FLOW permanent

Instruction Manual

Flow Measurement Transmitter
NFP – NIVUS Full Pipe

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Copyrights and property rights

Important Note

This 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 manual must be translated into the language of the country in which the device is to be used. Should the translated text be unclear, the original instruction manual (German) must be consulted or the manufacturer contacted for clarification.

Copyright

Names

The use of general descriptive names, trade names, trademarks and the like in this manual 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.

Table of Contents

General

1 About this manual

Important Note

READ CAREFULLY BEFORE USE!

KEEP IN A SAFE PLACE FOR LATER REFERENCE!

This instruction manual is required for the Installation of the flow measurement transmitter NIVUS Full Pipe 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 connection 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 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 Correlation Sensors and Electronic Box
- Installation Instruction for Correlation and Doppler Sensors

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

1.2 Signs and definitions used

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

Table 1 Structural elements within the manual

1.3 Abbreviations used

1.3.1 Colour code for wires and single conductors

The abbreviations of colours, wire and components follow the international colour code according 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		

Safety Instructions

2 Used symbols and signal words

2.1 Valuation of the accident level

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

DANGER

Warnings in high degree of risk

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

WARNING

Warnings in medium degree of risk

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

CAUTION

Warnings in low-risk or property damages

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

WARNING

Danger by electric voltage

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

Important Note

Contains information that should be highlighted.

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

Note

Contains information and facts.

2.2 Warning notices on the product (option)

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 Safeguards and Precautions

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

WARNING

Germ contamination

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

Disconnect the systems from mains

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

Disregarding may lead to electric shocks.

Putting into operation by trained experts only

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

Integrated buffer battery

The exchange of the integrated buffer battery shall be carried out by NIVUS staff or personnel authorised by NIVUS only. Otherwise the guarantee expires.

4 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 (in Germany e. g. VDE regulations) such as applicable Ex regulations as well as safety requirements and regulations in order to avoid accidents shall be 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 transmitter 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.

5 Use in accordance with the requirements

Note

The instrument is intended solely for the purpose described below.
Modifying or using the instruments for any other purposes without the 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 NFP - NIVUS Full Pipe including the accompanying sensors is designed for continuous flow measurement of slight to heavily polluted media in permanent full pipes.

The flow meter is designed and manufactured in accordance with the current state of the art and with the recognised safety rules and regulations applicable at the time this document is issued. Danger to persons or material damage cannot be completely ruled out, however.

The maximum permissible limit values as specified in chapter “15 Specifications” shall be necessarily observed. Any case varying from these conditions which is not approved by NIVUS GmbH in written form is left at the owner’s risk.

Ex protection

The Ex-version of the transmitter is designed to be used in areas with explosive atmospheres (zone 1).

Approval measurement transmitter: II (2) G [Ex ib Gb] IIB

WARNING

Risk of personal injury due to explosion hazard

Install the transmitter out of Ex zones!
The Ex approval of the sensors is part of the “Technical Description” and/or “Instructions Manual”.
The approval is valid only in conjunction with the according identification on the transmitter’s or sensor’s nameplate.
The Ex approval of the sensors is part of the “Technical Instructions for Correlation Sensors and Electronic Box”.

Conformity certificates and test certificates

For installation and commissioning the conformity certificates as well as the test certificates issued by the respective authorities shall be followed.
The Ex version of the NFP is adjusted solely to NIVUS pipe sensors type POA regarding the intrinsically safe system review according to EN60079-25.
In the event of using sensors by third-party manufacturers the operator shall carry out a system review according to EN 60079-25!
The required specifications of the Ex version of the NFP can be found in the according EC type examination certificate IBExU07ATEX1081.

6 User's Responsibilities

Important Note

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

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

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

Connections

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

7 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

Delivery, Storage and Transport

8 Delivery

The standard delivery of the transmitter NFP contains:

- Measurement transmitter NFP
- The instruction manual including the certificate of conformity and approvals. It contains any relevant information on how to operate the measurement system.

Check additional accessories such as sensor, welding nozzle, tapping saddle, ball valve etc. depending on your order and according to the delivery note.

9 Reception inspection

Check the packaging for visible damage immediately after receipt. Any possible damage in transit shall be instantly reported to the carrier. Furthermore a written report shall be sent to NIVUS GmbH in Eppingen.
Incomplete deliveries shall be reported in writing either to your local representative or directly to the NIVUS head office in Eppingen within two weeks.

Note

Mistakes cannot be rectified later.

10 Storing

Observe the minimum and maximum values on environmental conditions such as temperature and humidity according to chapter “15 Specifications”.
The NFP shall be protected from corrosive or organic solvent vapours, radioactive radiation as well as strong electromagnetic radiation.
Always store the instrument in its original packaging.

11 Transport

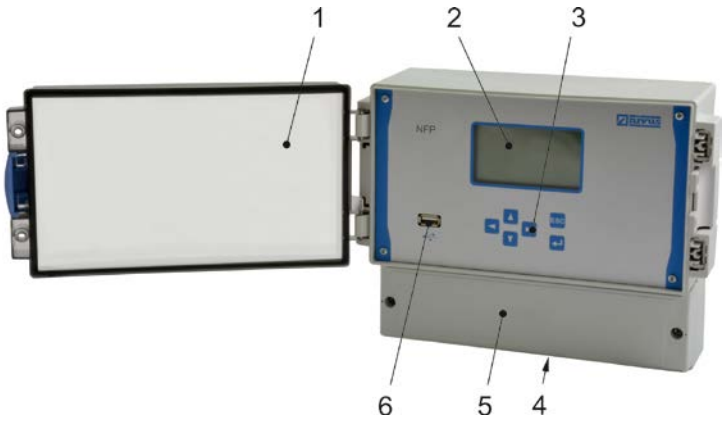
Do not expose the system to heavy shocks or vibrations.
Use the original packaging for transport.

12 Return

In case of a required reshipment return the unit at customer cost to NIVUS GmbH in Eppingen using the original packaging.
Insufficiently franked shipments will not be accepted.

Product specification

13 Overview



1 Clear view door
2 Graphic Display
3 Keypad
4 Preparation for Cable Glands
5 Terminal Clamp Housing
6 USB-A-Interface

Fig. 13-1 Overview

14 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 top of the enclosure and contains the following:

- Name and address of the manufacturer
- CE label
- Information on type and series, serial no. if available
- Year of manufacture: the first four digits of the serial number represent the year and the week number of manufacture (1821NFP….)
- Additional Ex identification for Ex-version devices (as mentioned in chapter “5 Use in accordance with the requirements”)

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.

Check the nameplate

Check the delivered instrument for accordance with your order by identifying the name-plate.

Check the nameplate for correct specification of the power supply.

➪ The EU-Type examination certificate (incl. appendix) and the declaration of conformity are located at the end of the manual.

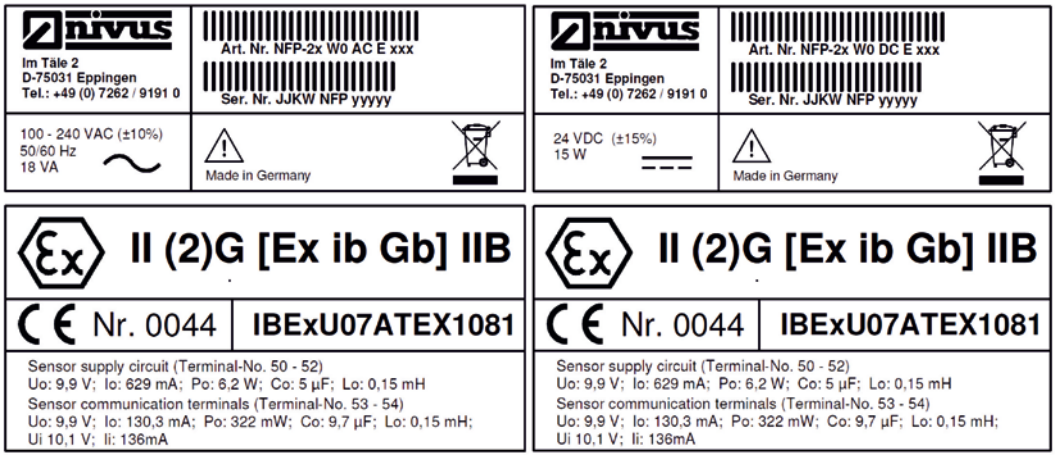


Fig. 14-1 Nameplates AC/DC (Ex versions)

15 Specifications

Power supply	100…240 V AC, +10 % / -15 %, 47…63 Hz 24 V DC, ±15 %, 5 % residual fluctuation
Power consumption	AC: max. 18 VA, typ. 7 VA DC: max. 15 W, typ. 6 W
Wall mount enclosure	Material:Polycarbonate Weight: approx. 1200 g
Protection	IP65
Operating conditions	Protection class I Overvoltage category II Pollution degree 2
Altitude	AC unit for use in altitudes up to 3000 m above MSL. At relay voltages >150 V the use is restricted to an altitude of max. 2000 m (AC and DC units)
Operating temperature	-20…+60 °C / for Ex: -20…+40 °C
Storage temperature	-30…+70 °C
Max. humidity	90 %, non-condensing
Display	Back-lit full graphic LCD, 128x64 pixel
Operation	6 keys, menu driven in German, English, French and Polish
Inputs	1x digital input 1x flow velocity pipe sensor type POA connectable
Outputs	1/3x 0/4…20 mA, load 500 Ohm, 12 bit resolution, accuracy 0,1 % (after calibration) 2x relays SPDT, maximum load 230 V AC / 2 A (cos.φ 0,9)
Data memory	4 MB, 64512 data points, for programming and readings memory; read-out via front-side USB stick
Storage cycle	1 minute to 1 hour
Ex approval (option)	II (2) G [Ex ib Gb] IIB

Rated voltage	264 V AC
Sensor circuits	Ignition protection type Ex ib IIB
Sensor power supply per channel (z. B. flow velocity sensor POA V2)	Terminal no. 50…52 U_o 9,9 V I_o 629 mA Rectangular characteristics C_o 5 µF L_o 0,15 mH
Sensor communication interface per channel	Terminal no. 53…54 U_o 9,9 V I_o 130,3 mA P_o 322 mW Linear characteristics C_o 9,7 µF L_o 0,15 mH U_i 10,1 V I_i 136 mA
The maximum values also apply to concentrated capacitance / inductors that can be switched on.	

Table 2 Specifications

⇨ The EU-Type examination certificate (incl. appendix) and the declaration of conformity are located at the end of the manual.

Sensors

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

16 Configuration

16.1 Device Types

The transmitter NFP is available in different versions. The transmitters primarily vary in terms of maximum pipe diameter, power supply, Ex-protection as well as the number of analog outputs.
The current type of device is indicated by the article number, which can be found on a weatherproof label on the bottom of the enclosure. From this article key the type of device can be specified.

NFP	Type				
	25	Nominal diameter DN100…DN500			
	28	Nominal diameter DN100…DN800			
		Construction			
		W0	Wall mount enclosure IP65		
			Power supply		
			AC	85…265 V AC	
			DC	20…28 V DC	
				ATEX approval	
				0	none
				E	Intrinsically safe sensor supply in Ex-Zone 1
					Extensions
					1 1 analog output
					3 3 analog outputs
NFP		**W0**			

Table 3 Type key for NFP transformer

Functional Principle

17 Operating Range

The NFP is a permanent measurement system for flow measurement of slightly to heavily polluted media with various consistencies in constantly full filled pipes.

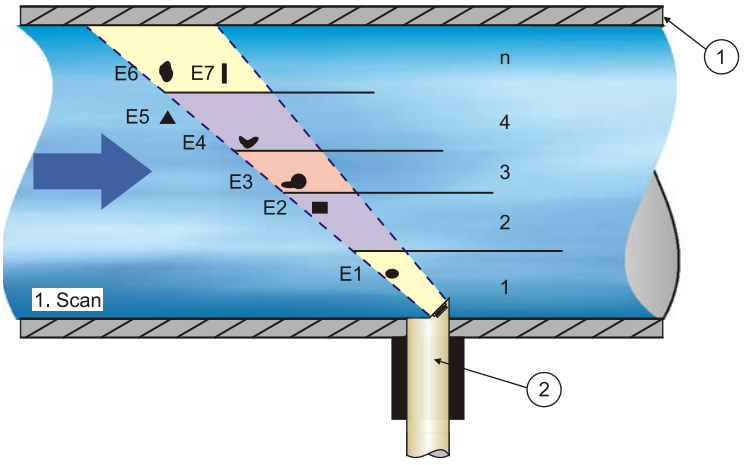
Important Note

The measurement method used for flow velocity detection is based on the ultrasound reflection principle.

Hence, it is indispensable for the system to work that there are particles in the water, which are able to reflect the ultrasonic signal sent by the sensor (dirt particles, gas bubbles or similar).

18 Flow Velocity Measurement

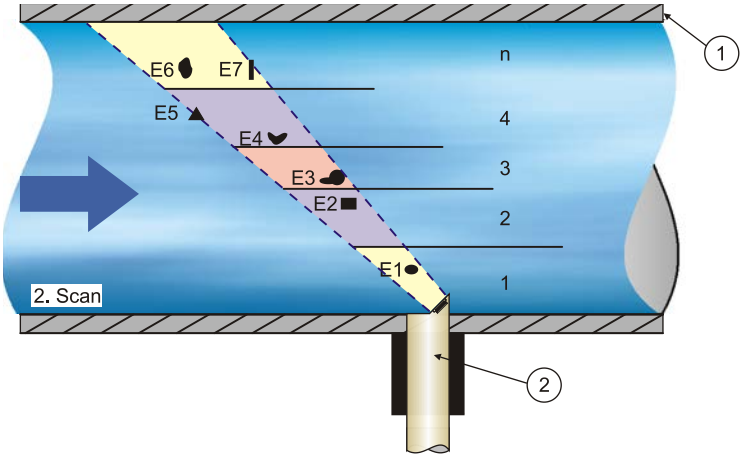
The piezo crystal has a slope to the flow direction and operates as a flow velocity sensor. Here an ultrasonic burst with a defined angle is sent into the medium. All the particles in the measurement path (air, dirt) reflect a small amount of the ultrasonic signal. The result is a particular signal depending on shape and size of the particles.
Hence, the multitude of the reflected signals results in a reflection pattern (see Fig. 18-1). The piezo crystal receives this pattern again, which then is converted into electric signals and will be saved in a built-in digital signal processor (DSP). This DSP is located within the active pipe sensor.



1	Pipe wall
2	Pipe sensor
E1…E7	Reflecting particles
1, 2, 3, 4, n	Measurement window

Fig. 18-1 Situation at first signal detection

After a certain period a second ultrasonic burst is sent into the medium (see Fig. 18-2). The newly generated reflection signal is saved in the DSP too.
In various sections there are different flow velocities, where in case of full filled pipes and sufficient calming sections the maximum velocity is in the centre of the pipe. Depending on medium viscosity, flow velocity and wall roughness this velocity decreases approaching the pipe wall (flow velocity profile, see Fig. 18-4).
The reflecting particles have moved away from the first measurement point by varying distances due to the flow velocity profile prevailing in the pipe. Hence, a distorted reflection pattern results (see Fig. 18-3). At the same time slightly different reflections will emerge additionally resulting from the fact that some particles have been turning around and thus have another shape of reflection; some particles are no longer within the measurement range and others have now moved into the measurement range.



1	Pipe wall
2	Pipe sensor
E1…E7	Reflecting particles
1, 2, 3, 4, n	Measurement window

Fig. 18-2 Situation at second signal detection

The DSP checks both the received reflection patterns for similarities using the cross correlation method. All existing signal differences are rejected so that two similar but temporarily offset signal patterns are left for velocity evaluation.
Depending on the inner pipe diameter set an overlay consisting of up to 16 measurement windows of different lengths will be added. Then, in each measurement window the lag Δt of the signal pattern is investigated (see Fig. 18-3).

