Instruction Manual for Measurement System NFP

(Original Instruction Manual – German)

valid as of Software Revision No. 1.52

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Translation

If the device is sold to a country in the European Economic Area (EEA) this instruction handbook must be translated into the language of the country in which the device is to be used.
Should the translated text be unclear, the original instruction handbook (German) must be consulted or the manufacturer contacted for clarification.

Copyright

Names

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

1 Contents

1.1 Table of Contents

2 Ex-Approval Transmitter

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

[1] **EC-TYPE EXAMINATION CERTIFICATE**
according to Directive 94/9/EC, Annex III

(Translation)

[2] Equipment and Protective Systems intended for use in Potentially Explosive Atmospheres, Directive 94/9/EC

[3] EC-Type Examination Certificate Number: **IBExU07ATEX1081**

[4] Equipment: Flow transducer type OCM F, OCM FR, OCM FM
NFP

[5] Manufacturer: NIVUS GmbH

[6] Address: Im Täle 2
75031 Eppingen
GERMANY

[7] The design of this equipment mentioned under [4] and any acceptable variation thereto are specified in the schedule to this EC-Type Examination Certificate.

[8] IBExU Institut für Sicherheitstechnik GmbH, NOTIFIED BODY number 0637 in accordance with article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment mentioned under [4] has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres given in Annex II to the Directive.
The test results are recorded in the test report IB-07-3-145/1 of 3rd July 2007.

[9] Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN 60079-0:2004 and EN 60079-11:2007.

[10] If the sign „X" is placed after the Certificate number, it indicates that the equipment is subject to special conditions for safe use specified under [17] in the schedule to this EC-Type Examination Certificate.

[11] This EC-Type Examination Certificate relates only to the design and construction of the specified equipment. If applicable, further requirements of this directive apply to the manufacture and supply of this equipment.

[12] The marking of the equipment mentioned under [4] shall include the following

Ex II (2)G [Ex ib] IIB

IBExU Institut für Sicherheitstechnik GmbH
Fuchsmühlenweg 7 - 09599 Freiberg, Germany
☎ +49 (0) 3731 3805-0 - 🖷 +49 (0) 3731 23650

Authorised for certifications
-Explosion protection-By order

By order

(Dr. Lösch)

Zertifizierungsstelle Explosionsschutz
IBExU
Institut für Sicherheits-technik GmbH
Kenn-Nr. 0637

- Seal -
(ID no. 0637)

Freiberg, 4th July 2007

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.

Schedule

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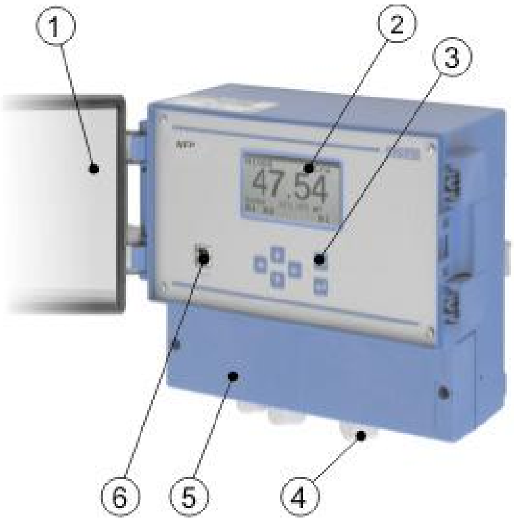
IBExU07ATEX1081

3 Overview and use in accordance with the requirements

3.1 Overview



1 Clear view door
2 Graphic display
3 Keypad
4 Cable Glands
5 Terminal Clamp Housing
6 USB-B Interface

Fig. 2-1 Overview

3.2 Use in accordance with the requirements

The measurement device type NIVUS Full Pipe (NFP) including the active pipe sensor is intended to be used for continuous flow measurement of slight to heavy polluted media in permanent full pipes.
Here the allowed maximum values, as specified in chapter 2.3 Specifications must be strictly kept. All cases which vary from these conditions and are not passed by NIVUS GmbH in writing are left at owner's risk.

The device is exclusively intended to be used for purposes as described above.
Modifying or using the devices for other purposes without the written consent of the manufacturer will not be considered as use in accordance with the re-quirements. Damages resulting from this are left at user's risk.

The device is designed for a lifetime of approx. 10 years. After that period an inspection in addition with a general overhaul has to be made.

The transmitter always has to be installed outside of Ex-zones!

Approval	Ex II(2)G [EEx ib] IIB
Sensor connections Clamps 50...54	ignition protection type intrinsically safe EEx ia IIB for connection of certified sensors only Type POA/... according to TÜV 03 ATEX 2262 Max. values per circuit: U_0 = 10,5 V I_0 = 640 mA rectangular characteristic Max outer inductivities allowed: 0,12 mH Max. outer capacities allowed: 4,8 µF

The intrinsically safe circuits are isolated galvanically safe from the remaining circuits up to a peak voltage value of 375 V.

3.3 Specifications

Power supply	100 to 240 V AC, +10 % / -15 %, 47 to 63 Hz or 24 V DC ±15 %, 5 % residual fluctuation
Power consumption	max. 18 VA, type 7 VA
Wall mount enclosure	- Material: Polycarbonate - Weight: approx. 1620 g - Protection: IP 65
Ex-Approval (optional)	II(2)G [EEx ib] IIB
Operating temperature	-20 °C to +60 °C (-4 °F to +140 °F) Ex: -20 °C to +40 °C (-4 °F to +104 °F)
Storage temperature	-30 °C to +70 °C (-22 °F to +158 °F)
Max. humidity	90 %, non-condensing
Display	Back-lit graphic display, 128 x 64 pixel
Operation	6 keys, menu driven in German, English and French
Inputs	- 1 x digital input - 1 active tube sensors connectable
Outputs	- 1/3 x 0/4–20 mA, load 500 Ohm, 12 bit resolution, accuracy better than 0.1 % (after calibration) - 2 switchable relays, loadable up to 230 V AC / 2 A (cos. φ 0.9)

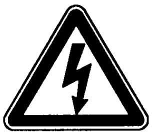
4 General Notes on Safety and Danger

4.1 Danger Notes

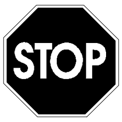
4.1.1 General Danger Signs

Cautions
are framed and labelled with a warning triangle.

Notes
are framed and labelled with a "hand".



Danger by electric voltage
is framed and labelled with the Symbol on the left.



Warnings
are framed and labelled with a "STOP"-sign.

For connection, initial start-up and operation of the NFP the following information and higher legal regulations (e.g. in Germany VDE), such as Ex-regulations as well as safety requirements and regulations in order to avoid accidents, must be observed.
All operations which go beyond steps to install, to connect or to program the device shall be carried out by NIVUS staff or authorised persons or companies only due to reasons of safety and guarantee.

4.1.2 Special Danger Notes

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

4.2 Device Identification

The instructions in this manual are valid only for the type of device indicated on the title page.
The nameplate is fixed on the bottom of the device and contains the following:

- Name and address of manufacturer
- CE label
- Type and serial number
- Year of manufacture
- Ex-label (on Ex-version devices only) as mentioned in chapter 2.2.

It is important for enquiries and replacement part orders to specify article number as well as serial number of the respective transmitter or sensor. This ensures correct and quick processing.

