individual velocities.
- The right function key (TAB) can be used to view each path individually. Prerequisite: one 2-path measurement must be available at least.

## 30.2 Delta t

Delta t is the measured transit time difference.

The transmitter uses this value to compute the velocity (v).

The value is indicated in nanoseconds.

## 30.3 Transit t

This term describes the average signal transit time between sensor 1 and sensor 2 of the according path.

The value is indicated in microseconds.

## 30.4 Alignment

By pressing the button >Alignment< the display changes to a graph.

This parameter indicates the signal strength of the sensors in % (0-120 %). The higher the percentage, the better the path alignment.

**The minimum value should be higher than 80 %.**

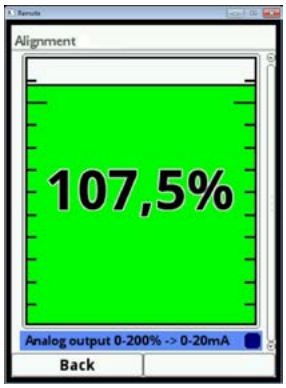



**Fig. 30-1 Alignment**

**Activation analog output 1**

The checkbox at the bottom of the graph serves as an aid for later alignment of path sensors.

This function is useful particularly if the transmitter is not installed in close proximity to the sensors.

**CAUTION**

***Analog output values can access to plant section***

*During the period of activation the value on analog output 1 will be overwritten.*

*Always make sure not to use any safety related signals or values on analog output 1 at the moment of activation!*

*During the testing period following safety circuits shall be deactivated.*

*Failure to observe may cause personal injury and lead to system damage!.*

***Important Note***

*Due to the risks mentioned before the activation of analog input 1 is password protected. Due to reasons of personal safety reveal your password to authorised and trained expert personnel only!*

With the checkbox ticked the percentage is put out as mA signal on analog output 1.

The sensor position can be optimised by readjusting the sensor with the aid of a multimeter.

The scale for readjustment is 0-20 mA; 0-200 %.

The checkbox is unticked automatically when you exit the menu.

## 30.5 Temperature calibration

Select the drop-down menu >Temperature calibration<. The view of the button changes from + symbol to - symbol.

The following temperatures can be read here:

- Path temperature (of the active path); calculated from sound velocity
- The sound velocity (in meter per second)

The other both parameters can be set in order to adjust the correct medium temperature:

- **Offset (Transit Time)** - this value is set automatically once an entry has been specified in >Calibr. temperature<. If you wish to reset the offset enter here >0<.
- **Calibr. temperature** - enter the actual medium temperature here. The actual temperature must be determined before (measure/sample).


**Fig. 30-2 Diagnostic Temperature calibration**

## 30.6 Firmware version

This menu contains the Firmware of the transmitter used.

Please quote this information in all queries about the device.

FPGA Core 1 and FPGA Core 2 are Firmware versions of DSP components.

**These specifications are relevant for service personnel and will not be explained here any further.**

## 30.7 Noise

This submenu can be used to recall information on noise. This is important when it comes to analyse poor signal values.

Noise values indicate unwanted background noise at signal evaluation.

These values provide information on the ambient conditions to the service personnel.

- **Upstream typical**
  a continuous level (noise), transmitted in the area against the flow direction.
- **Upstream max.**
  Here signal components known as peaks become visible. These peaks are short-term disturbances such as pumps etc. which here are detected against the flow direction.
- **Downstreem typical**
  a continuous level (noise), transmitted in the area with the flow direction.
- **Downstreem max.**
  Here signal components known as peaks become visible. These peaks are short-term disturbances such as pumps etc. which here are detected with the flow direction.

**A rule of thumb is: the higher the value the worse the signal.**

# 31 Diagnostic Inputs/Outputs

## 31.1 Important Information on the Simulation

**DANGER**

***Personal injury and damage caused by improper simulation handling***

*The simulation will directly affect to following plant sections .*

*The simulation shall be executed by trained electricians only. The responsible expert personnel must have sound knowledge on the entire control procedures of the according facility.*

*Prepare the simulation process carefully!*

*- Switch the following systems to manual operation.*

*- Disable actuating drives and similar or limit the according functions.*

***It is absolutely necessary to have a safety person available!***

*Disregarding may lead to personal injury or damage your facility.*

**DANGER**

***Effects on plant sections***

*The simulation of NivuFlow outputs will directly affect any following plant sections without any safety locking measures!*

*Simulations are allowed to be executed exclusively by qualified expert personnel.*

***Observe the hints contained within the above warning!.***

***Important Note***

*NIVUS 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!*

## 31.2 Analog Inputs

This menu can be used to indicate the current values on the NivuFlow 600 inputs as well as the readings assigned to this value by using the measurement span.