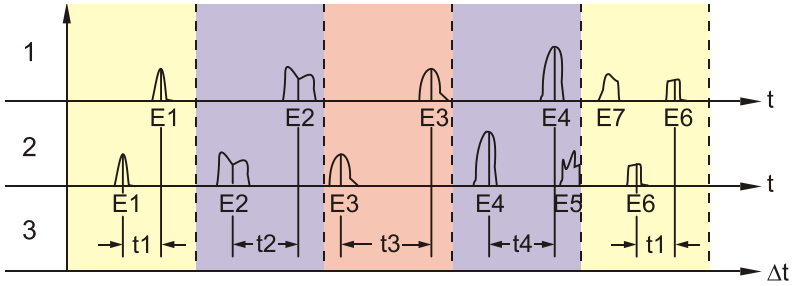


Fig. 18-3 Echo signal images and evaluation

Based on the beam angle, the interval between both transmitted signals and the lag of the signal pattern therefore in each single measurement window the flow velocity can be determined.
Stringing together the single flow mathematically velocities results in the flow profile of the acoustic path which is directly indicated on the display of NFP.

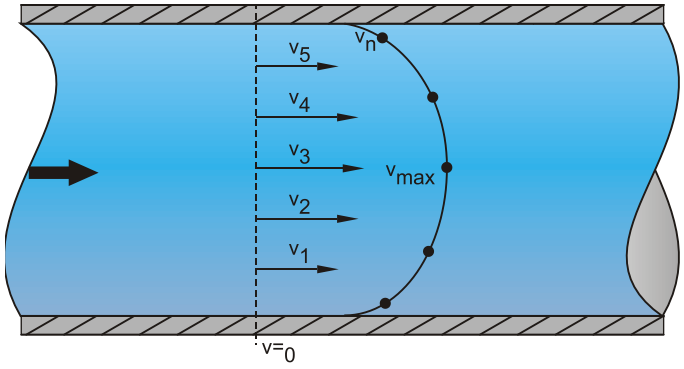


Fig. 18-4 Investigated flow profile

If there are appropriate banking distances on the measurement place available, based on the known pipe geometry and the velocity distribution a 3-dimensional flow distribution can be rendered.
From this flow velocity distribution and the mathematical weighting of the individual gates regarding the Reynolds number it is possible to calculate the average flow velocity. From this velocity multiplied by the circular pipe area we can obtain the flow rate. This rate can either be a free programmable analog signal or an impulse signal as well.

Installation and Connection

19 General Installation Instructions

For electric installation the local regulations in the respective countries (in Germany e. g. VDE 0100) must be referred to.

WARNING

Separate protection

The NFP 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).

Before feeding the rated voltage the transmitter and sensor installation must be correctly completed. The installation should be carried out by qualified personnel only.
Further statutory standards, regulations and technical rulings have to be taken into account.
All outer circuits, wires and lines connected to the device must have a minimum isolation resistance of 250 kOhm. If the voltage exceeds 42 V DC an isolation resistance with 500 kOhm min. will be required.
The cross-sectional dimension of the power supply wires must be 0.75 mm^2 (0.03 in^2) and must be in accordance to IEC 227 or IEC 245. The device protection rating is IP65. The maximum allowed switching voltage on the relay contacts must not exceed 250 V. According to Ex protection it must be checked if the devices power supplies must be integrated into the facility's emergency shutdown conception.

20 Transmitter Installation and Connection

Important hints on installation

- *Ensure proper installation.*
- *Follow applicable legal or operational guidelines.*
- *Improper handling may lead to personal injuries and/or equipment damage.*

20.1 General

The transmitters mounting place has to be selected according to certain criteria.
Please strictly avoid:

- direct sunlight (use weatherproof cover if necessary)
- heat emitting objects (max. ambient temperature see chapter "15 Specifications")
- objects with strong electromagnetic fields (e. g. frequency converters or similar)
- corrosive chemicals or gas
- mechanical shocks
- installation close to footpaths or travel ways
- vibrations

- radioactive radiation

During installation works keep in mind that electronic components may be irreversibly damaged due to electrostatic discharge. Therefore avoid intolerably high electrostatic charge during installation by implementing appropriate grounding measures.

Clear view door

The clear view door of the measurement transmitter is provided with a protection foil for protection during transport and from scratches during assembly. This protection foil has to be removed immediately after the assembly.

UV radiation

If the view door protection foil has been exposed to direct solar radiation for a long period, it cannot be removed easily.

Should this be the case try to clean the door using spirit or car polish.
If these measures should not be successful the clear view door can be replaced by NIVUS at extra costs.

20.2 Enclosure Dimensions

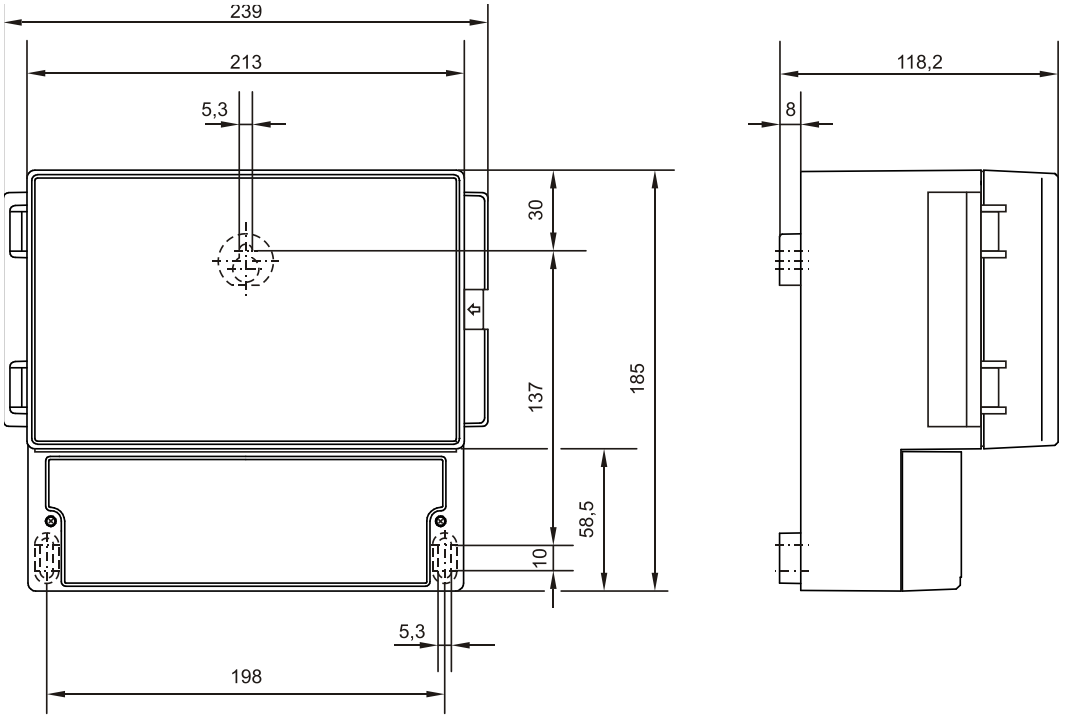


Fig. 20-1 Wall Mount Enclosure

20.3 Hints on how to avoid electrostatic discharge (ESD)

When connecting the NFP the following warnings and hints shall be observed right as the warnings and hints found in the according chapters on installation.

WARNING

Disconnect the unit from mains power

Disconnect the instrument from mains power before you begin to carry out maintenance, cleaning and/or repair works (expert personnel only).

Disregarding may lead to electric shocks.

The sensitive electronic components inside of the instrument may be damaged by static electricity which may impair the instrument's performance or even lead to instrument failure. The manufacturer recommends the following steps to avoid equipment damage due to electrostatic discharge:

- Discharge static electricity from your body before touching the instrument's electronic components such as circuit boards and the components installed on the boards. To do so touch a grounded metal surface such as the unit's enclosure frame or a metal pipe.
- Avoid unnecessary movements to reduce the risk of building up static electricity.
- Transport statically sensitive components in antistatic containers or packing materials.
- To discharge your body and to stay free of static electricity wear an antistatic wristband grounded through a cable.
- Only touch components that are sensitive to electric charges in an antistatic working area. If possible, use antistatic mats and work pads.

20.4 Transmitter Installation

Front panel

It is not allowed to remove the front panel.

Tightness of the terminal housing

Water or dirt must not leak into the terminal housing. Seal the housing with the supplied lid and both screws respectively.

Mounting Wall Mount Enclosure

Ensure proper installation.
The most simple way to install a wall mount enclosure is to fasten a DIN rail with a length of 210 mm (8.3 in.) and then to snap-on the enclosure.
It is possible to install the enclosure by using three screws as well. Use a pan head screw with a head diameter of 5.5...8.0 mm (0.22...0.32 in.) for this. This screw must be screwed into the mounting plate protruding 4 mm (0.16 in.). Then hang the enclosure on the screw and additionally fix it with two more screws from the terminal clamp housing. Make sure to screw

them not less than 40 mm into the wall or 50 mm into appropriate dowels which need to be set previously.

General

The field enclosure has cable glands and dummy plugs. Some of them are screwed in and some are enclosed as spare parts or additional parts.
The transmitter contains:

- 1x gland M16x1,5 with counter nut
- 2x gland M20x1,5 with counter nut

With the supplied glands the following outer cable cross-sections can be connected reliably:

- M16x1,5 3,5…10,5 mm
- M20x1,5 6,0…14 mm

Cables featuring **larger** outside diameters need to be equipped with cable glands (min. IP65). To guarantee the protection IP65 unused lead-ins have to be locked with an appropriate dummy plug before the initial start-up.

20.5 Electrical Installation

20.5.1 Transmitter Connection

Important Note

The complete measurement system shall be installed and put into operation by qualified personnel exclusively.

WARNING

Disconnect the unit from mains power

Each time before opening the terminal clamp housing ensure to disconnect the NFP from any voltage.

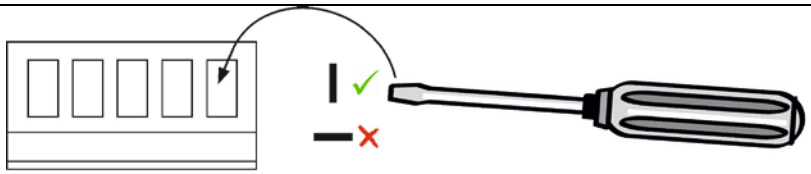
Disregarding may lead to electric shocks.

In terms of electric connection please note the device configuration since unspecified inputs, outputs as well as power supply connections are not connected.

Warranty of a correct clamp-connection

Supply power and grounding are connected as described below using the spring clamps 1…3 (AC unit) or 3…5 (DC unit):

- *To open the spring contact use a slot screwdriver (blade width 2.4…3.5 mm) from the top (hanging device from the front) to press down the clamp through the appropriate opening (see drawing below) and insert the connection wire/strand from the front (hanging device from the bottom) into the contact opening up to stop.*



- *Remove the screwdriver and check the mechanical strength of the connection.*

Any other clamps are equipped with screw clamp terminals.

Front panel

It is not allowed to remove the front panel.

Tightness of the terminal housing

Water or dirt must not leak into the terminal housing. Seal the housing with the supplied lid and both screws respectively.

When connecting the transmitter observe the terminal clamp specifications listed below:

Power supply (terminal 1…5):
Spring cage terminal; wire up to 2.5 mm², strand up to 1.5 mm²,
Screwdriver for pushing in, max. blade width 3 mm

Relay (terminal 12…17):
Screw terminals; wire up to 2.5 mm², strand up to 1.5 mm²,
Screwdriver blade width max. 3 mm

Plug connectors with screw terminal connection (terminal 24…54):
Screw terminal connection; wire up to 1.5 mm², strand up to 1.5 mm²,
Screwdriver blade width max. 2.5 mm

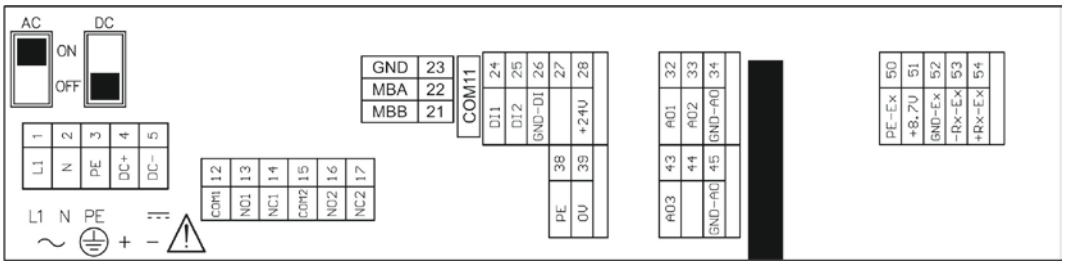
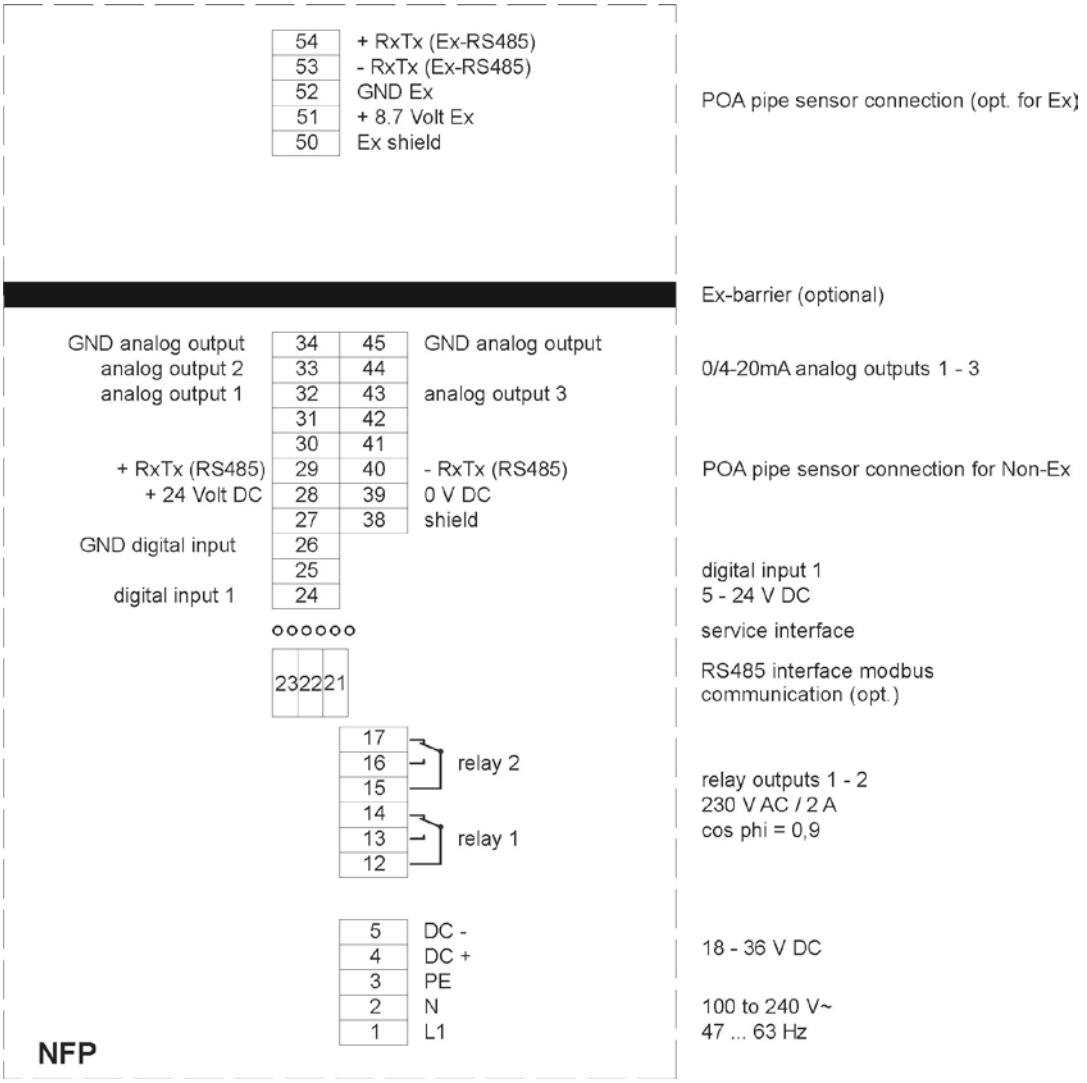


Fig. 20-2 Terminal housing, example Ex version



- Low-impedance connection exists between '0 V DC' and GND analog output.
- GND digital input and GND Ex are galvanically insulated from each other as well as from '0 V DC'.
- DC-powered units have 'DC +' and 'DC –' galvanically insulated from all other clamps.
- AC-powered units permit to tap the 24 V auxiliary voltage, which is also available on '+24 Volt DC' (28) and '0 V DC' (39), from connections 'DC +'/'DC –' (clamps 4 and 5) too. AC units therefore have a low-impedance connection between 'DC –' and GND analog output via the '0 V DC' connection. In contrast to the 24 V available on clamps 28 and 39, the auxiliary voltage on 'DC +'/'DC –' (clamps 4 and 5) is conducted through an internal extra common mode filter and 'DC +' can be enabled/disabled by using the DC switch.