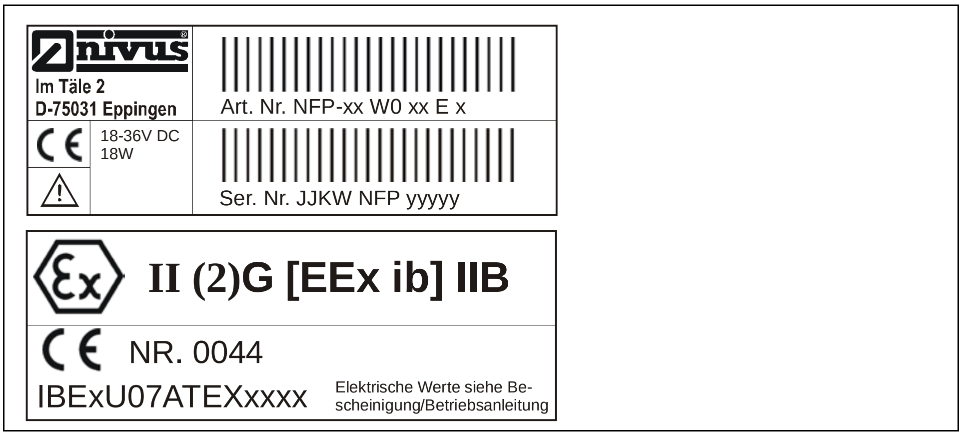


Fig. 3-1 NFP nameplate

This instruction manual is a part of the device and must be available for the user at any time.

The safety instructions contained within have to be observed.

For installation and operation of the entire system additionally please refer to technical instructions of correlation sensors and "Installation Instruction for Pipe and Wedge Sensors" besides this instruction manual.

It is strictly prohibited to disable the safety features or to modify their function.

4.3 Installation of Spare Parts and Parts subject to wear and tear

We herewith particularly emphasize that replacement parts or accessories, which are not supplied by us, are not certified by us, too. Hence, the installation and/or the use of such products may possibly be detrimental to the device's ability to work.
Damages caused by using non-original parts and non-original accessories are left at user's risk.

4.4 Turn-off Procedure

For maintenance, cleaning and repairs (authorised staff personnel only) the device shall be disconnected from mains and shall be prevented from being turned on again unintentionally.

4.5 User's Responsibilities

In the EEA (European Economic Area) national implementation of the framework directive 89/391/EEC and corresponding individual directives, in particular the directive 89/655/EEC concerning the minimum safety and health requirements for the use of work equipment by workers at work, as amended, are to be observed and adhered to.
In Germany the Industrial Safety Ordinance of October 2002 must be observed.

The customer must (where necessary) obtain any local **operating permits** required and observe the provisions contained therein.
In addition to this, he must observe local laws and regulations on

- personnel safety (accident prevention regulations)
- safety of work materials and tools (safety equipment and maintenance)
- disposal of products (laws on wastes)
- disposal of materials (laws on wastes)
- cleaning (cleansing agents and disposal)
- environmental protection

Connections:

Before operating the device the user has to ensure, that the local regulations (e.g. for operation in channels) on installation and initial start-up are taken into account, if this is both carried out by the user.

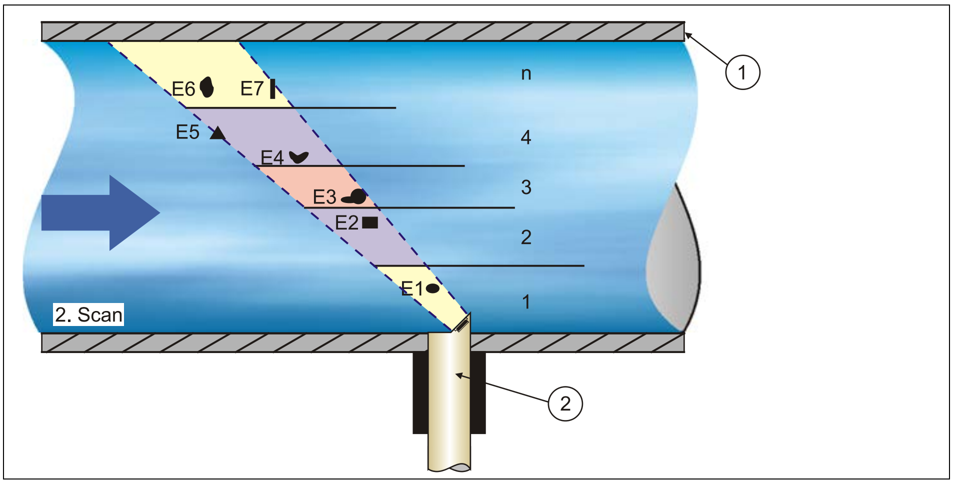
5 Functional Principle

5.1 General

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

The method of flow velocity investigation 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).

The piezo crystal, which has a slope towards the flow direction, 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. Depending on shape and size of the particle a particular signal results. Hence, the multitude of the reflected signals results in a reflection pattern (see Fig. 4-1). This signal pattern will be loaded into the active pipe sensor's built-in digital signal processor (DSP).



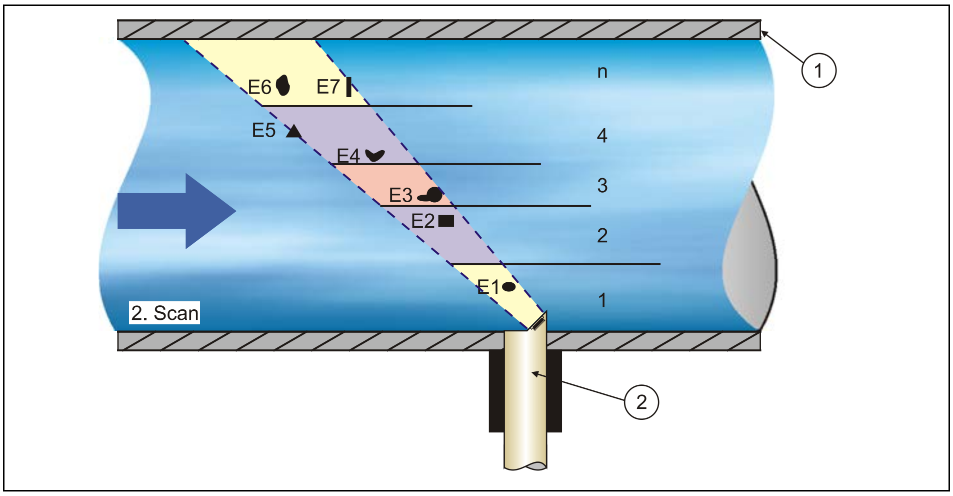
1	Pipe wall
2	Pipe sensor
E1 – E7	Reflecting particles
1, 2, 3, 4, n	Measurement window

Fig. 4-1 Situation at first signal detection

After a certain period a second ultrasonic burst is sent into the medium (see Fig. 4-2). 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. 4-4).

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. 4-3). 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. 4-2 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. 4-3).