The number of analog inputs is independent from the instrument type. There are 2 analog inputs available for type T2 and type T4.

Only this number of analog inputs will be shown on the display.

## 31.3 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 this values by using the measurement span. Moreover it is possible to simulate the analog values.

The number of analog outputs is independent from the instrument type. There are 2 analog outputs available for type 2 and type 4.

Only this number of analog outputs will be shown on the display.

***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.*

This menu allows to simulate the individual analog outputs.

**Here it is essential to observe the hints on safety as well as possible consequences to following plant sections.**


**Fig. 31-1 Simulation mode selected**

***Important Note***

*Due to the reasons of safety mentioned before the simulation mode access is password protected.*
*See password entry page 60.*

***Due to reasons of personal safety reveal your password to authorised and trained expert personnel only!***

**Before you enter the password necessarily observe the according hints on safety!**


**Fig. 31-2 Password query prior to simulation**

☞ To simulate an analog output proceed as follows:

1. Select the desired analog output by using the rotary pushbutton
2. Tick the checkbox to activate the analog output.
3. Then enter the desired output current as numeric value.
4. Observe that the analog output(s) will provide the entered current values until you finish the simulation menu.
5. Press the left-hand function key to exit the simulation menu

## 31.4 Digital Inputs

This menu indicates the signals available on the digital inputs.

The number of digital inputs is independent from the instrument type. There are 2 digital inputs available for type 2 and type 4.

Only this number of digital inputs will be shown on the display.

Enabled digital inputs feature a ticked checkbox.

## 31.5 Digital outputs

The digital output values set can be viewed using this menu. A simulation of digital outputs is available from this menu too.

The number of digital outputs is independent from the instrument type. There are 2 digital outputs available for type T2 and type T4.

Only this number of digital outputs will be shown on the display.

***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.*

Enabled digital outputs feature a ticked checkbox.

This menu allows to simulate individual digital outputs.
**Before you enter the password necessarily observe the hints on safety on page 108.**

☞ To simulate a digital output proceed as follows:

1. Select the button >Simulation< by using the rotary pushbutton
2. Enter the password
3. Select the required function from

The same procedure applies to activate the simulation of each output.

4. Please note that the digital output / digital outputs provide the registered current values until you finished the simulation menu.
5. Press the left function key to exit the simulation menu!

# 32 Simulation

This menu is can be edited by entering the password.

**DANGER**

***Effects on plant sections***

*The simulation of NivuFlow outputs will directly affect any following plant sections without any safety locking measures!*

*Simulations are allowed to be executed exclusively by qualified expert personnel.*

*It is essential to observe the hints on safety on page XX.*

***Disregarding may result to serious personal injury or damage plant parts.***

This menu allows to simulate theoretical flow. Simulation is carried out by entering assumed values for velocity and level.

These values do not really exist!

Using the dimensions of the programmed geometry as basis, the NivuFlow 650 calculates the flow rate prevailing by using the simulated values.

This rate will be issued on the analog or digital outs set previously.

**It is essential to follow the safety instructions mentioned before entering the password on page 108.**

☞ Enter your password.

☞ Rotate the rotary pushbutton until the desired value to simulate (level or velocity) is highlighted blue.

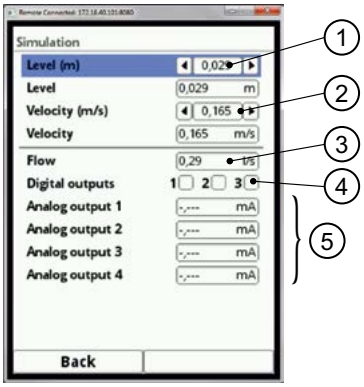
☞ Enter the desired measurement value.

☞ Confirm your entry with the right-hand function key.

The output box (see Fig. 32-1, point 3) automatically shows the flow rate computed by considering the simulation data.

Digital and analog outputs possibly set behave like being actually programmed and will output these values effectively.

Issued signals and values are indicated on the display (see Fig. 32-1, point 4 and 5).