Fig. 20-3 Clamp wiring transmitter NFP

20.5.2 Sensor Connection

The sensor is equipped with a fixed cable Type LIY11Y 2x1.5 mm² + 1x2x0.34 mm² with various possible lengths.
The allowed maximum fixed cable length between flow velocity sensor and transmitter is 150 m.
It is possible to extend the sensor cable up to a total length of 150 m using the cable type mentioned above or an adequate cable type.

Use metal box

If you use a connection box in order to extend the cable, this box must be made of metal. Necessarily connect the shields of feed and return cable to the shield connections of the connection box.

Disregarding may cause EMC errors.

Eliminate the possibility of improper connections

Improper connections which lead to higher transition resistance or the use of other cables may lead to disturbance and errors in the measurement.

Disregarding may lead to errors or measurement failure.

Route the cable correctly within the Ex zone

For use of the sensors in the Ex-area, the sensor cables must not be directed past the mechanical shield between the termination blocks.

Use the cable gland directly underneath the sensor terminal block.

The sensor cable has to be connected to the transmitter at the termination block using connectors with screw clamps.

- Lead the sensor cable from outside through the cable gland.
- Connect the sensor cables to the connection board as descripted in the wiring diagram.
- Tighten the cable gland to fix the sensor cable.

The diagram below applies in case of connecting a flow velocity sensor:

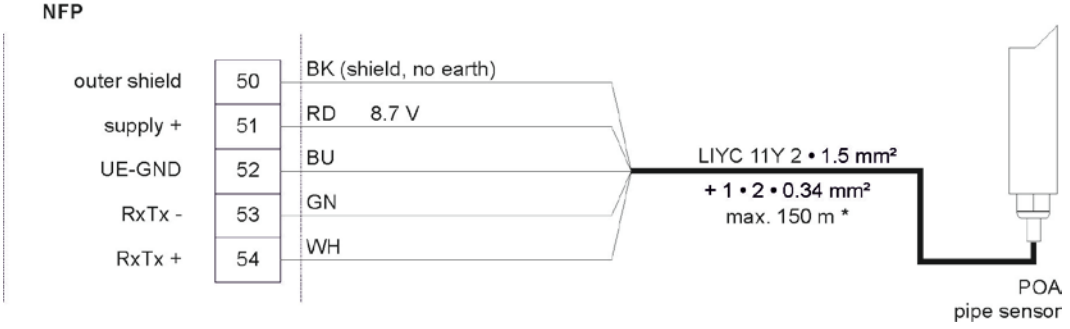


Fig. 20-4 Connection of a flow velocity sensor Type POA Ex version

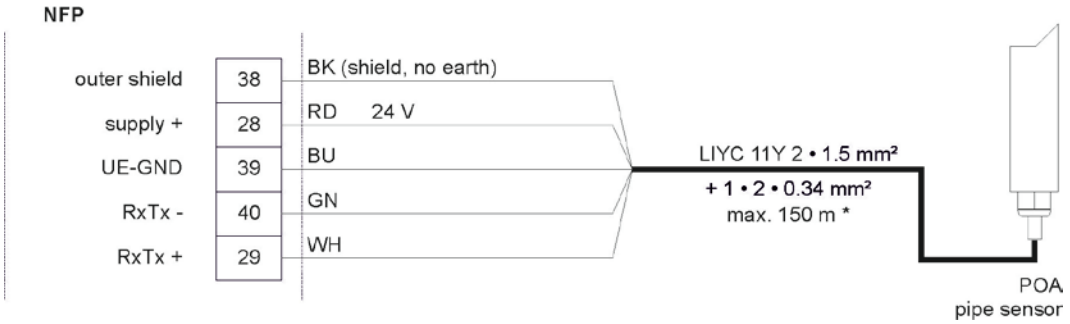


Fig. 20-5 Connection of a flow velocity sensor Type POA Non-Ex version

20.6 NFP Power Supply

Depending on the type of NFP used, it can be supplied with 100…240 V AC or with 24 V DC (see chapter “15 Specifications”).The two slide switches (located above the terminals) serve as additional power switches.

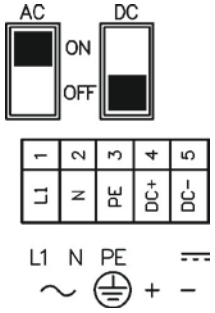


Fig. 20-6 Slide switch position in terminal clamp housing

Operation with AC voltage / DC voltage

*A DC unit can be operated **exclusively** with 24 V (±15 %) **DC voltage**.*

*An AC unit can be operated **exclusively** with 100…240 V (+10 % / -15 %) **AC voltage**.*

When operated with alternating current, the direct current supply clamps 4 and 5 both provide a voltage of 24 V and max. capacity of 100 mA (turn on 24 V switch!).
Please note, when using this supply voltage (e. g. for digital inputs with control signals), it must not be shielded through the complete switchgear in order to maintain disturbing interferences on a low level.

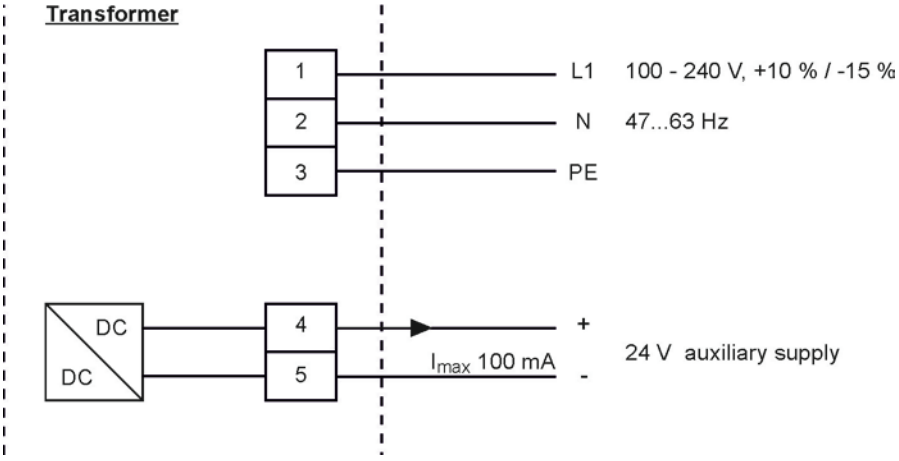


Fig. 20-7 AC model power supply

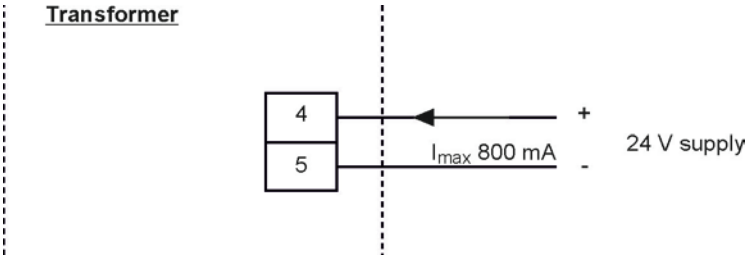


Fig. 20-8 DC model power supply

20.7 Overvoltage Protection Precautions

Reduction of the possible cable length with overvoltage protection

The use of overvoltage protection elements for sensors in Non-Ex areas will reduce the maximum possible cable length.

The line resistance is 0.3 Ohm/wire. This resistance must be taken into account considering the allowed total resistance. Observe the "Technical Instructions for Correlation Sensors and external Electronic Box".

Overvoltage protection elements are subject to natural wear and tear and therefore shall be inspected regularly and replaced if necessary in the course of maintenance measures as well as after electric malfunctions.

For effective protection of the NFP transmitter it is necessary to protect power supply and mA-output.

NIVUS recommends

- **for the mains supply the types**
  >EnerPro 220 Tr< for 230 V AC
  and/or
  >EnerPro 24 V< for 24 V DC

- **for mA-outputs the type**
  >DataPro 2x1 24 V / 24 V<

The flow velocity sensors are internally protected against overvoltage. In case of an expected high hazard potential it is possible to protect the sensors by using a combination (on a single end) of the following Types

- **for Ex sensors**
  >SonicPro 3x1 24 V / 24 V Ex<
  and
  >DataPro 2x1 12 V / 12 V 11µH Tr (N)<
- **for Non-Ex sensors**
  >SonicPro 3x1 24 V / 24 V<
  and
  >DataPro 2x1 24 V / 24 V Tr<

Permissible cable length

If using the sensors in Ex areas consider the connected loads of the overvoltage protection devices as well as capacity and inductance of the NIVUS sensor cables (POA) additionally.

The maximum permissible NIVUS cable lengths in Ex areas are:

- *Single-side overvoltage protection: 135 m*
- *Double-side overvoltage protection: 120 m*

Observe the connection direction

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

The overvoltage protection devices are ineffective if wired incorrectly.

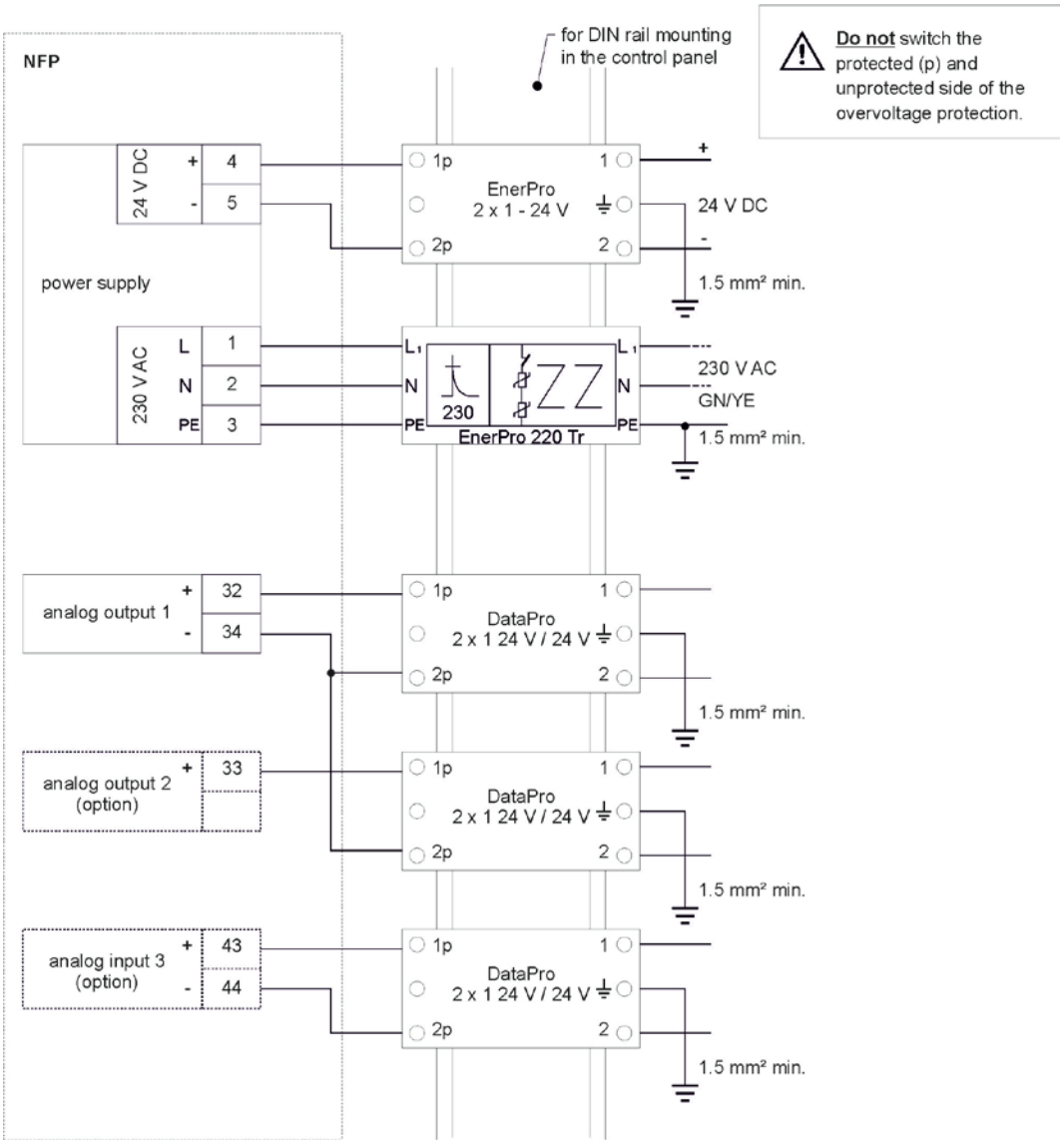


Fig. 20-9 Connecting the overvoltage protection for power supply and analog outputs

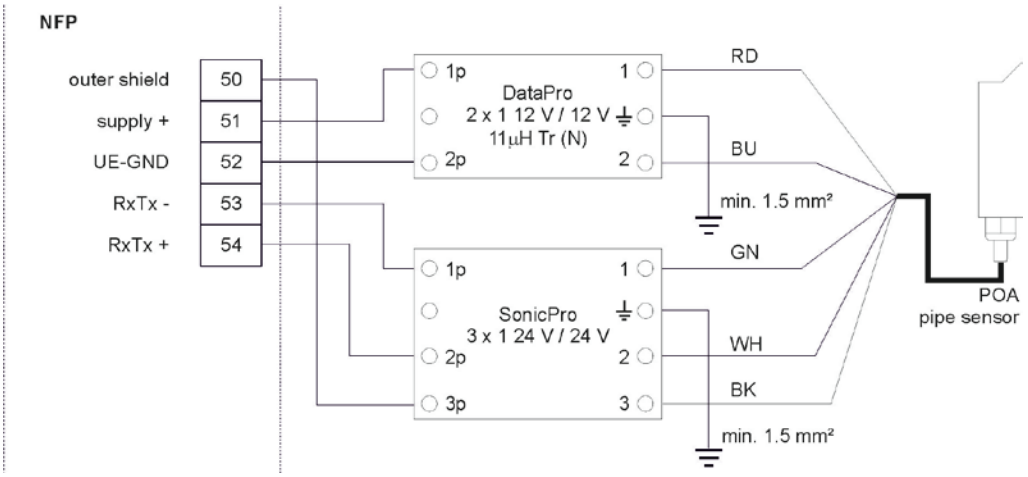


Fig. 20-10 Connecting the overvoltage protection for velocity sensor Ex version

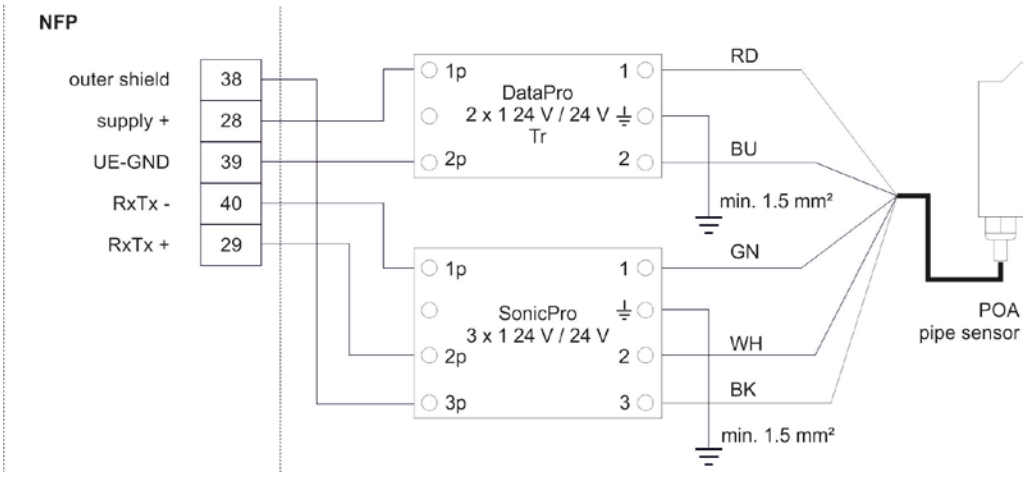


Fig. 20-11 Connecting the overvoltage protection for velocity sensor Non-Ex version

Initial start-up

21 Notes to the user

Required documentation

To put the entire system into operation it may be necessary to additionally consult the instruction manuals of the following accessories as well.