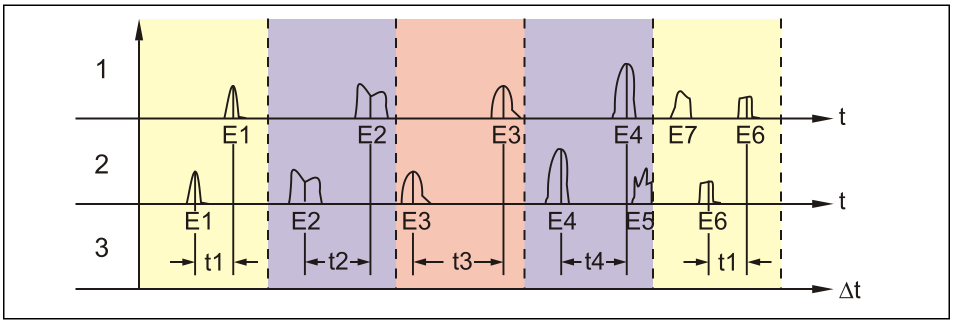


Fig. 4-3 Echo signal images and evaluation

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.

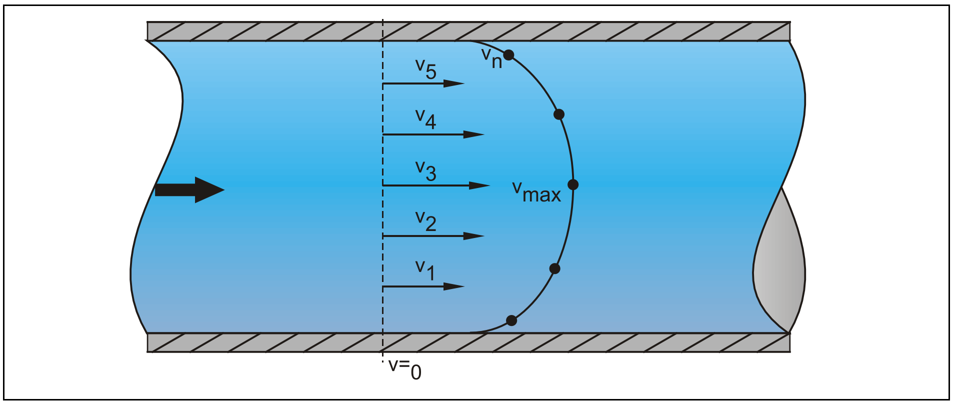


Fig. 4-4 Investigated flow profile

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.

5.2 Device Versions

The NFP transmitter as well as the accompanying flow velocity are 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**

- **05** Nominal diameter 100 - 500 mm
- **08** Nominal diameter 550 - 800 mm

Construction

- **W0** Wall mount enclosure IP65

Power Supply

- **AC** 115-230 V AC, 50-60 Hz
- **DC** 18-36 V DC

Approvals

- **0** none
- **E** ATEX approval

Extensions (Hardware)

- **1** 1 analog output
- **3** 3 analog outputs

NFP-					

Fig. 4-5 Type key for NFP measurement transmitter

6 Storing, Delivery and Transport

6.1 Receipt

Please check your delivery according to the delivery note for completeness and intactness immediately after receipt. Any damage in transit must be instantly reported to the carrier. An immediate, written report must be sent to NIVUS GmbH Eppingen as well.
Please report any delivery incompleteness in writing to your representative or directly to NIVUS Eppingen within two weeks.

Mistakes cannot be rectified later!

6.1.1 Delivery

The standard delivery of the NFP transmitter contains:

- the instruction manual with the certificate of conformity. Here, all necessary steps to correctly install and to operate the measurement system are listed.
- a NFP transmitter
- a 2.5 mm special screw driver to use the caged spring terminals in the connection compartment of the transmitter

Additional accessories such as sensors, welding nozzle, tapping saddle, ball stop valve, pipe sensor retaining element etc. depending on order. Please check by using delivery note.

6.2 Storing

The following storing conditions shall be strictly adhered to:

Transmitter:	max. temperature:	+ 70 °C (158 °F)
	min. temperature:	- 30 °C (-22 °F)
	max. humidity:	90 %, non-condensing

The devices must be protected from corrosive or organic solvent vapours, radioactive radiation as well as strong electromagnetic radiation.

6.3 Transport

The device is conceived for harsh industrial conditions. Despite this do not expose them to heavy shocks or vibrations.
Transportation must be carried out in the original packaging.

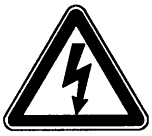
6.4 Return

The device must be returned at customer cost to NIVUS Eppingen in the original packaging.
Otherwise the return cannot be accepted!

7 Installation

7.1 General

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



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 V. 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 IP 65.
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.

7.2 Transmitter Installation and Connection

7.2.1 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: +40 °C (104 °F))
- objects with strong electromagnetic fields (e.g. frequency converters, electric motors with high power consumption or similar)
- corrosive chemicals or gas
- mechanical shocks
- installation close to footpaths or travel ways
- vibrations
- radioactive radiation

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 3 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 2 more screws from the terminal clamp housing.

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.

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

Cleaning of the front foil can be undertaken with spirit or if necessary with car polish. If this is not successful, a new front door can be ordered from NIVUS GmbH or your local representative.

7.2.2 Enclosure Dimensions

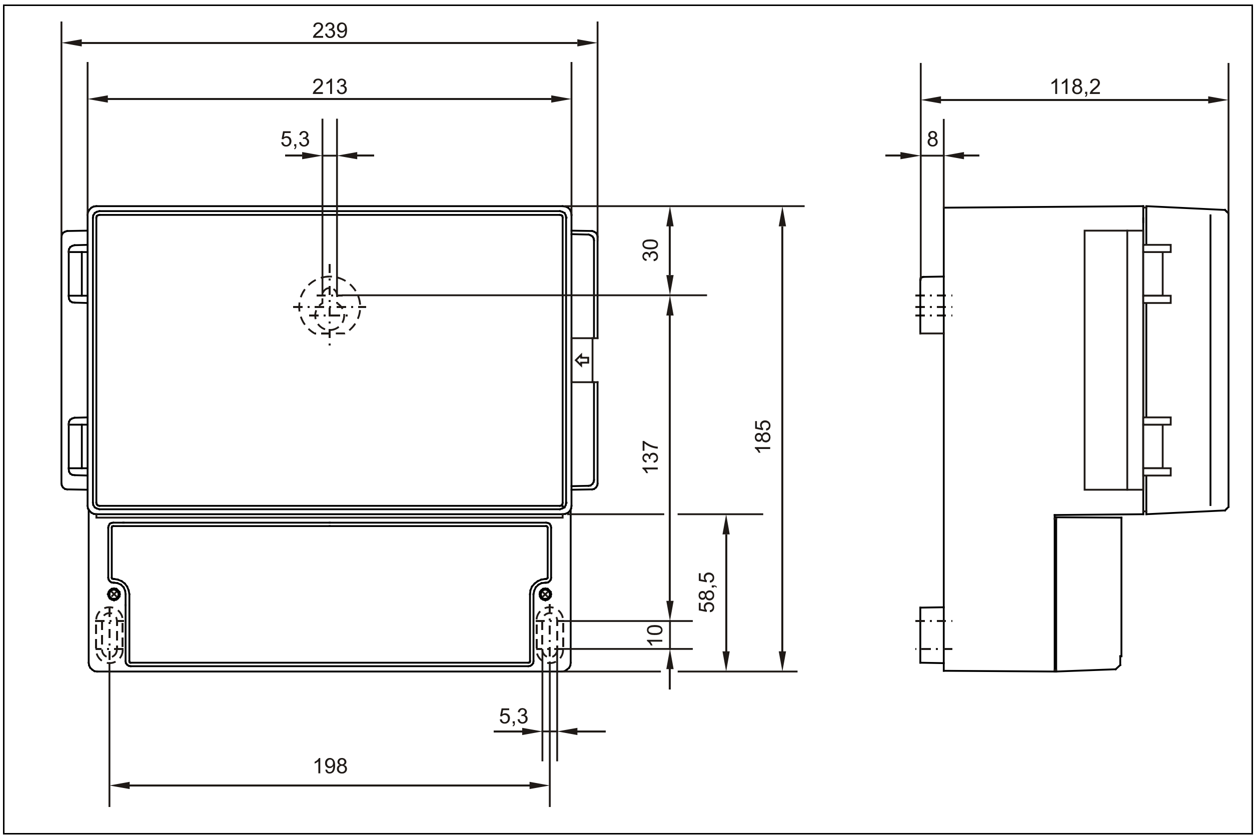


Fig. 6-1 Wall Mount Enclosure

7.2.3 Transmitter Connection

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:
1 gland M20 x 1.5
2 glands M16 x 1.5