1 Input field level
2 Input field velocity
3 Readout field calculated flow
4 Display digital output status
5 Display analog outputs status

**Fig. 32-1 Display of calculated values and issued conditions**

# Maintenance and Cleaning

**WARNING** ***Disconnect instrument from mains***

*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** ***Disconnect instrument from mains***

*Due to being frequently used in wastewater applications, some portions of the measurement system may be loaded with hazardous germs. This is why precautionary measures shall be taken while being in contact with the system, cables and sensors.*

***Wear protective clothing.***

# 33 Maintenance

## 33.1 Maintenance interval

The Type NivuFlow transmitters are conceived to be virtually free of calibration, maintenance and wear (Requirements of the Industrial Safety Regulations are unaffected.)

NIVUS recommend to have the entire measurement system inspected by the NIVUS customer service once per year.

Depending on the area of use the maintenance intervals however may vary.

Extent and intervals of maintenance depend on the following conditions:

- Material wear
- General regulations for the operators of the measurement facility
- Ambient conditions

After 10 years the measurement system should be completely inspected by the manufacturer.

(The verification of instruments / sensors is a basic measure executed by NIVUS GmbH in order to improve operational reliability and to increase the lifetime).

## 33.2 Customer Service Information

For annual inspection of the entire measurement system contact our customer service:

**NIVUS GmbH - Customer Service**

Phone +49 (0) 7262 9191 - 922

Kundencenter@nivus.com

# 34 Cleaning

## 34.1 Transmitter

**WARNING**

***Disconnect instrument from mains***

*Disconnect the instrument from mains power before cleaning.*

*Do not wipe over the terminal clamp blocks with damp cloth or similar!!*

***Disregarding may lead to electric shocks.***

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 sharp cleansing agents or solvents! Light household cleaners or soapy water can be used.

**Caution:**

- **Do not remove the blue plastic rails to clean the enclosure!**
- **Do not use the damp cloth to wipe over the terminal clamp blocks!**

## 34.2 Sensors

The hints on how to maintain and clean the sensors shall be necessarily observed. These hints can be found in the >Technical Instruction for Transit Time Sensors<.

This instruction is part of the standard sensor delivery!

# 35 Dismantling/Disposal

**Improper disposal may be harmful to the environment.**

Always dispose equipment components and packaging materials according to applicable local regulations on environmental standards for electronic products.

☞ Disconnect the unit from mains power.

☞ Use appropriate tools to remove the connected cables from the faceplate of the instrument.

☞ Remove the transmitter from the DIN rail.

☞ Make sure that the backup battery and will be disposed of separately.

***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.*

# 36 Accessories

| | |
|---|---|
| NOZ0 0HAL0 | Holder bracket for Rod sensor fastening on vertical walls, material: stainless steel 1.4301 (2 pcs. required per measurement path) |
| NOZ0 0HAL90 | Holder bracket 90° for Rod sensor fastening on horizontal surface, material: stainless steel 1.4301 (2 pcs. required per measurement path) |
| NOZ0 ROHRVE1 | Extension for installation tube 33.7 x 2.0 mm; length 1000 mm; Material 1.4571 |
| NOZ0 0STRBL | Flow-optimised protective sheet for rod sensors; length 1300 mm, material 1.4301 |
| ZUB0 STUXXX | Welding nozzle for pipe sensors, 1½“ inner thread, in various materials |
| NOZ0 0HALHK | Standard holder bracket for hemisphere fastening for sensors Type NOS-V30B... on counterforts, material: stainless steel 1.4571 |
| ZUB0 USB 08 | USB stick 8 GB for readout of parameter settings and measurement values using the NivuFlow USB interface |
| SW0N SPRO | Evaluation software, NivuSoft Professional with matched functions: documentation of measurement sites, output as graphs and tables, creation of statistics/reports etc. |
| BSL0xx | Overvoltage protection for measurement transmitter and sensors |

You can find more accessories in the current NIVUS price list.