- *Installation Instruction for Correlation and Doppler Sensors*
- *Technical Instructions for Correlation Sensors and external Electronic Box*

These manuals are provided with the delivery of the accessories.

Before connecting and operating the transmitter the instructions below shall be followed.
This instruction manual contains all information required for the setting of parameters and for the use of the instrument. The manual is intended for qualified personnel. Appropriate knowledge in the areas of measurement systems, automation technology, control engineering, information technology and wastewater hydraulics are preconditions for putting the transmitter into operation.
Read this instruction manual carefully in order to guarantee proper function of the transmitter.
The transmitter shall be wired according to chapter “20.5.1 Transmitter Connection”.
In case of doubt regarding installation, connection or the setting of parameters contact our hotline:

- +49 (0) 7262 9191 955

To put the entire system into operation additionally consult the instruction manuals of the following accessories as well. These manuals are provided with the delivery of the accessories.

22 General principles

The system shall not be put into operation before the installation has been finished and checked. To exclude faulty programming this instruction manual must be read before the initial start-up. Please get familiar with the NFP programming via display and keyboard by reading the instruction manual before you begin to program the device.

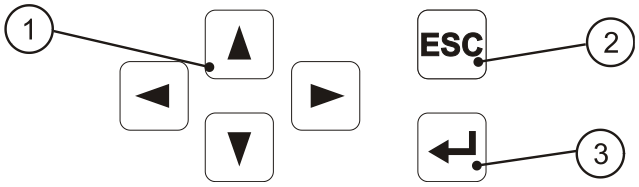
After transmitter and sensors are connected the parameters must be set. In most cases all you need is:

- inside pipe diameter
- display units
- span and function of analog and digital outputs

The NFP user surface was designed in a way that even unfamiliar users are able to easily set up basic settings in graphic dialog mode which ensure reliable device operation.
For extensive programming, difficult hydraulic conditions, in case of absence of expert staff or if a setup and error protocol is required, the programming should be carried out by the manufacturer or an expert company which is authorised by the manufacturer.

23 Operator Panel

There is a comfortable 6-button keypad available to input required data.
Due to reasons of mechanic and electronic protection the push button keypad is sealed completely by means of a plastic membrane with indelible marking.

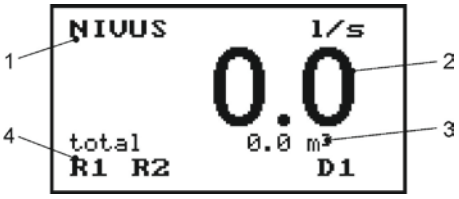


1 Control buttons
2 Abort button
3 Confirmation button

Fig. 23-1 Operator panel

24 Display

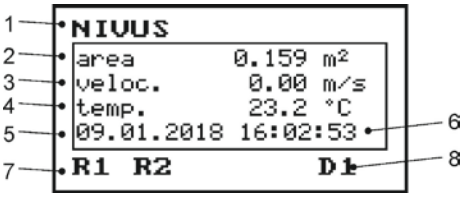
The NFP has a large back-lit graphic display with a resolution of 128x64 pixel. This ensures a comfortable communication mode for the user.



1 Name of measurement place
2 Flow
3 Total
4 Relay status

Fig. 24-1 Overview main menu

Press >ENTER< once in order to get to the secondary screen of the main menu.



1 Name of measurement place
2 Calculated cross-sectional area (depending on entered inside pipe diameter)
3 Measured average velocity
4 Measured medium temperature
5 System date

6 System time

7 Relay status

8 Digital input status

Fig. 24-2 Overview secondary screen

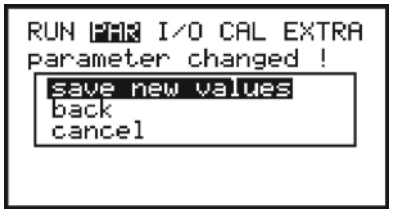


Fig. 24-3 Display with basic menus

Five basic menus for selection, programming or diagnostics are visible in the headline of the display. They can be selected individually using the >left< and >right< arrow keys.

RUN	Standard operation mode: – Indication of day totals – Indication of possible error messages – Definition of time of 24-hour totalising – Reset day totalizer
PAR	Parameter setting (most extensive menu; for initial start-up): – Parameter setting of dimensions of the measurement – Parameter setting of sensors – Parameter setting of analog and digital outputs – Damping settings – System reset
I/O	Diagnostics and display menu: – Indication of current readings on analog outputs – Indication of current readings on relays – Indication of current flow velocity – Indication of spatially allocated single velocities – Transmission of measurement data and parameters to USB stick
CAL	Calibration and Simulation – Definition of maximum and minimum measurable flow velocity – Calibration of analog outputs – Simulation of analog and digital outputs – Simulation of the calculated volume
EXTRA	Basic system and display settings – Display – Contrast – Language

	– Units – Decimal digits – System times – Totalizer presets

Table 4 Functions of the basic menus

25 Operation Basics

The entire operation of the NFP is menu driven. To navigate within the menu structure use the 4 control keys (see chapter “23 Operator Panel”).

▲ **>up<**	- Navigates upward in the respective submenu (e. g. PAR/measurement place/name) - Select preset values e. g. units (m, cm, l/s, m³/s etc.) - Increase values
▼ **>down<**	- Navigates downward in the respective submenu (e. g. PAR/measurement place/name) - Select preset values e. g. units (m, cm, l/s, m³/s etc.) - Decrease values - Set decimal point
◄ **>left<**	- Press once to toggle between indication mode and overview menu (main menu) - Jump across in main or submenu - Jump across between identical measurement values (e. g. span of analog outputs 1…3)
► **>right<**	- Press once to toggle between indication mode and overview menu (main menu) - Jump across in main or submenu - Jump across between identical measurement values (e. g. span of analog outputs 1…3)
ESC **>ESC<**	- Delete values - Each key action in menu → jumps back one level until RUN menu
↵ **>ENTER<**	- Press once to toggle from RUN menu to overview menu (main menu) - Activate a submenu - Accept and store values, units and so on

Table 5 Functions of the control keys

Parameter Setting

26 Basics of Parameter Setting

The transmitter in the background operates with the settings which have been entered at the beginning of the parameter setting. The system will not ask to accept the modifications before the settings or modifications have been finished.

Choosing >Save values< will prompt you to enter the system PIN (may be abbreviated as “PIN” within the display context).

Default setting:

2718 Type in if prompted

Share password / system PIN only with authorised persons

Never share the system PIN with unauthorised persons. Do not even leave the code next to the equipment nor write it down on it.

The system PIN protects from unauthorised access.

Single input of system PIN within 24 hours

*The system PIN must be entered only once within 24 hours. The transmitter will save more password-protected settings within this period **without** the need to **re-enter** the PIN.*

Options at the end of setting parameters:

- Save modified parameters by pressing >save new values< and inserting the System-PIN
- Jumping back to the previous level using the >back< function to modify settings which might have been forgotten (without the need to buffer previously modified settings)
- Quit setting parameters and reject any modification by pressing >cancel<

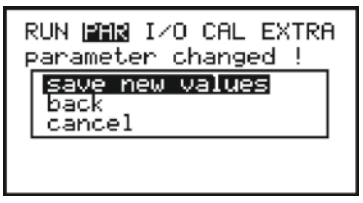


Fig. 26-1 Screen on end of parameter setting

The transmitter will indicate if the **system PIN should have been entered incorrectly** and then waits for correct entry.
If you should have forgotten to enter the system PIN use the >ESC< key to go back within the menu.

Modifications concerning language, units and contrast do not require the code to be entered as these settings influence just the way of representation and not measurement or output.
If parameter settings are not going to be modified but just verified by selecting each parameter, there will also be no request at the end of the dialog.

Regard the measuring units

Please observe the bottom line of the display whilst programming, indicating the pre-selected measuring unit.

Regard the options of the device type used

This instruction manual describes all programming options of the NFP. Depending on the device type however there might be only one analog output available or the maximum pipe diameter to set might be 450 mm (see Table 3).

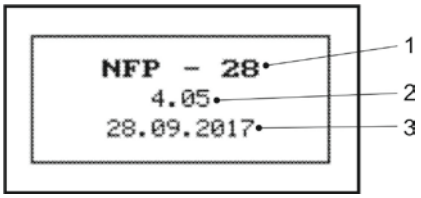
After mounting and installing sensor and transmitter (see previous chapters) activate the power supply.

On **initial start-up** the operating language needs to be selected:

Fig. 26-2 Language options for initial start-up

Use >up< and >down< arrow keys to choose the desired language and confirm with >Enter<.
The language can be changed later at any time by using the >EXTRA< / >Language< menu.

On **initial start-up** the screen below comes up:



1 Device version (25 or 28 resp. 25 - Ex or 28 - Ex) (see chapter “16.1 Device Types”)
2 Device software version No.
3 Device software version date

Fig. 26-3 Start screen

This screen will remain for a couple of seconds before the main display appears.

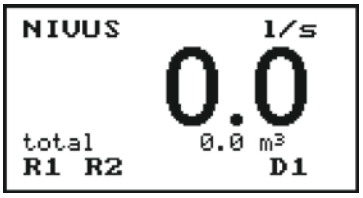


Fig. 26-4 Main display

In the basic setting the transmitter operates with a nominal diameter of 450 mm. The NFP will indicate a flow rate if there is a flow velocity prevailing at the moment of initial start-up and the sensor has been installed correctly. This reading of course is not yet relevant to the current application. It however can be used as a response reflecting the functioning of the unit.

➲ Press >ENTER< in order to get to the secondary screen of the main display.

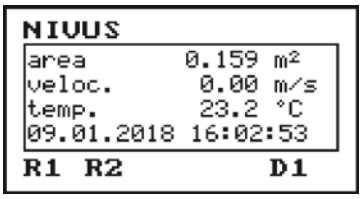


Fig. 26-5 Secondary screen of the main display

➲ The display will return to the previous screen either if pressing >ENTER< again or approx. 30 seconds after the last key action.

27 Operation Mode (RUN)

This menu is a display menu for standard operation mode and indicates day values and error messages. Containing the following sub menus, it is not required for parameter setting:

Submenus **>day values<** and **>error messages<**:

>Day values< **>Info<**

- Selecting the >Info< submenu allows you to view the total flow values of the past 14 days (see Fig. 27-1).
  Presumption: the transmitter was operated without any interruption in the past 14 days. Otherwise it shows the total for the uninterrupted days of operation.
- Only the first 3 days will be indicated after selecting. Browse to other days by using the key >down<.
- The oldest day total will be overwritten as soon as the 24h-total of the 15th day has been created (circular memory function).

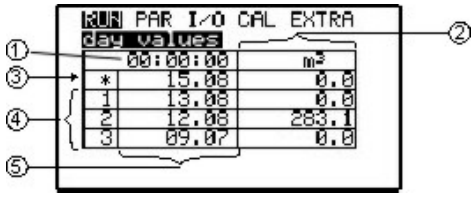
>Cycle<

The flow totals of 24 hours will be indicated. Totalisation normally is carried out at 00:00 h (midnight). If desired, this value can be modi-

fied under >cycle< (see Fig. 27-2).

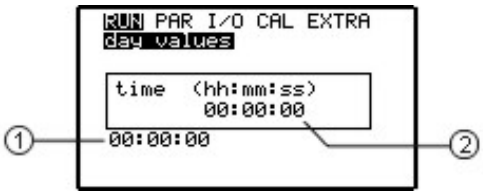
>Erase counter<

All day counters can be erased under >erase counter<. Due to safety reasons it is required to enter the PIN >2718< and confirmation with >ENTER< after erasing.



1 Time of day totalising
2 Day values (and unit)
3 Current day with cumulated total
4 24 h-day totals
5 Date

Fig. 27-1 Display day values / info



1 Current time of day totalising
2 Programmable time of future totalising in „hours:minutes:seconds" format

Fig. 27-2 Time of day totalising (cycle)

Information concerning the totalising

If the transmitter is disconnected from mains at the time of totalising set, it is not possible to create or to save a total for the respective day.

*If the unit has been shut down temporarily between two totalising points, the flow rate missed during the inoperative period is **not** going to be considered for totalising. There will be no averaging interpolated replacing the lost flow rate.*

>Error messages< >Error<

- This menu is to monitor any interruptions in the unit function. Errors are going to be saved and ordered by type of error, date and time.
- Selecting the menu will always indicate the latest error message. Browse through error

messages using the keys >left< and >right<.
- Pressing the >ENTER< key will delete all error messages one by one.
- The maximum number of stored error messages is limited to 10. The oldest of 11 error messages will be overwritten as soon as saved old error messages are not going to be erased (circular memory function).

Information on error messages:
- “Sensor” – if the sensor communication is interrupted or the POA pipe sensor is defective
- “Sensor status” – sensor reports status error
- “Temperature” – medium temperature significantly going over or falling below a range of +/-10 °C of the permissible temperature range (-40…+100 °C) or defective temperature sensor
- “Battery” – transmitters buffer battery empty

1 Error number
2 Number of stored error messages
3 Date of error message
4 Time of error message
5 Type of error / error message

Fig. 27-3 Error message

Information on error memory

*Remaining errors are **not** going to be re-written into the error memory if once deleted. As soon as the error occurs repeatedly (or if the power supply has been interrupted for a short period) the same error will be saved into the error memory again.*

28 Display Menu (EXTRA)

This menu allows modifying settings such as units, language, system time as well as the display itself. The following submenus are available:

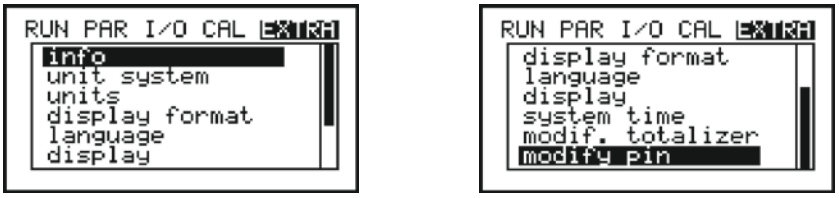


Fig. 28-1 EXTRA submenus

Due to reasons of limited space it is not possible to indicate the entire menu on the display. This can be seen from the black scroll bar on the right-hand side of the display.

▲ ▼ Scroll through the menu using the >up< and >down< keys.

>Info< This point provides comprehensive information on unit type, transmitter serial no. and software version (see Fig. 28-2). The menu is subdivided into 4 single pages. Pressing the key >right< and >left< will take you through the pages. Among other information these pages contain information on last parameter setting / parameter change as well as mains power failure which might have been occurred.

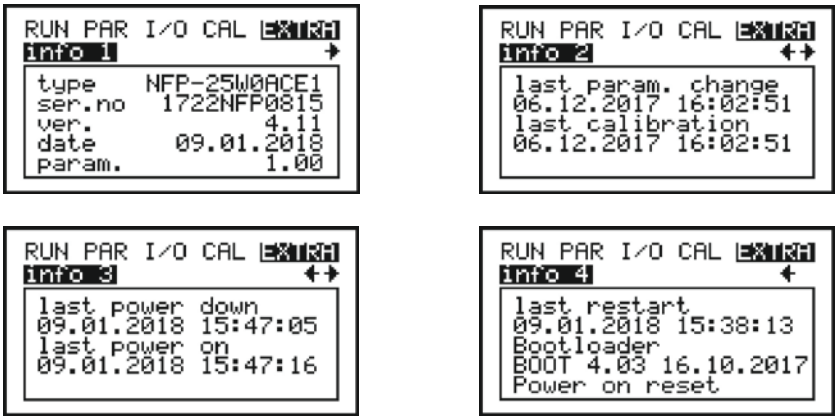


Fig. 28-2 System information / info 1…4

>Unit System< Here the unit systems can be pre-selected.
Available units:

>metric<	l/s, m³/h, cm/s etc.
>UK-english<	ft, in, gal/s etc.
>US-english<	fps, mgd etc.