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

M16 x 1.5 3.5 mm – 10.5 mm
M20 x 1.5 6.0 mm – 14.0 mm

To be able to use cable diameters outside of the tolerance, glands must be used which ensure IP 65 minimum protection.
Unused lead-ins have to be locked with an appropriate dummy plug before the initial start-up.

Each time before opening the terminal clamp housing (see Fig. 2-1) please ensure to disconnect the NFP from any voltage.

It is not allowed to remove the front panel.

Before the first connection it is necessary to have a slight pressure on the screw of the clamping connection to ensure its safe opening and a correct connection.

In terms of electric connection please note the device configuration (Fig. 4-5) since unspecified inputs, outputs as well as power supply connections are not connected.

On power supply and relay clamps one copper wire with a maximum cross-section of 2.5 mm² (0.01 in.) can be connected per clamp. Connection is made by using terminal clamps and a screwdriver with a 2.5 mm (0.01 in.) blade.
All other clamps are equipped with tension springs or plug connectors with screw connections requiring the use of a special screw driver which is part of the standard delivery. It is possible to connect one copper wire 1.5 mm² or one copper strand with max. 1 mm² per clamp.

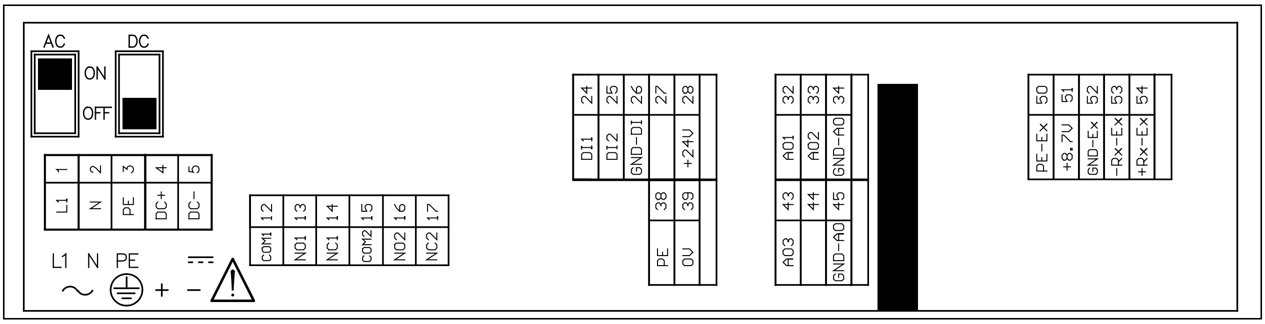
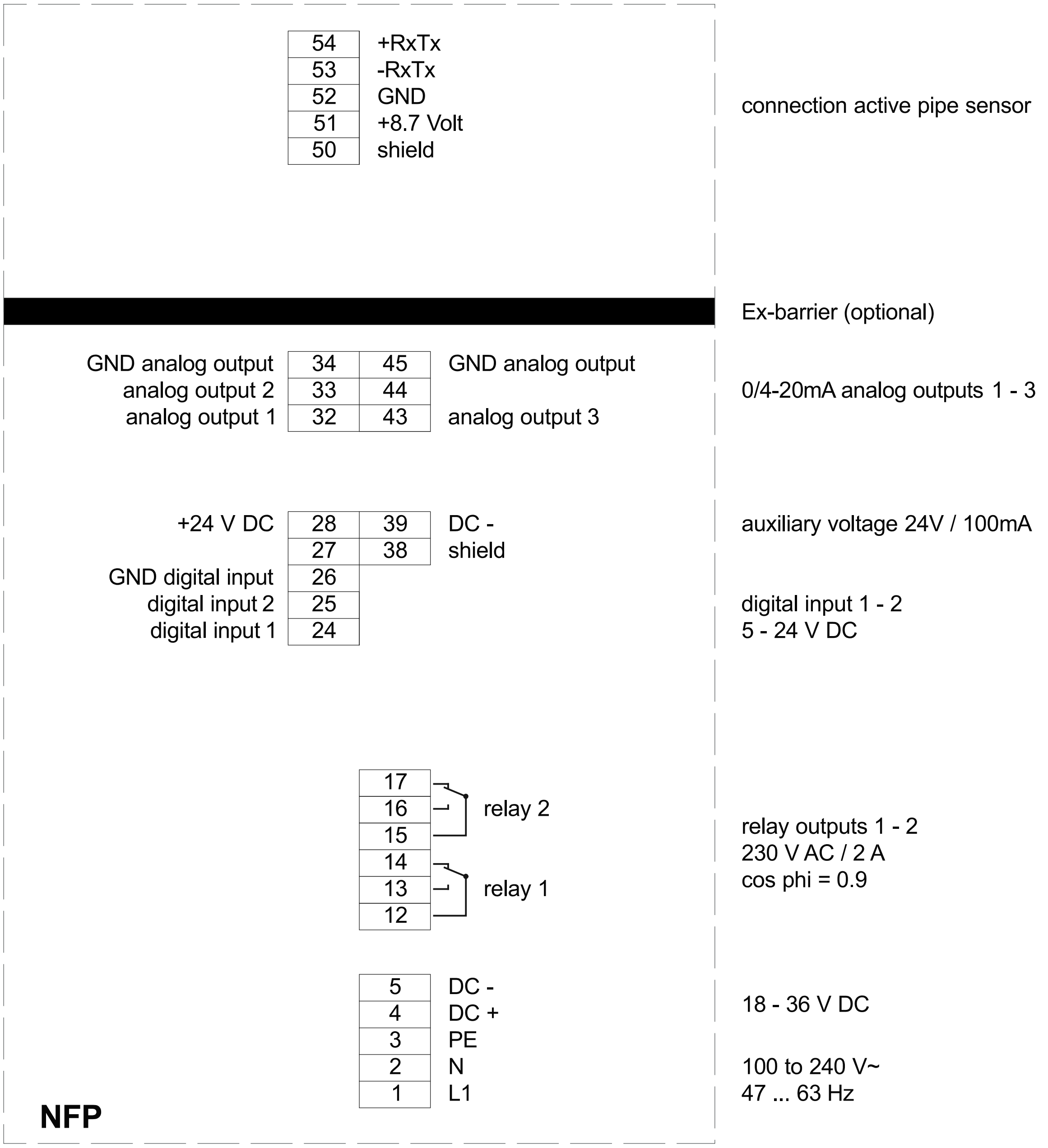


Fig. 6-2 Connection Enclosure

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



GND digital input, GND analog output and GND Ex are galvanically isolated from each other! DC- is galvanically isolated from all clamps (except GND analog output)!