## S



## T



## U



## V

# Glossar

**This product uses codes of the following open source projects:**

Contact opensource@nivus.com in regard of all licensing issues

- Nanox/nxlib (http://www.microwindows.org)
- Freetype FreeType Team (http://www.freetype.org)
- FLTK (http://www.fltk.org)
- Libpng (http://www.libpng.org)
- The Independent JPEG Group‘s JPEG software (http://www.ijg.org)
- MiniXML (http://www.msweet.org)
- TinyGL (http://bellard.org/TinyGL)
- Zlib (http://www.zlib.net)
- Duktape (http://www.duktape.org)

# Certificates and approvals

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 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
- EN 61010-1:2010

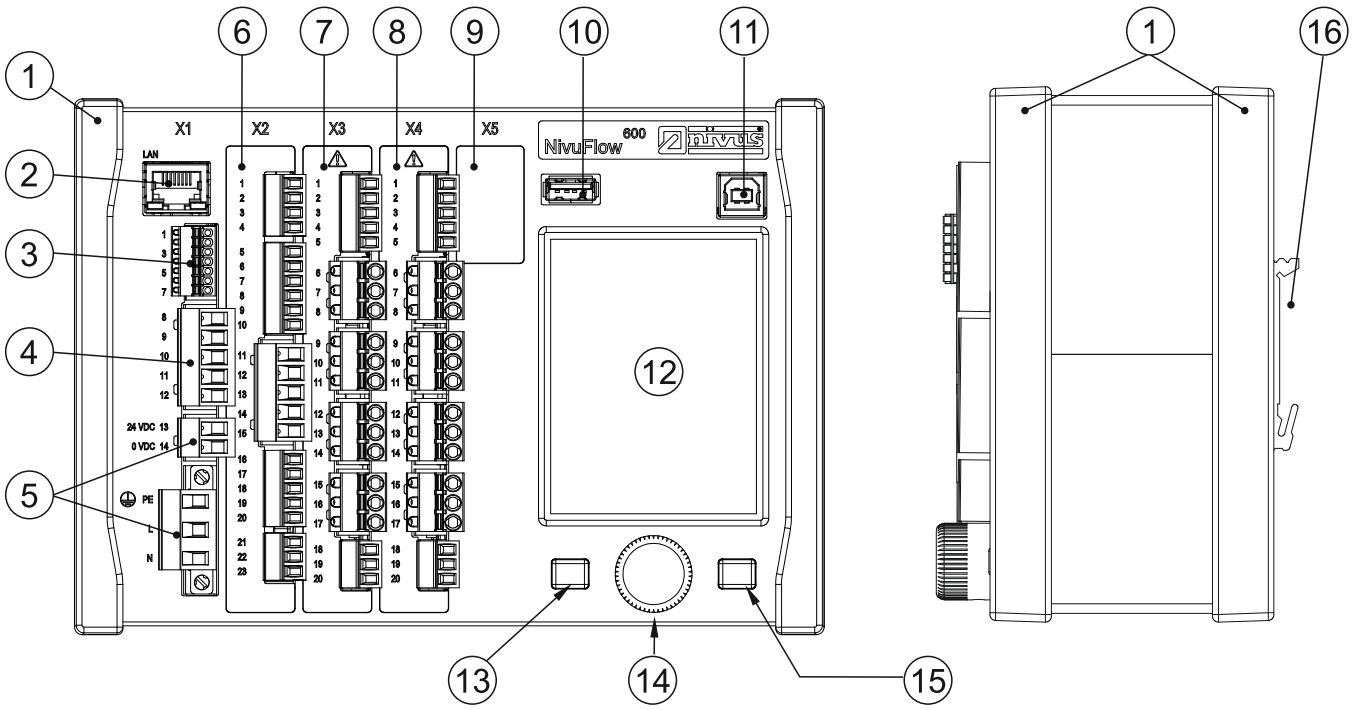
Diese Erklärung wird verantwortlich für den Hersteller:
*This declaration is submitted on behalf of the manufacturer:*
*Le fabricant assume la responsabilité de cette déclaration:*

**NIVUS GmbH**
**Im Taele 2**
**75031 Eppingen**
**Allemagne**

abgegeben durch / *represented by / faite par:*
**Marcus Fischer** (Geschäftsführer / *Managing Director / Directeur général)*

Eppingen, den 20.04.2016

Gez. *Marcus Fischer*




| | |
|---|---|
| 1 | Trims / cover strips |
| 2 | Network interface LAN |
| 3 | BUS interface |
| 4 | Connection level sensor (active, optional) |
| 5 | Power supply |
| 6 | Connection level sensor via RS485 |
| 7 | DSP-Card: Transit time sensor connection (2-path measurement) |
| 8 | DSP-Card: Transit time sensor connection (4-path measurement) |
| 9 | Spare slot |
| 10 | USB-A-interface (data transfer) |
| 11 | USB-B-interface (Service interface) |
| 12 | Graphic display |
| 13 | left function key |
| 14 | Rotary pushbutton |
| 15 | right function key |
| 16 | DIN rail fastening |