>Units< For each of the three measured/calculated values
>Flow<
>Velocity<

>Total<
a unit which appears on the display can be selected. Depending on the unit system selected, there are various units available.

Fig. 28-3 Selecting the units system and units

>Format< Choose the format (decimal position) to indicate flow rates, velocity and total.
The decimal positions can be selected. Since the NFP cannot indicate more than a maximum of five digits (incl. comma/dot), the decimal places, however, may be reduced as soon as multiple digits need to be indicated left of the decimal point.
Example:
a total of 10 litres is indicated as 10.00 (xx.yy) instead of x.yyy

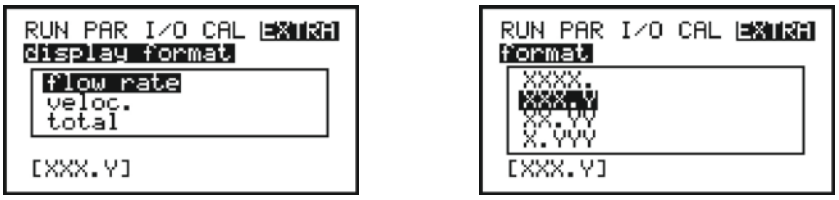


Fig. 28-4 Selecting the display format

>Language< Select from German, English, French and Polish

>Display< Permits to adjust the display contrast. Use the arrow key >down< to decrease and >up< to increase the value in steps of 5 %. The new setting will be saved automatically.
The contrast can be set also directly in the main and secondary screen by using the >up< and >down< arrow keys. In this case the percentage steps will not be indicated and the modifications are merely temporary. The transmitter will go back to the previously set values at the next power on.

>System time< In order to perform various memory functions, the unit includes an internal system clock. The clock settings can be modified if required (different time zones, summer time / winter time etc.).

>Info<	Indicates the current (adjusted) values for date and time
>Set date<	Modify date
>Set time<	Modify time
>Date format<	Adjust date format

>Time format< 12- or 24-hours format

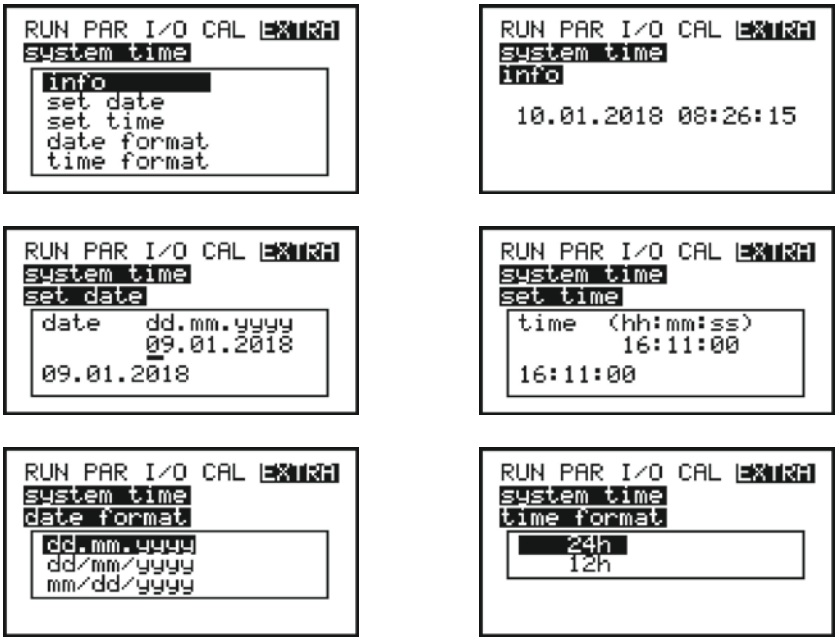


Fig. 28-5 System time submenus

>Modif. totalizer< This menu allows to newly set the totalizer indicated on the main screen. This function is used if the transmitter has been replaced and the new transmitter is to show the same total value.

- Specify new total value
- Confirm with Enter key
- Enter system PIN and confirm
- New total value is shown in the main screen

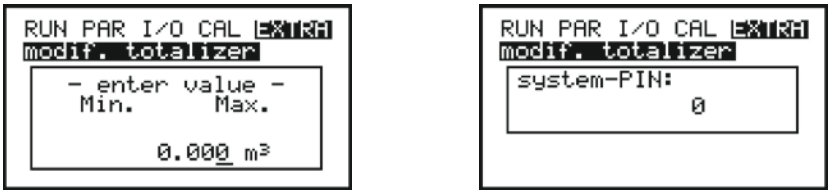


Fig. 28-6 Modification of totalizer

>Modify PIN< **>System-PIN<** The system PIN is the transmitter password and for parameter modifications.
Default system PIN: “2718”.
NIVUS recommend changing the PIN to protect the system from unauthorised access.
The PIN is arbitrarily selectable (max. six digits).

Tip:
For your own safety we recommend to share

the system PIN only with authorised persons. Make a note of the system PIN and store it in a safe place.

>Service-code< This menu point is for the NIVUS commissioning service only.

>Reset all pins< If the system PIN should get lost a PUK (Personal Unlocking Key) can be generated by NIVUS (upon request) which will reset all modified PINs to factory default and hence restores transmitter access.

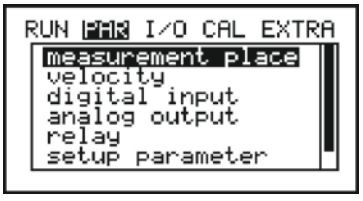
Fig. 28-7 Submenu modify PIN

29 Parameter Menu (PAR)

This menu is used to set all relevant parameters required to ensure reliable device function. Choose from the following parameters:

- Name of measurement place
- Inside pipe diameter
- Measurement place application (mode and medium)
- Analog output (function, measurement range and measurement span)
- Relay output (function and values)

The >PAR< parameter setting menu contains seven partially very extensive submenus which are described in greater detail on the following pages.



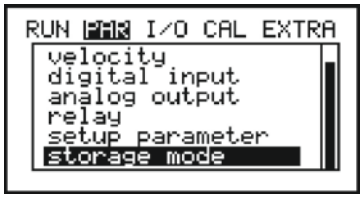


Fig. 29-1 Parameter menu

▲ ▼ Scroll through the menu using the >up< and >down< keys.

29.1 Parameter Menu “Measurement Place”

This menu is one of the most important basic menus for parameter setting as the measurement place is going to be defined here.

Fig. 29-2 Submenu measurement place

>Name<

NIVUS recommends to coordinate and to define names according to names stated in the respective documents. Names may contain up to 20 letters. The display, however, does not necessarily indicate the complete name; what is decisive is the available space on each individual page.
After the submenu >Name< has been selected the basic setting “NIVUS” will come up. There is a cursor blinking below the first digit which can be modified.
Underneath the measurement place name you can find a table with 20 lines containing all uppercase and lowercase letters as well as a large number of special characters (see Fig. 29-3). Use the keys >up< and >down< to jump across two lines up or down at each key action.
To complete the name of the measurement place use the four arrow keys and confirm your selection with >ENTER<. The cursor subsequently will jump one digit to the right enabling you to choose the next character.
Surplus or incorrect characters can be overwritten by entering a blank which can be found top left in the table.
In order to modify an existing name move the input cursor right by simultaneously pressing the >right< + >down< or >up< arrow keys. Press >left< + >down< or >up< to move to the left.

1 Current name of the measurement place
2 Selected character
3 Selection list

Fig. 29-3 Setting the name of the measurement place

The >right< or >left< arrow keys can be used to move the cursor even after the cursor reaches the right or left margin of the table. Pressing the >right< or >left< arrow keys once again after the input cursor has reached the right or left table margin will move the cursor one more step in the desired direction.
Press ESC to finish the measurement place name entry:

>Accept changes<	Saves the input
>Back<	Enables corrections
>Cancel<	Aborts the input and the previous name will be kept

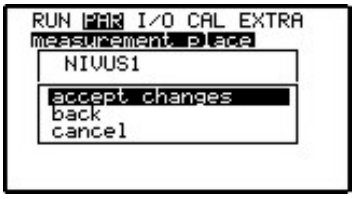


Fig. 29-4 Accepting the new measurement place name

>Diameter< Enter the **accurate** inner diameter of the measurement place here.

Enter inside pipe diameter

*The DN number is **not equal** to the inner pipe diameter which, depending on pressure level and pipe material, may significantly vary from the DN number.*
Entering an incorrect inside pipe diameter inevitably leads to a faulty calculation of the cross-sectional area resulting in faulty calculated flow readings.

Maximum inside diameter depending on version

With NFP version “25” the maximum possible inside diameter is limited to 0.55 m. Version “28” permits to specify diameters up to 0.85 m.

>Qmin< This parameter is to suppress lowest evaluated and indicated volumes which are either undesired or not relevant.
The parameter is mainly used in permanently full large pipelines with partially low movements or to suppress indication and output of low leakage volumes.
$\mathbf{Q_{min}}$: Measurement values lower than this one will be set to “0”.
Only positive values are allowed to be set. These values are going to be considered as absolute values and therefore have positive as well as negative effects.

>Operation mode< This parameter is for adjustment to existing applications. Distinguish between:

>Cyclic (pump)<	Medium condition changes between standing and strong movement. Primarily for use in applications such as

pump stations using switch-on and switch-off events or movable flaps.

>Cont. operation< Medium mostly moving within pipeline

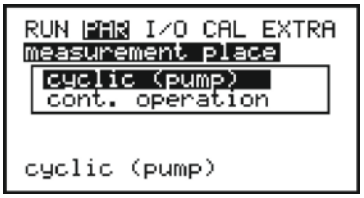


Fig. 29-5 Operation mode

29.2 Parameter Menu “Velocity”

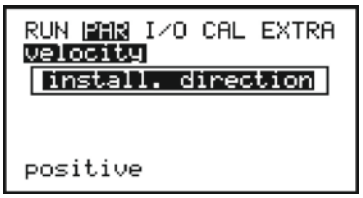
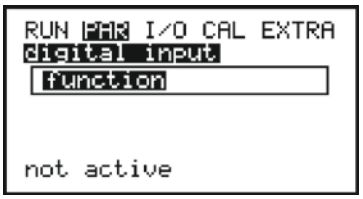


Fig. 29-6 Installation direction

>Install. direction< Installation position is set to “positive” per default.
This parameter should not be modified.
It is going to be used only for special applications where the flow velocity sensor is heading upstream (unlike heading downstream towards the flow direction as in standard applications) but is to detect positive velocities however. This is the only case which requires setting “negative” here.

29.3 Parameter menu “Digital Input”



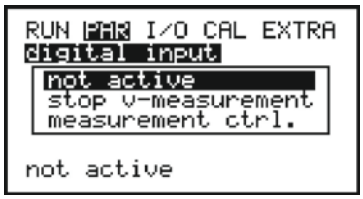


Fig. 29-7 Digital input – function – not active

The NFP comes with one digital input (digital input 1, see Clamp wiring Fig. 20-3) to release the flow velocity measurement (stop v-measurement) or to switch over between operation modes (measurement ctrl.).
Both functions are required only in exceptional cases and hence shall be used by the NIVUS commissioning service or authorised persons only.

The digital input is not activated per default.

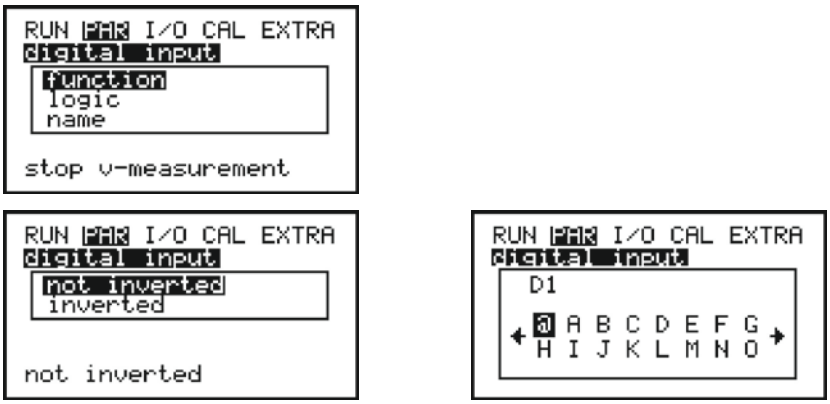


Fig. 29-8 Logic and name

>Function< A function is assigned to each digital input selectable with the >left< or >right< keys. Default: >Not active<.
The functions below are available:

>not active< Digital input is without function

>stop v-measurement< The digital input is used to release/lock the measurement by external control signals (such as flood message, threshold for detection start or similar).

>Measurement ctrl.< In hydraulically critical applications it is possible to externally switch over between operation modes >cyclic (pump)< / >cont. operation< via the digital input.

>Logic< Toggle between inverse and non-inverse mode.
Default: >not inverted<

>Name< The digital input name may consist of up to four characters which will be indicated on main screen as well as in the overview menu. The procedures are the same as described in the measurement names chapter (see chapter “29.1 Parameter Menu “Measurement Place””).

Ensure reliable contact

The digital input is passive and hence shall be supplied with 24 V DC. The signal current is 10 mA.

Ensure reliable contact by using appropriate materials for relay or end switch contacts.

29.4 Parameter Menu “Analog Output”

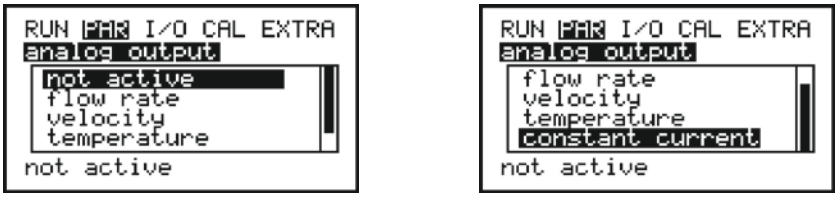


Fig. 29-9 Menu Analog output

Use the >right< or >left arrow key within this menu to select analog outputs 1…3.

>Function< A function is assigned to each analog output selectable with the >left< or >right< keys. Default: >Not active<.
The functions below are available:

>Not active< Digital output is without function.

>Flow rate< Output of the flow rate calculated from cross-sectional pipe area and average flow velocity.

>Velocity< Output of the measured average velocity.

>Temperature< Output of the measured medium temperature.

>Constant current< The analog output can be set to output a constant current which is independent from any readings.
After choosing the function a new window comes up in order to enter the analog output details.
In case of flow, velocity or temperature these details include output range, value at 0/4 as well as 20mA and the >error mode<
(Fig. 29-10/1).
For constant current enter the desired initial current (Fig. 29-10/2).

Fig. 29-10 Function – Constant current

The following menu points will not be indicated on the display before the analog output has been enabled for output of flow, velocity or temperature readings.

>Output span< Possible output span 4-20 mA or 0-20 mA.

>Value at 4mA< Input of measurement values at 4 mA. Negative values can be entered as well.
Example: A measurement place is partially tending to backwater formation. Negative values shall be recorded as well, the following recording or process conducting system however has only one analog input left available. In this case the analog output signal is set to have a “floating” behaviour.
This means that flow = 0 is going to output a mA signal in the middle of the measurement span.
4 mA = -100 l/s
20 mA = 100 l/s
In this case the signal output is 12 mA if flow = 0. Backwater will cause the analog signal to decrease, positive flow will cause the signal to increase.

>Value at 20mA< Enter the measurement value at 20 mA.

>Error mode< Options: active/not active.
If this mode has been unlocked by setting to “active” two other points will be added to Fig. 29-10/1.

>Error input mask< Tick the box of the elements to check: sensor, sensor status, temperature and battery (Fig. 29-11/1).
Select the desired function with the >up< or >down< arrow keys and confirm with ENTER. The function checkbox is ticked after confirmation.
Pressing ENTER once again will de-select the function. Use ESC to exit.
All errors are written into the error memory (see “27 Operation Mode (RUN)” / “Error message“).