1

Fig. 6-3 Clamp wiring NFP field enclosure

7.2.4 Sensor Connection

The sensor is equipped with a fixed cable Type LIY11Y 2x1.5 mm² + 1x2x0.34 mm² with various possible lengths (see also Fig. 6-4).
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.

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

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

The sensor cable has to be connected to the transmitter at the termination block Sensor. The diagram below applies in case of connecting a flow velocity sensor:

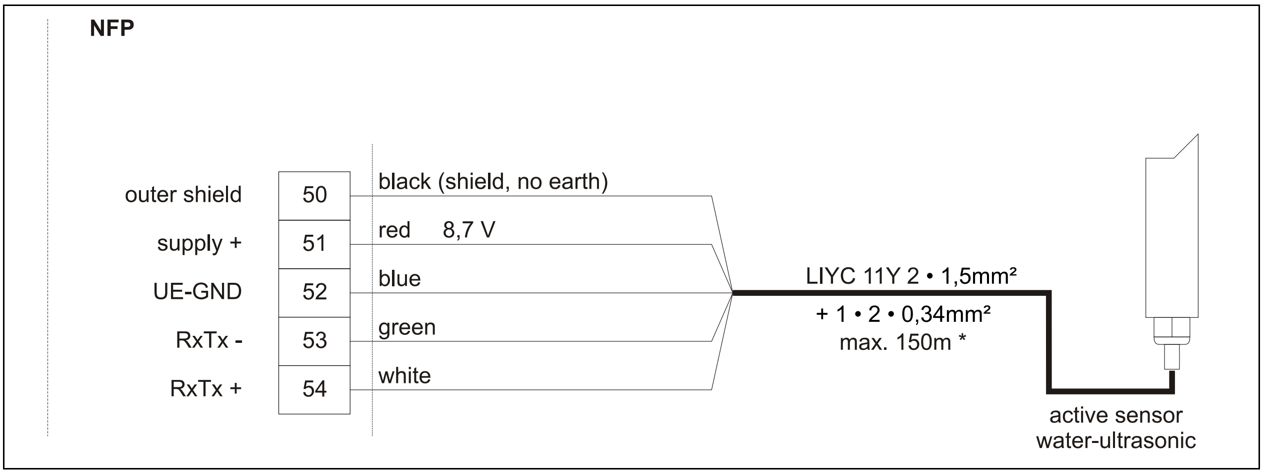


Fig. 6-4 Connection of a water ultrasonic active sensor

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 only the 3 cable connections of the sensor connection block!

7.3 NFP Power Supply

Depending on the type of NFP used, it can be supplied with 100-240 V AC. Also possible is a 24 V DC supply (see chapter 4.2).
The two slide switches located above the terminals serve as additional power switch.

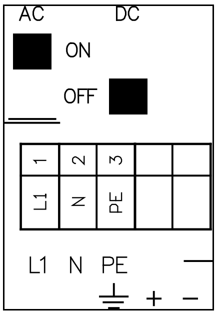


Fig. 6-5 Slide switch position in terminal clamp housing

A transmitter with 24 V DC cannot be operated with alternating current, just as it is impossible to operate a 230 V AC transmitter with direct current.

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.

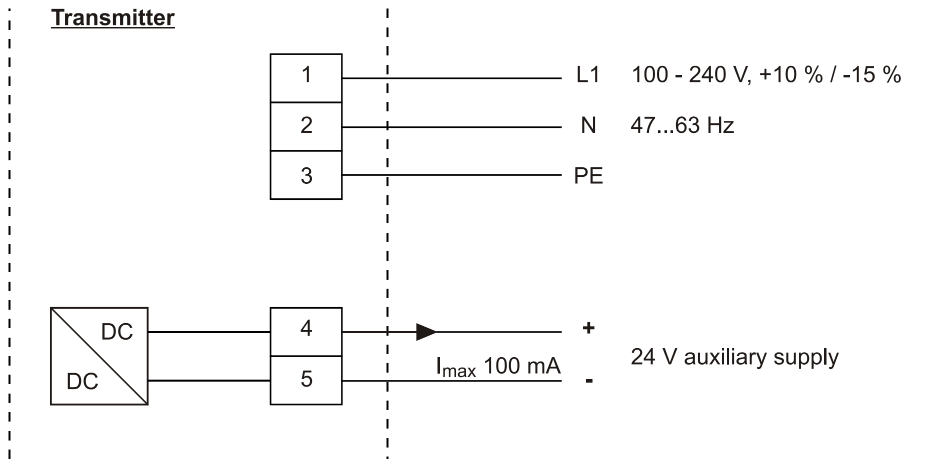


Fig. 6-6 AC model power supply

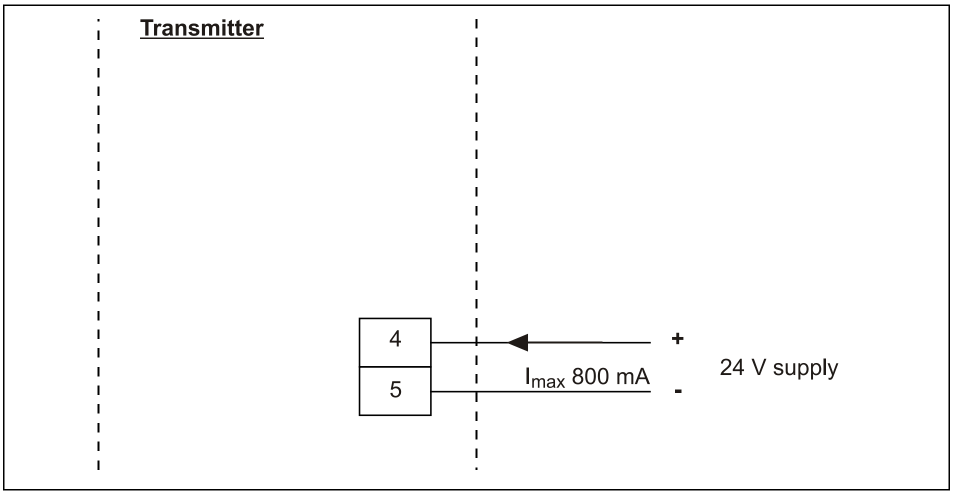


Fig. 6-7 DC model power supply

7.4 Overvoltage Protection Precautions

For effective protection of the NFP transmitter it is necessary to protect power supply and mA-output.
NIVUS recommends surge arrestors types EnerPro 220Tr bzw. EnerPro 24Tr (for 24 V DC) for the mains supply, as well type 2x1 24/24 Tr for mA-outputs.
The flow velocity sensor is internally protected against overvoltage. In case of an expected high hazard potential it is possible to protect the sensor by using a combination of the Types SonicPro 3x1 24 V/24 V and DataPro 2x1 12/12-11µH-Tr (N) on a single end.

Using overvoltage protection elements for sensor protection reduces the possible maximum cable length.

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.

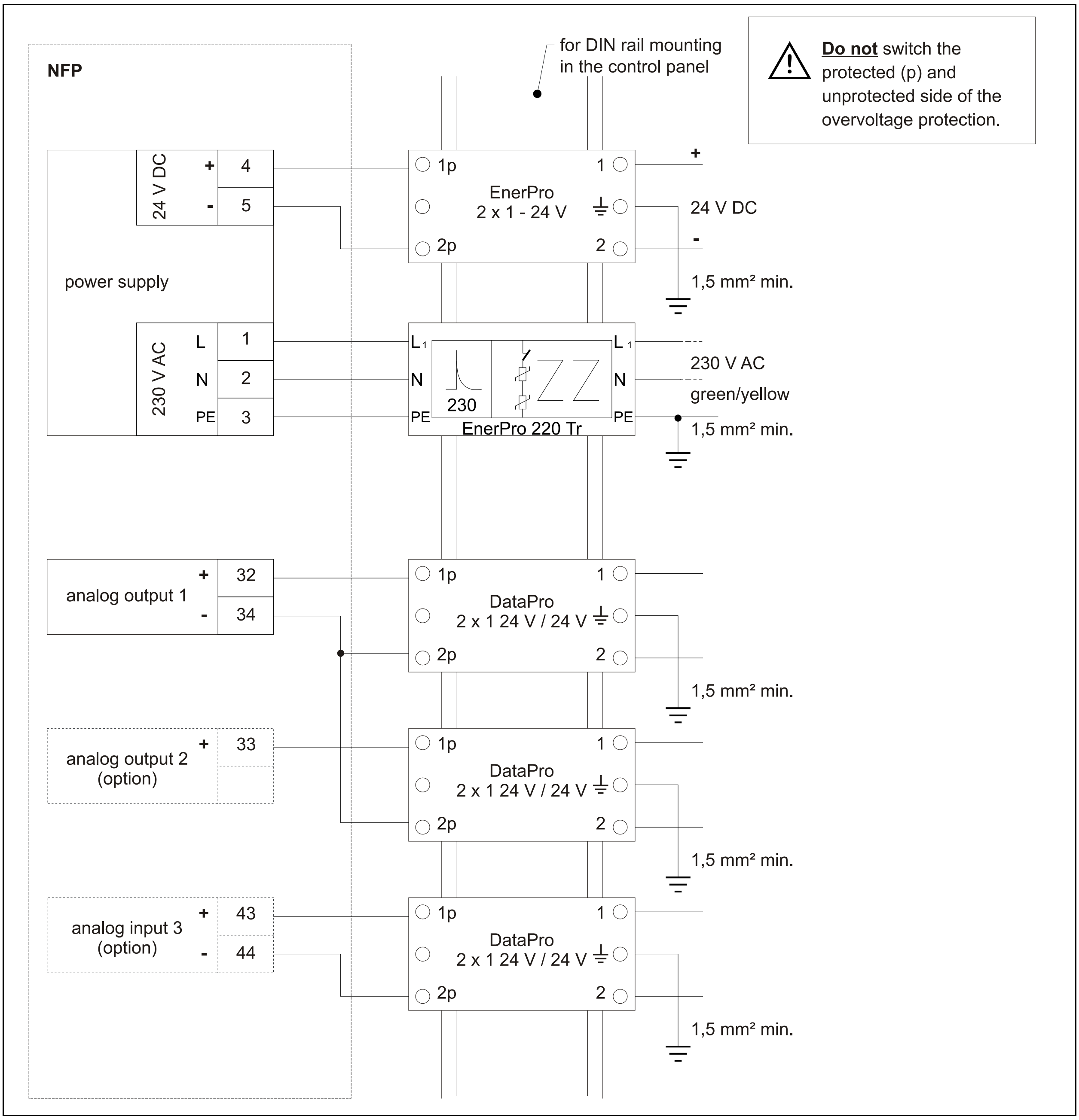


Fig. 6-8 Connecting the overvoltage protection for power supply and analog outputs

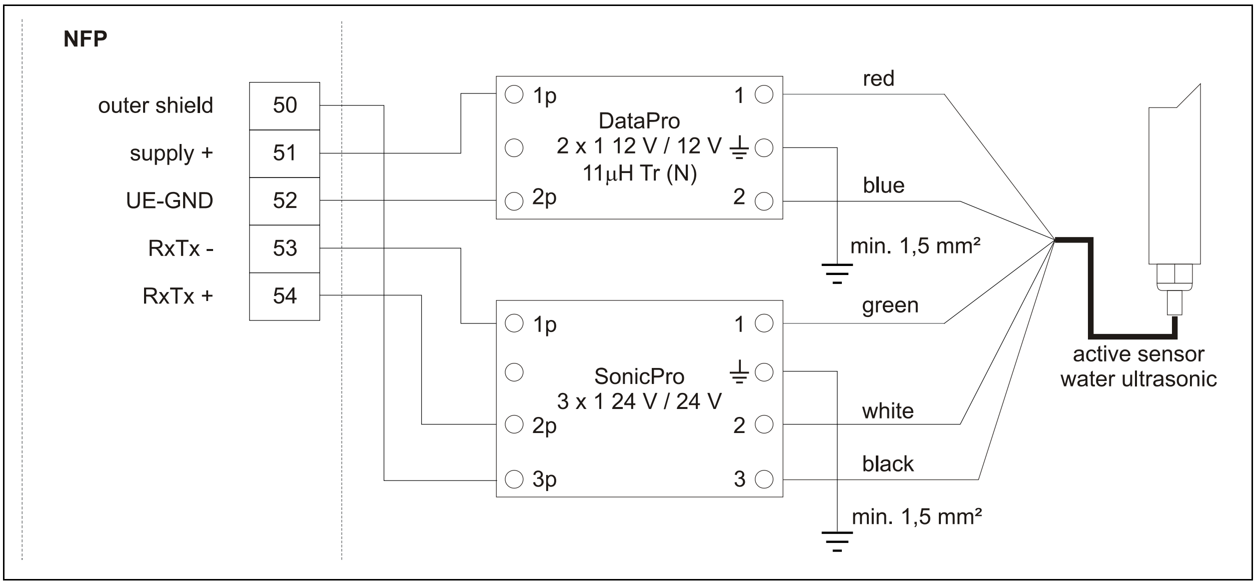


Fig. 6-9 Connecting the overvoltage protection for velocity sensor

8 Initial start-up

8.1 General

Notes to the user

Before you connect and operate the NFP you should strictly follow the notes below!
Please read the instruction manual thoroughly in order to ensure proper function of the measurement system!

This instruction manual contains all necessary information to program and to operate the device, addressing qualified technical staff who have appropriate knowledge about measurement technology, automation technology, information technology and waste water hydraulics.
To ensure a correct function of the NFP this instruction manual shall be read thoroughly!
The NFP must be wired in accordance with the wiring diagram, see chapter 6.2.3!
If any problems regarding installation, connection or programming should occur please contact our technical division or our service centre.

General Principles

The initial start-up is not allowed until 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.