>Value at errors< This parameter is to define the desired analog output condition if an error should occur.
The following functions are available (Fig. 29-11/2):
- hold old value
- constant 0,0 mA
- constant 3,5 mA
- constant 4,0 mA
- constant 21,0 mA

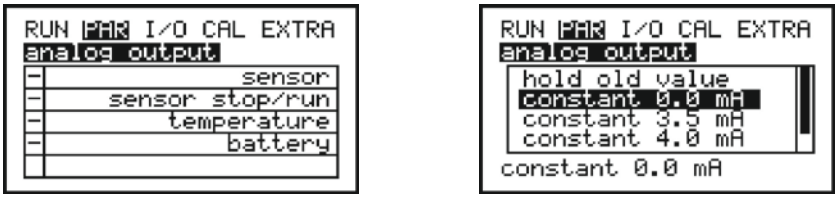


Fig. 29-11 Programming error output

29.5 Parameter Menu “Relay”

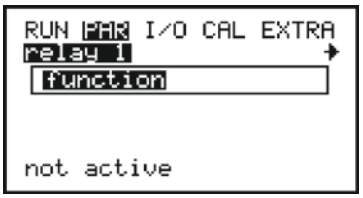


Fig. 29-12 Menu relay

This menu allows defining both functions as well as accompanying parameters (such as limit values, duration of impulse and more) of individual relay outputs. Select parameter “relay function” in order to indicate the available functions.

◄ ► Toggle between relays using the >left< and >right< arrow keys.

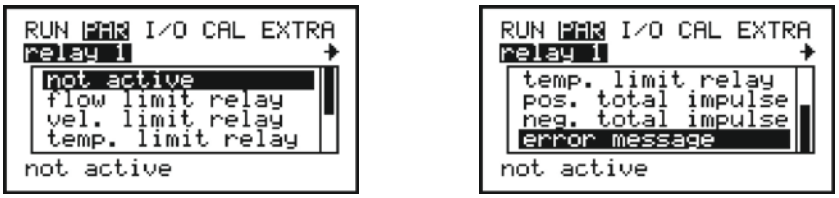


Fig. 29-13 Relay sub menu

Possible relay functions:

>Function< No relay function; default setting

>Flow limit relay< Relay will energise if a flow limit value (to be set) has been exceeded and will de-energise if flow falls below a second limit value (to be set).

>Relay mode< It is possible to select between >normally open< and >normally closed<. The relay is going to energise if >normally open< has been selected and the according value has been reached, if >normally close< has been selected the relay will energise immediately after the parameter has been set and will de-energise as soon as the according value has been reached.

>ON point<	Defines the “ON” point for the selected limit value.
>OFF point<	Defines the “OFF” point for the selected limit value.
>ON delay<	The “ON” event in case of reaching the limit value can be delayed by up to 9999 seconds max. The relay will not energise before the time set is expired and the limit value is present yet. If the value falls below the limit threshold for a moment the cycle will begin anew.
>OFF delay<	The “OFF” event in case of reaching the limit value can be delayed by up to 9999 seconds max. The relay will not de-energise before the time set is expired and the limit value is present yet. If the value falls below the limit threshold for a moment the cycle will begin anew.
>Name<	The relay output name may consist of four characters max. which will be indicated in main menu and in overview menu. Set the name as described in chapter “29.1 Parameter Menu “Measurement Place””.

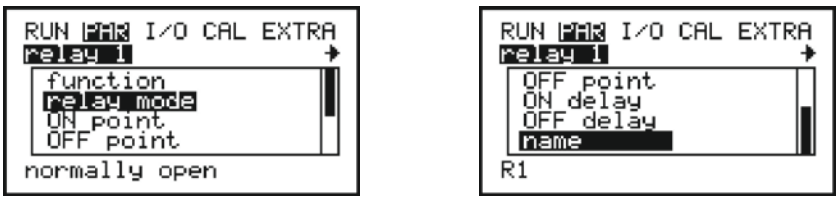


Fig. 29-14 Limits sub menu

>Vel. limit relay<	Relay will energise if a velocity limit value (to be set) has been exceeded and will de-energise if velocity falls below a second limit value to be set).
>Relay mode<, >ON point<, >OFF point<, >ON delay<, >OFF delay<, >Name<	See >Flow limit relay<
>Temp. limit relay<	Relay will energise if a medium temperature limit value (to be set) has been exceeded and will de-energise if the Medium temperature falls below a second limit value.
>Relay mode<, >ON point<, >OFF point<,	See >Flow limit relay<

>ON delay<, >OFF delay<, >Name<

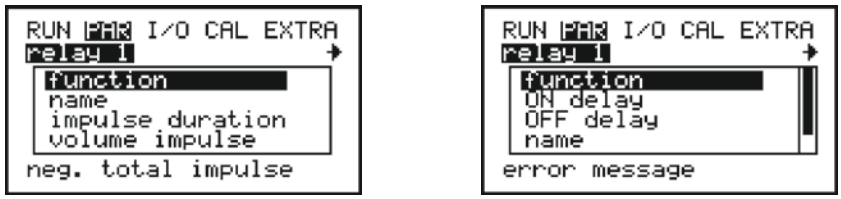


Fig. 29-15 Sub menu impulse and error message

>Pos. total impulse< Relay will output volume-proportional impulses if the flow direction is positive. Weighting and impulse duration are free programmable.

>Name< The relay output name may consist of four characters max. which will be indicated in main menu and in overview menu. Set the name as described in chapter “29.1 Parameter Menu “Measurement Place””.

>Impulse duration< The impulse duration can be adjusted between 0.1 seconds and 1.0 seconds. The impulse-pause ratio here is 1:1.
Default setting: 0.5 seconds

>Volume impulse< Defines the impulse value. The measured volume will be added internally until the value set has been reached. Then an impulse signal with the duration set will be output and the internal counter will be set to 0 again. The course of events will repeat again subsequently.

>Neg. total impulse< Relay will output volume-proportional impulses if the flow direction is negative (= backwater). Weighting and impulse duration are free programmable.

>Name<, >Impulse duration<, >Volume impulse< See >Pos. total impulse<

>Error message< Relay will energise in case of error messages. After activation several points can be chosen.

>Error input mask< Tick the box of the elements to check: sensor, sensor status, temperature and battery (similar to analog outputs parameter menu). Select the desired function with the >up< or >down< arrow keys and confirm with ENTER. The function checkbox is ticked after confirmation.
Pressing ENTER once again will de-select

	the function. Use ESC to exit. All errors are written into the error memory (see “27 Operation Mode (RUN)” / “Error message”).
>ON delay<	The “ON” event in case of reaching the limit value can be delayed by up to 9999 seconds max. The relay will not energise before the time set is expired and the limit value is present yet. If the value falls below the limit threshold for a moment the cycle will begin anew.
>OFF delay<	The “OFF” event in case of reaching the limit value can be delayed by up to 9999 seconds max. The relay will not de-energise before the time set is expired and the limit value is present yet. If the value falls below the limit threshold for a moment the cycle will begin anew.
>Name<	The relay output name may consist of four characters max. which will be indicated in main menu and in overview menu. Set the name as described in chapter “29.1 Parameter Menu “Measurement Place””.

29.6 Parameter Menu “Settings”

CAUTION

Data loss due to system reset

A system reset will reset the system to its basic parameter settings. The default parameters will be loaded and all customer settings as well as all counters will be reset (general system reset).

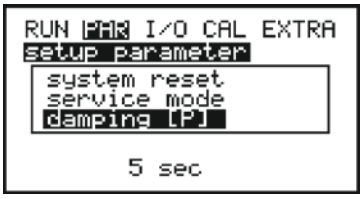


Fig. 29-16 Settings sub menu

This menu allows resetting the system to default condition, to modify special settings by using the service code as well as to modify measurement and output damping.

>System reset< Enables a general reset of the measurement transmitter. Entering the system PIN “2718” will cause the transmitter to execute a general reset. The unit will be in initialising mode subsequently which requires the operation language to be set.
The transmitter will now overwrite the flash memory restarting the program. Displays and settings are the same as with initial start-up (see chapter “26 Basics of Parameter Setting”).

>Service mode< Additional system setting options are going to be revealed as soon as a special code has been entered.
These settings are reserved to be used by the NIVUS initial start-up service as these modifications require comprehensive expert knowledge and do not need to be adjusted during standard use.

>Damping [P]< This menu point is to adjust the damping of display and analog output between 2…600 seconds. This means that output and display require the time to set to indicate a jump of the calculated volume from 0 % to 100 %.

29.7 Parameter menu “Storage mode”

This menu permits to modify the storage cycle and various format settings.

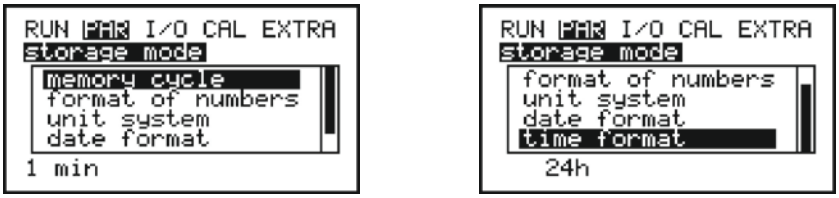


Fig. 29-17 Parameter menu “Storage mode”

>Memory cycle< Selectable options for the storage cycle are 1, 2, 3, 5, 10, 15, 20, 30 minutes or 1 hour.
Default setting: 1 minute

>Format of numbers< Use of comma or dot (XX.YYY or XX,YYY) for data storage.
Default setting: XX,YYY

>Unit system< Define the units/unit system used for data storage (metric, UK-english or US-english).
Default setting: metric

>Date format< Define the date format for data storage (TT.MM.YYYY or TT/MM/YYYY or MM/TT/YYYY).
Default setting: TT.MM.YYYY

>Time format< Define the time format for data storage (24h or 12h).
Default setting: 24h

30 Signal Input/Output Menu (I/O)

This menu includes several submenus which both serve to assess and to check sensors as well as to control signal inputs and outputs. It allows to indicate various values (current values of inputs and outputs, relay conditions, echo profiles, individual velocities etc.), however does not enable to influence signals or conditions (offset, adjustment, simulation or similar). The menu therefore primarily serves in order to assess the parameter settings and for error diagnosis.

Indication of all theoretically possible inputs and outputs

The menu basically allows indicating any input and output theoretically possible even if it might not be connected or available.

This menu is not capable of detecting defects on relay or D/A-converter but only indicates the peripheral control signals.

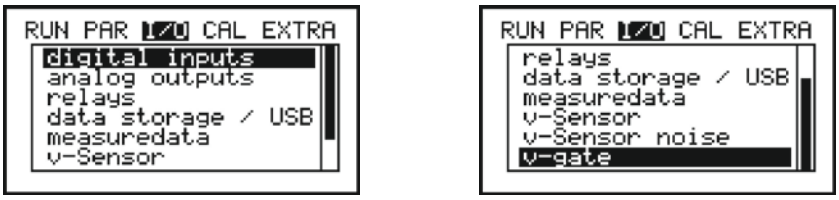


Fig. 30-1 I/O sub menu

30.1 I/O sub menu “Digital Inputs”

This menu enables to view the digital status of the transmitter’s input terminal. It is distinguished between logical “OFF” and “ON”.

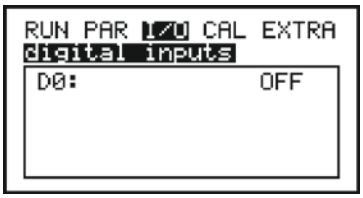


Fig. 30-2 Indication of digital input status

30.2 I/O sub menu “Analog Outputs”

This menu shows the values to be issued on the D/A-converter calculated by the transmitter as mA-signal.

Fig. 30-3 Indication of values on analog outputs

Observe the signal display

The currents actually present on the output terminals are not shown here. Only the signal received by the D/A-converter for output is indicated here.

This menu cannot be used to detect and to view external incorrect connections.

30.3 I/O sub menu “Relay”

This submenu indicates the conditions calculated by the transmitter to be sent to the relay. It is distinguished between logical “OFF” and “ON”.

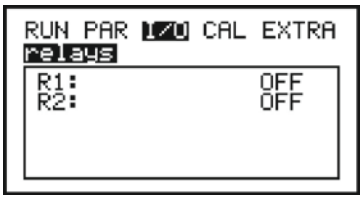


Fig. 30-4 Indication of relay output status

Observe the signal display

The actual output conditions of the relay contact on the output terminals are not shown here. Only the signals received by the relays for output are indicated here.

This menu cannot be used to detect and to view external incorrect connections.

30.4 I/O sub menu “Data storage / USB”

The >Data storage / USB< menu allows access to all measurement values saved internally.

Fig. 30-5 Sub menu Data storage / USB

>Info< Number of measurement data sets including the recording time.

>Erase< You can erase the complete internal data memory. The memory is password-protected to avoid unintentional deletion.

>USB stick< Transmission of measurement data to USB stick;
Instrument parameters can be saved to USB stick;
Saved parameter can be restored from USB stick back to the instrument;

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

Working with USB stick:
Plug the USB stick into the USB slot located next to the keypad.

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

>Store NivuSoft< **>All<**
All readings saved in the internal memory are transmitted to USB stick in txt-format. The readings can be easily imported into NivuSoft using the “Quick Import” function.

>New only<
Only readings saved after the time of the last data readout are transmitted to USB stick in txt-format. The readings can be easily imported into NivuSoft using the “Quick Import” function.

>Store CSV< **>All<**
All readings saved in the internal memory are transmitted to USB stick in csv-format. The measurement data can be easily opened and processed using Excel.

File name: DTA_DATE_TIME.txt

>New only<

Only readings saved after the time of the last data readout are transmitted to USB stick in csv-format. The measurement data can be easily opened and processed using Excel.
File name: DTA_DATE_TIME.csv

>Save parameter< **>All<**

The complete current parameter set of the transmitter is transmitted to USB stick.
File name: PAR_DATE_TIME.csv

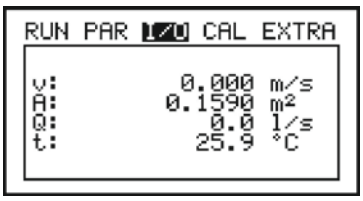
>Changed only<

Only modified (= other than the default settings) parameters are transmitted to USB stick.
File name:
CHGPARAM_DATE_TIME.csv

>Load parameter< All parameter files on the USB stick are shown. The file chosen using ENTER will be loaded to the transmitter.

30.5 I/O sub menu “Measuredata”

This menu can be used to view the currently measured and calculated measurement data at one sight.



v = measured flow velocity

A = calculated area

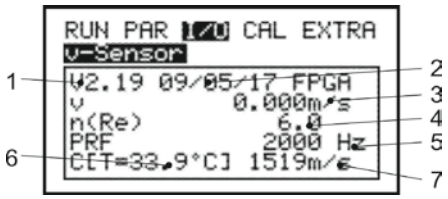
Q = calculated flow rate

t = measured temperature

Fig. 30-6 Indication of measurement date

30.6 I/O sub menu “v-Sensor”

This screen indicates sensor number and software version, measured velocity, investigated Reynolds correction, transmitting frequencies and velocity of sound.
This is primarily for service purposes.



1 Software version of sensor
2 Creation date of sensor software
3 Calculated average velocity
4 Exponent of Reynolds function
5 Impulse repeat frequency
6 Measured medium temperature
7 Velocity of sound resulting from medium temperature

Fig. 30-7 v-Sensor

◄ ► Use >left< and >right< arrow keys to browse through more screens.

The velocity graph represents the velocity distribution of individual gates within the pipeline. This graph enables to assess the prevailing hydraulic conditions.

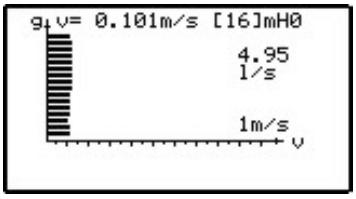


Fig. 30-8 Velocity graph

The velocity distribution diagram combines all measured flow velocities in all gates and represents their distribution within frequency groups.
The shape of this distribution may provide information on asymmetric hydraulic conditions, vorticity or similar.

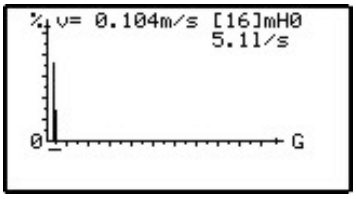


Fig. 30-9 Velocity distribution diagram

The last screen provides information on amplification, cable noise and various evaluation results between transmitter and sensor.

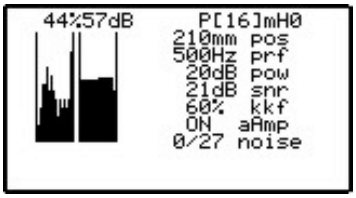


Fig. 30-10 System info screen

30.7 I/O sub menu “v-Sensor noise”

This screen helps the NIVUS commissioning service to gain information on possible electric disturbances or interferences between sensor and transmitter.
Normally the average value >Sens[mean]< should be 12…24 dB slightly higher. The peak value >Sens[max.]< should not exceed 25…40 dB significantly.

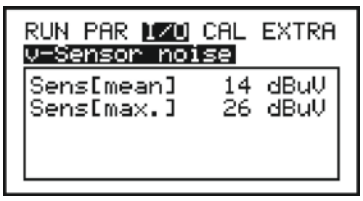


Fig. 30-11 Sensor noise

In the event of higher values check the layout of the sensor cable as well as the transmitter earthing.

30.8 I/O sub menu “v-Gate”

Tables showing individual velocities in the calculated positions/gates (centre of gate) referred to pipe wall as well as the individual velocity measured within the 16 gates.
The screen is divided into four pages.

▲ ▼ Browse through the pages using the arrow keys >up< and >down<.

1 Gate number
2 Gate position
3 Velocity measured within the gate

Fig. 30-12 Table of velocity distribution

31 Calibration and Calculation Menu (CAL)

This menu permits to adjust the level measurement, to adapt flow velocity and analog outputs to the following system as well as to simulate relay switching actions and analog outputs.

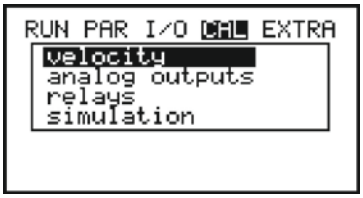


Fig. 31-1 CAL Menu selection

31.1 CAL Menu “Velocity”

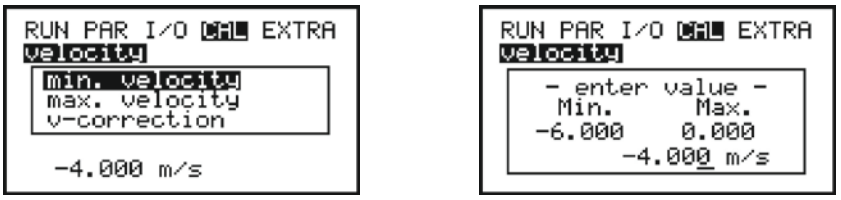


Fig. 31-2 Submenu flow velocity and value settings

>min. velocity< Defines the minimum flow velocity range measured and evaluated by the transmitter.
Default setting: 1 m/s
The minimum velocity can be set to “0” as soon as it is not desired to measure the negative flow direction.

>max. velocity< Defines the maximum flow velocity range measured and evaluated by the transmitter.
Default setting: 6 m/s

Positive and negative velocities are not measured

*If the **maximum** value is set to **“0”** it is not possible to measure and to issue the positive velocity!*

*If the **minimum** value is set to “**0”** it is not possible to measure and to issue the negative velocity!*

>v-correction< Here it is possible to add a factor to measured and calculated flow velocity values. Normally it is not necessary to use this parameter since the NFP calculation functions have been optimised regarding full pipes and flow velocity detection using the cross correlation method does not require any calibration as long as physical conditions are sufficient.

31.2 CAL Menu “Analog Outputs”

31.2.1 Basic Information on Simulation

DANGER

High risk of danger during simulation conditions

NIVUS herewith in advance refuse responsibility for any possible damage to persons or objects at any extent due to the extremely high risk of danger (direct access to following facility sections) and unforeseeable consequences in case of incorrect or faulty simulation.

Simulations shall be carried out exclusively by trained expert personnel.

>Calibration<

The three analog outputs can be adjusted to following systems within a range of -4…+4 mA (Fig. 31-3).
These values will be added or subtracted to/from the analog outputs.
Adjustment is not possible as soon as the analog output is set to “Constant Current”.
It is necessary to enter the system PIN.

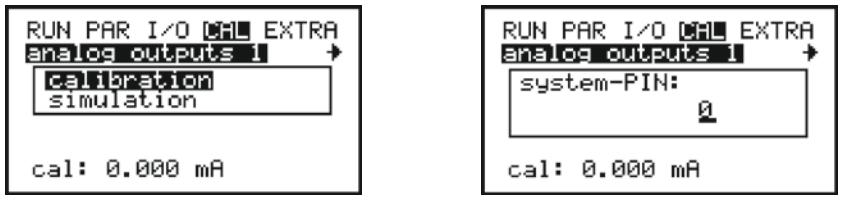


Fig. 31-3 Calibration of analog outputs

DANGER

Personal injury or property damage

The simulation of NFP outputs will access any following facility areas without any safety locking measures!
Simulations may only be carried out by NIVUS expert personnel or by specialist companies trained by NIVUS in cooperation with qualified operator personnel.

Always pay attention to safety.

It is absolutely necessary to have a safety person available!

The simulation of analog inputs and outputs is allowed to be carried out by specialist electricians only who have sound knowledge on the control system of the facility. This requires detailed preparation.

The following system must be set to manual operation mode. Actuators or similar have to be disabled if possible or have to be functionally restricted in a way not to cause any damage.

>Simulation<

It is possible to simulate a freely adjustable analog output current for the three analog outputs. Choose the desired analog output by using the >right< or >left< arrow keys.
In case of output current simulation it is possible to increase or decrease the mA value in steps of 0.01 mA by pressing arrow keys

>up< and >down< after the PIN code “2718” (safety function) has been entered. Furthermore it is possible to directly enter the desired simulation value by pressing ENTER. A maximum output current of 21 mA can be simulated (see Fig. 31-4/2).

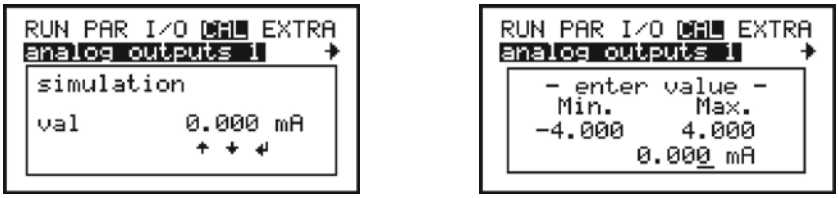


Fig. 31-4 Simulation of analog outputs

31.3 CAL Menu “Relays”

>Relays<

Selecting the >Relay Outputs< option requires to enter the system PIN once again to make sure that simulations can be carried out by authorised personnel only.
Select the desired relays to simulate by using the >up< or >down< arrow keys. Use ENTER to directly energise or de-energise the chosen relay. Energised relays will de-energise as soon as you exit the menu.

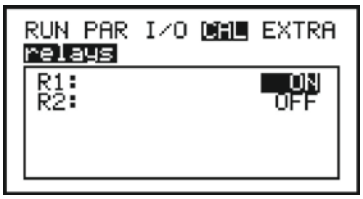
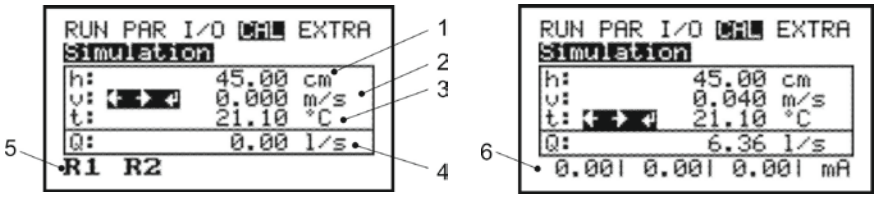


Fig. 31-5 Relay simulation

31.4 CAL Menu “Simulation”

>Simulation<

Simulation of measurement.
After entering the PIN code select between level, velocity and medium temperature by using the arrow keys >up< and >down<. Pressing the arrow keys >left< or >right< will increase or decrease the simulated flow velocity, level or temperature value in steps of 1 cm or 0.1 °C.
Using ENTER enables to enter the desired simulation value directly.
The flow value which has been calculated by means of the simulated readings will be indicated on the bottom line of the screen. Relays which might have been set will switch and programmed mA outputs supply according current values simultaneously.
In position “h” use the >up< and in position “t” use the >down< arrow key to toggle between the relay status and the analog output signals on the bottom line of the screen.



1 Simulated height
2 Simulated flow velocity
3 Simulated medium temperature
4 Calculated simulated flow value
5 Programmed relay activated by simulation
6 Analog output-signals (2nd display page; choose by pressing >down< repeatedly)

Fig. 31-6 Simulation mode

Parameter Tree / Menus available

Operation mode (RUN)					Default settings
RUN	Day values	Info			
		Cycle			
		Erase counter			
	Error message				

Parameter menu (PAR)					Default settings
PAR	Measure-ment Place	Name			NIVUS
		Diameter			0,45
		Qmin			0
		Operation mode	Cyclic (pump)		x
			Cont. opera-tion		
	Velocity	Install. Direc-tion			Positive
	Digital inputs	Function	Not active		x
			Stop v measure-ment		
			Measure-ment ctrl.		
			Logic	Not inverted	X
				Inverted	
		Value at 20mA			
		Error mode	Not active		x
			Active		

PAR	Relay	No function			
		Flow limit relay	Relay mode	Normally open	x
				Normally closed	
			ON point		
			OFF point		
			ON delay		0
			OFF delay		0
			Name		R1
		Vel. limit relay	Relay mode	Normally open	x
				Normally closed	
			ON point		
			OFF point		
			ON delay		0
			OFF delay		0
			Name		R1
		Temp. limit relay	Relay mode	Normally open	x
				Normally closed	
			ON point		
			OFF point		
			ON delay		0
			OFF delay		0
			Name		R1
		Pos. total impulse	Relay mode	Normally open	X
				Normally closed	
			ON point		
			OFF point		
			ON delay		0
			OFF delay		0
			Name		R1
			Impulse duration		5
			Volume impulse		1

PAR	Relay	Neg. total impulse	Relay mode	Normally open	X
				Normally closed	
			ON point		
			OFF point		
			ON delay		0
			OFF delay		0
			Name		R1
			Impulse duration		5
			Volume impulse		1
		Error message	Relay mode	Normally open	X
				Normally closed	
			ON point		
			OFF point		
			ON delay		0
			OFF delay		0
			Name		R1
	Setup pa-rameter	System-reset			
		Service mode			
		Damping [P/K]			20
	Storage mode	Memory cycle			1 min
		Format of numbers			,
		Unit systems			Metric
		Date format			TT/MM/JJJJ
		Time format			24

Signal In-/Output menu (I/O)					Default settings
I/O	Digital Inputs				
	Analog Out-puts				
	Relays				
	Data storage / USB	Info			
		Erase			
		USB-Stick	Store NivuSoft		
			Store CSV		
			Save parameter		
			Load parameter		
	Measure data				
	v-Sensor				
	v-Sensor noise				
	v-Gate				

Calibration menu (CAL)					Default settings
CAL	Velocity	Min. velocity			-1,0000
		Max. velocity			4,0000
		v-correction			1,0000
	Analog out-puts	Calibration			
		Simulation			0
	Relays				
	Simulation				

Display menu (EXTRA)					Default settings
Extra	Info (1-4)	Info 1			
		Info 2			
		Info 3			
		Info 4			
	Unit system	Metric			x
		UK-english			
		US-english			
	Units	Flow rate			
		Veloc.			
		Total			
	Display format	Flow rate			
		Veloc.			
		Total			
	Language	Deutsch			x
		English			
		Francais			
		Polski			
	Display	Contrast			50 %
	System time	Info			
		Set date			
		Set time			
		Date format			TT.MM.JJJJ
		Time format			24
	Modif. Total-izer				0
	Modify PIN	System-PIN			2718
		Service-code			
		Reset all pins			

Troubleshooting

Error	Possible Reason	Correction
No indication of flow (>0< resp. >----<)	Connection	Check connection between sensor cable and terminal strip; Check complete cable incl. possible clamp connections and overvoltage protection elements for breaks, short-circuits or too high resistances; Sensor connection cable connected to correct terminal strip (Ex or non-Ex)?
	Sensor	Sensor alignment facing the flow direction, check correct installation depth and horizontal installation.
		Check sensor for soiling, sedimentation, silting (→ to be removed) or mechanical damage or sensor body and cable (→ replace sensor).
	Transmitter	Call up error memory. Take appropriate measures depending on error message (check cables and clamp connections, check sensor installation) or call NIVUS service personnel.
	Negative flow direction	Check sensor installation direction, rotate sensor if required. If measurement fails only with the flow direction reverted → go to CAL-Flow Velocity – min. + max. value: set min value to -6.0 m/s.
	Programming	Completely check the transmitter parameter settings.
No screen (black / flickering)	Connection	Check power supply connection.
	Power supply	Check power supply voltage.
		Check switch position on connection board.
		Compare power supply (AC or DC) with transmitter type (see Table 3).
Display >Error Sensor<	Connection	Check cable connection. Wiring on terminal strip switched? Cables firmly connected to plugs (re-tighten screws, pull at cable ends)? Insulation of single wires unintentionally clamped in?
	Communication	Communication to sensor disturbed. Can be checked by selecting Menu >I/O/v-Sensor<. Sensors should be indicated in the first line of the following screen. Check cable connection. Wiring on terminal strip switched? Cables firmly connected to plugs (re-tighten screws, pull at cable ends)? Insulation of single wires unintentionally clamped in?

Error	Possible Reason	Correction
Unstable measurement values	Hydraulically unsuitable measurement place	Check quality of measurement place by using the graphic flow profile display. Relocate the sensor to a hydraulically more suitable place (extend calming section).
		Remove soiling, sedimentation or obstructive constructions in front of the sensor.
		Straighten the flow profile by installing appropriate baffle plates and calming elements, flow straighteners or similar upstream of measurement.
		Increase damping
	Sensor	Check sensor position (towards flow direction, horizontal installation) and correct installation depth.
		Check sensor for sedimentation or obstructions.
Implausible measurement values	Hydraulically unsuitable measurement place	See Error: “Unstable measurement values”.
	Sensor	Check for correct connection.
		Check if cables are crushed / for extensions/cable types, short circuits, surge arresters or improper resistive loads.
		Check echo profile, flow velocity signal, cable parameters and temperature in I/O menu.
		Check if sensor is installed on a vibration-free place. Check sensor position (towards flow direction, horizontal installation) and installation depth, check sensor for soiling.
	Programming	Check dimensions (observe units), programmed application, operation mode, entered flow velocity limits etc. Diameter set correctly (please observe accurate value)? Tip: DN values rarely match actual diameters
Faulty relay output	Connection	Check connections on terminal clamp strip.
		Check power supply of external control relays.
		In I/O menu check signals to be output.
		Check output control function in calibration menu.
	Programming	Check if relay outputs are enabled.
		Check if outputs are correctly assigned to respective output channels.
		Check additional values such as impulse parameters, limit values, logic etc.
Faulty mA output	Connection	Check connection clamps for correct wiring and polarity.

Error	Possible Reason	Correction
		In case of using one or several outputs: check following systems/indicators if they are potential-free. Two analog outputs at a time have a common ground.
	Programming	Output enabled?
		Check if functions have been assigned to correct output channel.
		Check output range (0 or 4…20 mA)
		Check output span
		Check offset
		Check output signal in I/O menu
	Following systems	Check cables and connections, overvoltage protection elements as well as input and output clamps.
		Check input range (0 or 4…20 mA) of following system.
		Check input span of following system.
		Check possible offset of following system.
Real time clock shows incorrect time	Buffer battery empty	Let NIVUS replace the built-in buffer battery. Attention: replacement must be carried out only by NIVUS or personnel authorised by NIVUS. Otherwise the warranty will expire.
Parameter memory shows no parameters	Buffer battery empty	Let NIVUS replace the built-in buffer battery. Attention: replacement must be carried out only by NIVUS or personnel authorised by NIVUS. Otherwise the warranty will expire.