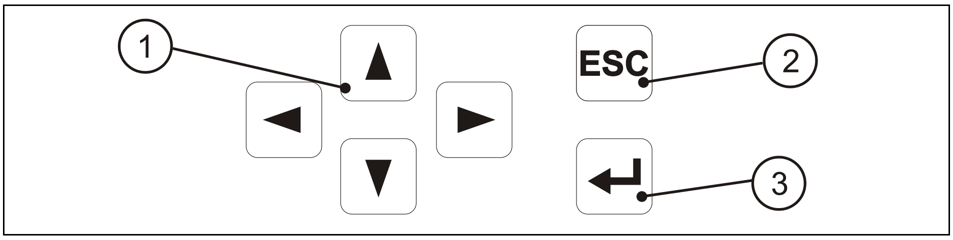
After transmitter and sensors are connected (see chapters 6.2.3 and 6.2.4) the parameters must be set. In the most cases all you need is:

- geometry of the measurement place and dimensions
- 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, special channel shapes, in case of absence of expert staff o 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.

8.2 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. 7-1 Operator panel

8.3 Display

The NFP has a large back-lit graphic display with a resolution of 128 x 64 pixel. This ensures a comfortable communication mode for the user.

Fig. 7-2 Display with main-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/right arrow keys.

These menus contain the following functions:

RUN	Standard operation mode. Enables to indicate day totals and error messages. Furthermore it is possible to define the time of 24-hour totalising and to reset the day totaliser.
PAR	This menu is the most extensive of the NFP. It is for the complete parameter setting of dimensions of the measurement, sensors, analog and digital outputs, damping settings and system reset.
I/O	This menu includes information about internal operation of the NFP. Besides the current readings on analog outputs and relays it is possible to indicate the current flow velocity, flow velocity distribution and the spatially allocated single velocities.
CAL	Define maximum and minimum measurable flow velocity here. Furthermore it is possible to calibrate analog outputs as well as to simulate analog outputs, digital outputs and the calculated volume.
EXTRA	This sub-menu includes basic display settings: contrast, language, units, decimal digits, system times and totaliser presets.

8.4 Operation Basics

The entire operation of the NFP is menu driven.
To navigate within the menu structure use the 4 control keys (see Fig. 7-1).

▲	- 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
▼	- 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
◄	- press once ; 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)
►	- press once ; 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	- delete values - each key action in menu → jumps back one level until RUN menu
↵	- press once; toggle from RUN menu to overview menu (main menu) - activate a submenu - accept and store values, units and so on

9 Parameter Setting

9.1 Basics

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. Enter the PIN below in order to accept modifications.

2718 type in 2718 if prompted.

Never give the code number to any unauthorised persons. Even do not leave the code next to the equipment or write it down on it. The code number protects against unauthorized access.

Besides having the option to save modified parameters or to reject any modification by pressing >No< at the end of the parameter setting procedure, it is possible to jump back to the previous level using the >back< function. This enables the user to modify settings which might have been forgotten without the need to buffer previously modified settings.

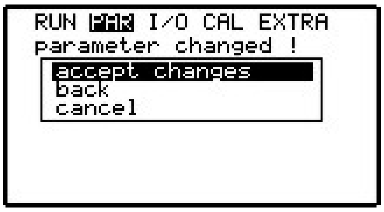


Fig. 8-1 Screen on end of parameter setting

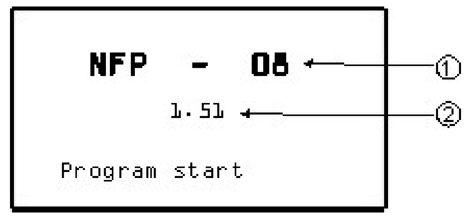
The transmitter will prompt you to enter the correct code if a faulty code has been entered.
If the PIN code is not available, it is possible to jump back within the menu by pressing >ESC< and to exit the programming dialog without modifications by pressing >cancel<.

If parameter settings are not going to be modified but just verified by selecting each parameter, there will be no request at the end of the dialog.
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.

Please observe the bottom line of the display whilst programming, indicating the required measuring unit!

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 Fig. 4-5).

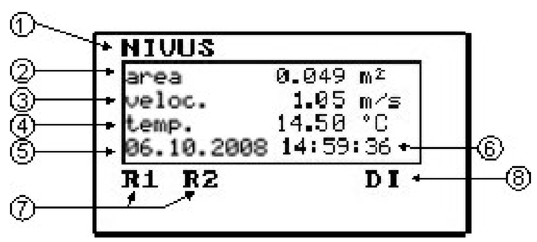
After mounting and installing sensor and transmitter (see previous chapters) activate the power supply.
On initial start-up the screen below comes up:



1 Device version (05 or 08) - see also Chapter 4.2
2 Device software version No.

Fig. 8-2 Start screen

In the basic setting the transmitter operates with a nominal diameter of 250 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 the Enter key once in order to get to the overview menu. The display will return to the previous screen either if pressing again or approx. 30 seconds after the last key action.



1 Name of measurement place
2 Calculated cross-sectional area (depending on entered diameter)
3 Measured velocity
4 Measured medium temperature
5 System date
6 System time
7 Relay status
8 Digital input status

Fig. 8-3 Overview menu

The overview menu enables to quickly monitor the most important points of the installed measurement at one glance. It is clearly visible if flow velocities are detected, which wetted cross-sectional area is used for flow rate calculation and if the sensor has been connected correctly and if connection to the transmitter has been established (indication of medium temperature).

9.2 Parameter storage

Via the front-side USB interface, data can be either loaded or saved on PC or Laptop using software tool „PaDa“. This tool is free and can be downloaded from www.nivus.com under >Download/Software<.
Connect NFP and PC or Laptop with an USB cable (Type A-B). The „PaDa“ software tool at present can run under Windows® 2000, XP and Vista (32-Bit version).

9.2.1 >PaDa< Installation

After downloading double-click the file to run the installation. The standard installation routine will install the software under Windows XP in C:\Programs\PaDa. Device parameter will be saved here and transmitted back to the unit again from here as well.

If a warning should be displayed during installation click the ***"Continue Anyway"*** *button.*

PC or Laptop are not capable of detecting the transmitter however if you select "STOP Installation" instead. In this case the software must be installed again!

Fig. 8-4 PaDa – Installation Warning

9.2.2 >PaDa< Operation

After the software has been installed successfully, run the tool under Windows XP either from **„Start - All Programs - NIVUS GmbH“** or via the desktop icon (self-installed; German, English or French).

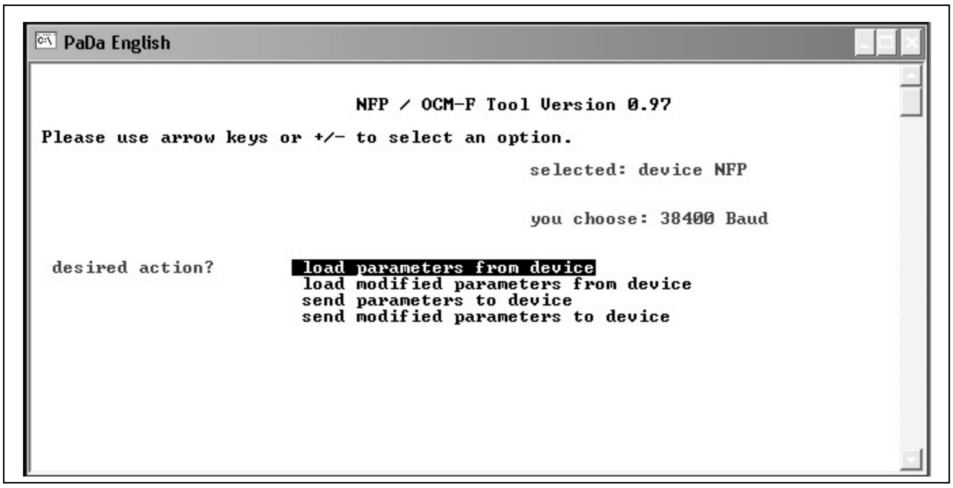


Fig. 8-5 PaDa English

Select the desired option using the >up< and >down< arrow keys and confirm with the Enter key. The standard installation routine will install the software under Windows XP in the **C:\Programme\PaDa** directory. Parameter sets will be saved there as well. Read out or open parameters either with EXCEL or an appropriate editor application.