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

Contamination by hazardous germs

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.

32 Maintenance

32.1 Maintenance interval

The transmitters are conceived to be virtually free of calibration, maintenance and wear (requirements of the Industrial Safety Regulations are unaffected).
NIVUS recommends having 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
- Fluid and channel hydraulics
- General regulations for the operators of the measurement facility
- Ambient conditions

NIVUS recommends having the measurement system completely be inspected by the manufacturer after latest ten years.
Generally the verification of instruments and sensors is a basic measure in order to improve operational reliability and to increase the lifetime.

32.2 Customer Service Information

For the recommended annual inspection of the entire measurement system and/or the extensive inspection after latest ten years contact our customer service:

NIVUS GmbH - Customer Service

Phone +49 (0) 7262 9191 - 922
Kundencenter@nivus.com

33 Cleaning

33.1 Transmitter

WARNING

Disconnect instrument from mains

Disconnect the instrument from mains power before cleaning.
Disregarding may lead to electric shocks.

The transmitters are conceived to be virtually free of calibration, maintenance and wear (requirements of the Industrial Safety Regulations are unaffected).
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.

33.2 Sensors

The hints on how to maintain and clean the sensors shall be necessarily observed. These hints can be found in the Technical Instruction and/or the Instructor Manual.
This (these) document(s) is (are) part of the standard sensor delivery.

34 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:

1. Disconnect the unit from mains power.
2. Use appropriate tools to remove the connected cables from the faceplate of the instrument.
3. Remove the transmitter from the DIN rail.
4. Remove the backup battery and make sure that the backup battery will be disposed of separately.

EC WEEE-Directive logo

This symbol indicates that the Directive 2012/19/EG on waste electrical and electronic equipment requirements shall be observed on the disposal of the equipment. The unit contains a buffer battery (Lithium coin cell), which must be disposed separately.

35 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 in chapter “36 Accessories” and/or in the valid price list.

36 Accessories

Mounting stand *ZMS0 151*	Mounting stand 1½", material: 1.4301 (V2A), height 1700 mm, incl. base plate and fastening tube
Assembly plate *ZMS0 161*	Assembly plate, for mounting stand ZMS 151, material: 1.4301 (V2A), for OCM Pro, NivuSonic, NivuChannel, OCM F, NFP, NivuMaster in wall mount enclosure, incl. fastening material
Weather protective roof for assembly plate *ZMS0 180*	Weather protective roof for assembly plate ZMS 160, incl. fastening material Plain model for Types NivuMaster, NFP, OCM F and NivuCont Plus material: 1.4301 (V2A)
Stop ball valve *ZUB0 HAHNR15*	For removal of pipe sensors from pipes without pressure
Tapping saddle *ZUB0 ABS01…* *ZUB0 ABS02…* *ZUB0 ABS03…*	For installation of 1½“ pipe sensors in pipe lines
Welding nozzle *ZUB0 STU15…*	For pipe sensors; material: steel or stainless steel

You can find more accessories in the valid NIVUS price list.

Index

Approvals and certificates

IBExU Institut für Sicherheitstechnik GmbH
An-Institut der TU Bergakademie Freiberg

[1] **EU-TYPE EXAMINATION CERTIFICATE** - Translation

[2] Equipment or protective systems
intended for use in potentially explosive atmospheres, Directive 2014/34/EU

[3] EU-type examination certificate number **IBExU07ATEX1081** | Issue 1

[4] Product: **Permanent flow measurement transmitter**
Types: OCM F, OCM FR, OCM FM, NFP und NivuLevel 350

[5] Manufacturer: NIVUS GmbH

[6] Address: Im Täle 2
75031 Eppingen
GERMANY

[7] This product and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

[8] IBExU Institut für Sicherheitstechnik GmbH, notified body number 0637 in accordance with Article 17 of Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the essential health and safety requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in the confidential test report IB-17-3-0089 of Oct, 16th 2017.

[9] Compliance with the essential health and safety requirements has been assured by compliance with:
EN 60079-0:2012+A11:2013 EN 60079-11:2012
except in respect of those requirements listed at item [18] of the schedule.

[10] If the sign "X" is placed after the certificate number, it indicates that the product is subject to the specific conditions of use specified in the schedule to this certificate.

[11] This EU-type examination certificate relates only to the design and construction of the specified product. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.

[12] The marking of the product shall include the following:

Ex II(2)G [Ex ib Gb] IIB

IBExU Institut für Sicherheitstechnik GmbH
Fuchsmühlenweg 7
09599 Freiberg, GERMANY

Tel: + 49 (0) 37 31 / 38 05 0
Fax: + 49 (0) 37 31 / 38 05 10

By order

Dipl.-Ing. [FH] Henker

- Seal -
(notified body number 0637)

Certificates without signature and seal are not valid. Certificates may only be duplicated completely and unchanged. In case of dispute, the German text shall prevail.

Freiberg, 2017-11-14

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IBExU Institut für Sicherheitstechnik GmbH
An-Institut der TU Bergakademie Freiberg

[13] **Schedule**

[14] **Certificate number IBExU07ATEX1081** | Issue 1

[15] **Description of product**
The OCM F, OCM FR, OCM FM, NFP und NivuLevel 350 systems are different versions of stationary measuring systems for flow measurement and flow control. These devices are designed for use in the range of low to heavily polluted water-based liquids of different mixtures.

The permanent flow measurement transmitter is used as associated equipment in non-hazardous areas. It is used for galvanically isolated supply and signal transmission for 2-wire and flow sensors. The electronic components are located on a printed circuit board within a wall-/DIN-rail housing. The electrical connection is made using screw terminals and plug connectors. The device is equipped with LC display and membrane keyboard as well as USB-A interface for service purposes and data exchange.

technical data

operating temperature range:	-20 °C to +40 °C
Enclosure protection class:	IP65 (≥ IP54)
zone classification:	[Ex ib Gb]
gas explosion class:	IIB

electrical data

power supply circuits:	Terminal no. 4[DC+], 5[DC-] and 3[PE] U_N 20 - 28 VDC Terminal no. 1[L1], 2[N] and 3[PE] U_N 85 - 264 VAC P_N 18 W
signal circuits:	Terminal no. 6 to 45 U_N 24 VDC resp. IN 0/4 -20 mA U_N 250 VAC (relay)
rated voltage:	U_M 264 VAC
sensor circuits OCF	ignition protection type Ex ib IIB
2-wire sensors per channel	Terminal no. 46 - 49 and 55 - 58 U_O 26.1 V I_O 87.9 mA P_O 574 mW (linear characteristic) C_O 400 nF L_O 5 mH
Flow rate sensors (not for NivuLevel 350)	Terminal no. 50 - 54 and 59 - 63 U_O 9.9 V I_O 629 mA P_O 6.2 W (rectangular characteristic) C_O 5 µF L_O 0.15 mH
data circuits RS485 (not for NivuLevel 350)	galvanically connected to sensor circuit U_s 5 V
sensor circuits NFP	
Flow rate sensors POA V2 oder ähnlich	Terminal no. 50 - 52 and 59 - 61 U_O 9.9 V I_O 629 mA P_O 6.2 W (rectangular characteristic)

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	C_o 5 µF L_o 0.15 mH
Sensor communication interface with type of protection Ex ib IIB	Terminal no. 53 - 54 and 62 – 63 U_o 9.9 V I_o 130.3 mA P_o 322 mW ((linear characteristic) C_o 9.7 µF L_o 0.15 mH Ui 10.1 V Ii 136 mA The maximum values also apply to concentrated capacitance/inductors that can be switched on.

Variations compared to issue x of this certificate:

Variation 1
The two voltage limiting Z-diodes 1N5361D (D11, D12) were replaced by three SMD Z-diodes BZG05C8V2 each. The third Z-diode 1N5361D (D13) is no longer in use because it is not required for protection level "ib".

Variation 2
The CNY65 optocouplers (current interface) and the QEE122/QSE158 optocouplers (data interface) have been replaced by HCWN136 optocouplers. The circuit part for automatic data direction switching has been omitted.

Variation 3
The fuse F2 (63 mA) is replaced by a 50 mA type.

Variation 4
A partition wall area in the area of the connection terminals between Ex- and non-Ex-area has been inserted.

Variation 5
The type designation has been specified.

nomenclature: AAA-BB W0 vv E xxx	
AAA	3-digit product code OCF, NFP or N35
BB	Product variant (software and/or hardware): 02 - Standard R2 - Controller M2 - Alternative type designation 2s - Standard version with Specification of the instrument measuring range 2c – Device basic configuration Interfaces (variant specific full or partial assembly)
W0	wall-/DIN-rail housing
vv	AC or DC version
E	Ex - design
xxx	Not Ex-relevant, customer-specific versions, e.g. software adaptations

An article number with a 3-digit device key is used for identification on the nameplate:

Device type	Part number
OCM F	OCF-02 W0 vv E xxx
OCM FR	OCF-R2 W0 vv E xxx
OCM FM	OCF-M2 W0 vv E xxx
NFP	NFP-2s W0 vv E xxx
NivuLevel 350	N35-2c W0 vv E xxx

The associated equipment meets the requirements of the current standards.

[16] **Test report**
The test results are recorded in the confidential test report IB-17-3-0089 dated October, 16th 2017.

The test documents are part of the test report and they are listed there.

Summary of the test results
The permanent flow measurement transmitter meet all explosion protection requirements for a corresponding electrical equipment of device group II in device category 2G in ignition protection class "ib" intrinsically safe equipment of explosion group IIB.

[17] **Specific conditions of use**
None

[18] **Essential health and safety requirements**
In addition to the essential health and safety requirements (EHSRs) covered by the standards listed at item [9], the following are considered relevant to this product, and conformity is demonstrated in the test report: none

[19] **Drawings and Documents**
The documents are listed in the test report.

IBExU Institut für Sicherheitstechnik GmbH
Fuchsmühlenweg 7
09599 Freiberg, GERMANY

By order

Dipl.-Ing. [FH] Henker

Freiberg, 2017-11-14

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**
Description:	*permanent flow measurement transmitter*
Désignation:	*convertisseur de mesure de débit fixe*
Typ / Type:	**OCF-00… / OCF-R0... / NFP-…**

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 auf die nachfolgend genannten anderen technischen Spezifikationen:

The evaluation assessed the following applicable harmonised standards or the conformity is declared in relation to other technical specifications listed below:

L'évaluation est effectuée à partir des normes harmonisées applicable ou la conformité est déclarée en relation aux autres spécifications techniques désignées ci-dessous:

- EN 61326-1:2013
- EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019

Diese Erklärung wird verantwortlich für den Hersteller:

This declaration is submitted on behalf of the manufacturer:

Le fabricant assume la responsabilité de cette déclaration:

NIVUS GmbH
Im Taele 2
75031 Eppingen
Germany

abgegeben durch / *represented by / faite par:*

Ingrid Steppe (Geschäftsführerin / *Managing Director / Directeur général)*

Eppingen, den 25.10.2022

Gez. *Ingrid Steppe*

UK Declaration of Conformity

NIVUS GmbH
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75031 Eppingen

Telefon: +49 07262 9191-0
Telefax: +49 07262 9191-999
E-Mail: info@nivus.com
Internet: www.nivus.de

For the following product:

Description:	**Permanent flow measurement transmitter**
Type:	**OCF-00… / OCF-R0... / NFP-…**

we declare under our sole responsibility that the equipment made available on the UK market as of the date of signature of this document meets the standards of the following applicable UK harmonisation legislation:

- SI 2016 / 1091 The Electromagnetic Compatibility Regulations 2016
- SI 2016 / 1101 The Electrical Equipment (Safety) Regulations 2016
- SI 2012 / 3032 The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

The evaluation assessed the following applicable harmonised standards or the conformity is declared in relation to other technical specifications listed below:

- BS EN 61326-1:2013
- BS EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019

This declaration is submitted on behalf of the manufacturer:

NIVUS GmbH
Im Taele 2
75031 Eppingen
Germany

represented by:
Ingrid Steppe (Managing Director)

Eppingen, 25/10/2022

Signed by *Ingrid Steppe*

DE / EN / FR

EU Konformitätserklärung

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Déclaration de conformité UE

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Für das folgend bezeichnete Erzeugnis:

For the following product:

Le produit désigné ci-dessous:

Bezeichnung:	**"Ex" Durchflussmessumformer stationär OCM F / OCM FR / NFP**
Description:	*"Ex" permanent flow measurement transmitter*
Désignation:	*"Ex" convertisseur de mesure de débit fixe*
Typ / Type:	**OCF-02W0xxExxx / OCF-R2W0xxExxx / NFP-2xW0xxExxx**

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
- 2014/34/EU
- 2014/35/EU
- 2011/65/EU

Bei der Bewertung wurden folgende einschlägige harmonisierte Normen zugrunde gelegt bzw. wird die Konformität erklärt in Bezug auf die nachfolgend genannten anderen technischen Spezifikationen:

The evaluation assessed the following applicable harmonised standards or the conformity is declared in relation to other technical specifications listed below:

L'évaluation est effectuée à partir des normes harmonisées applicable ou la conformité est déclarée en relation aux autres spécifications techniques désignées ci-dessous:

- EN 61326-1:2013
- EN IEC 60079-0:2018
- EN 60079-11:2012
- EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019

Ex-Kennzeichnung */ Ex-designation / Marquage Ex* : II (2)G [Ex ib Gb] IIB

EU-Baumusterprüfbescheinigung / *EU-Type Examination Certificate / Attestation d'examen «UE» de type:*

IBExU 07 ATEX 1081 | Ausgabe 1

Notifizierte Stelle (Kennnummer) / *Notified Body (Identif. No.) / Organisme notifié (№ d'identification)*

IBExU Institut für Sicherheitstechnik GmbH, 09599 Freiberg, Germany (0637)

Qualitätssicherung ATEX / *Quality assurance ATEX / Assurance qualité ATEX:*

TÜV Nord CERT GmbH, Am TÜV 1, 45307 Essen, Germany (0044)

Diese Erklärung wird verantwortlich für den Hersteller:

This declaration is submitted on behalf of the manufacturer:

Le fabricant assume la responsabilité de cette déclaration:

NIVUS GmbH
Im Taele 2
75031 Eppingen
Germany

abgegeben durch / *represented by / faite par:*

Ingrid Steppe (Geschäftsführerin / *Managing Director / Directeur général)*

Eppingen, den 21.10.2022

Gez. *Ingrid Steppe*

UK Declaration of Conformity

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Telefax: +49 07262 9191-999
E-Mail: info@nivus.com
Internet: www.nivus.de

For the following product:

Description:	**“Ex” permanent flow measurement transmitter OCM F / OCM FR / NFP**
Type:	**OCF-02W0xxExxx / OCF-R2W0xxExxx / NFP-2xW0xxExxx**

we declare under our sole responsibility that the equipment made available on the UK market as of the date of signature of this document meets the standards of the following applicable UK harmonisation legislation:

- SI 2016 / 1091 The Electromagnetic Compatibility Regulations 2016
- SI 2016 / 1107 The Equipment and Protective Systems Intended for use in Potentially Explosive Atmospheres Regulations 2016
- SI 2016 / 1101 The Electrical Equipment (Safety) Regulations 2016
- SI 2012 / 3032 The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

The evaluation assessed the following applicable harmonised standards or the conformity is declared in relation to other technical specifications listed below:

- BS EN 61326-1:2013
- BS EN IEC 60079-0:2018
- BS EN 60079-11:2012
- BS EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019

Ex-designation: Ⓔx II (2)G [Ex ib Gb] IIB
EU-Type Examination Certificate: IBExU 07 ATEX 1081 Issue 1
Notified Body (Identif. No.):
IBExU Institut für Sicherheitstechnik GmbH, 09599 Freiberg, Germany (0637)
Quality Assurance Ex:
TÜV Nord CERT GmbH, Am TÜV 1, 45307 Essen, Germany (0044)

This declaration is submitted on behalf of the manufacturer:

NIVUS GmbH
Im Taele 2
75031 Eppingen
Germany

represented by:
Ingrid Steppe (Managing Director)

Eppingen, 21/10/2022

Signed by *Ingrid Steppe*