Load parameters from device
Downloads the complete current parameter settings of the transmitter from NFP to PC/Laptop creating a file named "PARAM.TXT“.

Load modified parameters from device
Loads only parameters which have been modified in the unit (varying from default) using a file named "CHGPARAM. TXT“.

Send parameters to device
Sends previously saved parameters ("PARAM. TXT“) to NFP in case of accidental system reset, faulty modification of specific settings or device defects. Synchronises the parameters between PC/Laptop and NFP. Copy the desired parameters into the same directory as the "**PaDa.exe**“ before transmitting.

Send modified parameters to device
Use this function to send modified parameters to the transmitter. The file name is "CHGPARAM. TXT“. Copy the desired parameters into the same directory as the "**PaDa.exe**“ before transmitting.

Do not close the tool window during data transmission!

The window will close automatically as soon as the transmission has been finished successfully!

In order to prevent data from being overwritten, move parameters which have been read out before into a separate folder.

9.3 Operation Mode (RUN)

This menu is a display menu for standard operation mode. Containing the following sub menus, it is not required for parameter setting:

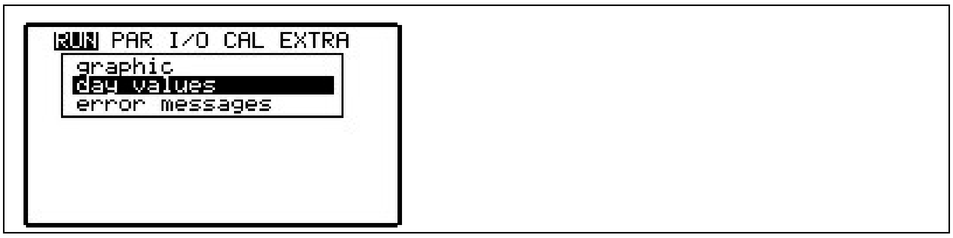


Fig. 8-6 Operation mode selection

Day Values

Please select submenu INFO (see Fig. 8-7). This menu contains the total flow values of the past 7 days (see Fig. 8-8), presumed the transmitter was operated without any interruption in the past seven 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 8. day has been created des (circular memory function).
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 modified under RUN – day values - cycle (see Fig. 8-9).
Additionally, you can erase all day counters (see Fig. 8-10). Due to safety reasons it is required to enter the PIN >2718< and confirmation with ENTER after erasing.

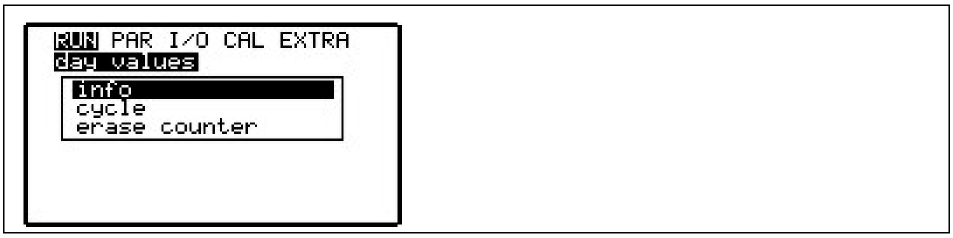
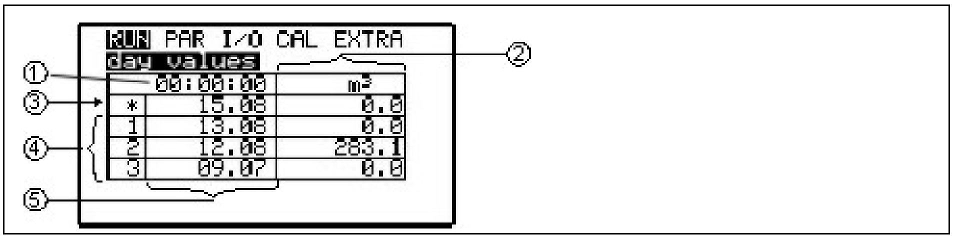
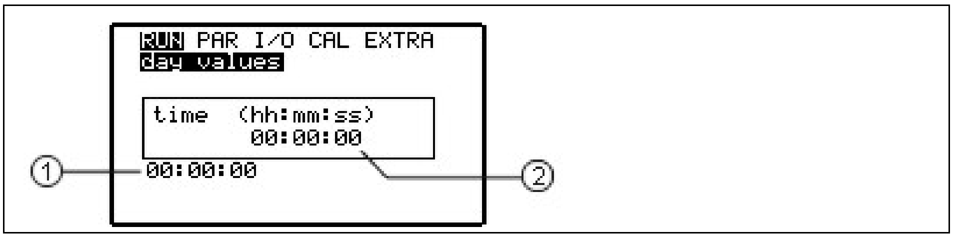


Fig. 8-7 Info menu



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

Fig. 8-8 Day values



1 current time of day totalising
2 programmable time of future totalising in <hours : minutes : seconds> format

Fig. 8-9 Time of day 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!

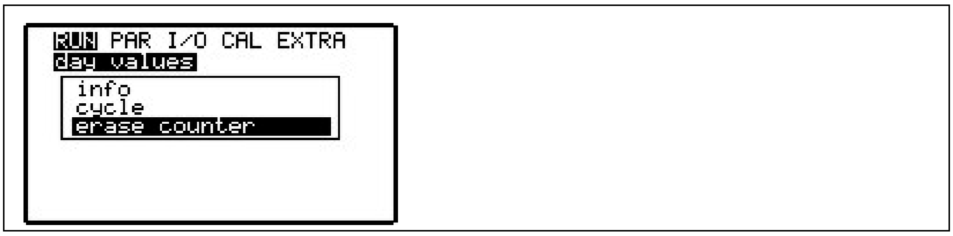
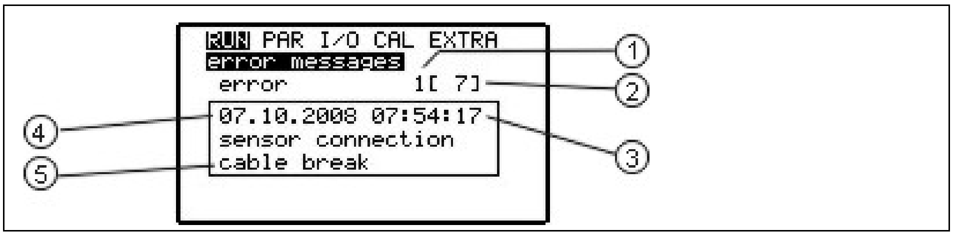


Fig. 8-10 Erase days counter

Error messages

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 >up< and >down<.
Pressing the >ENTER< key will delete all error messages one by one.
The maximum number of stored error messages is limited to10.
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).



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. 8-11 Error messages

9.4 Display Menu (EXTRA)

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

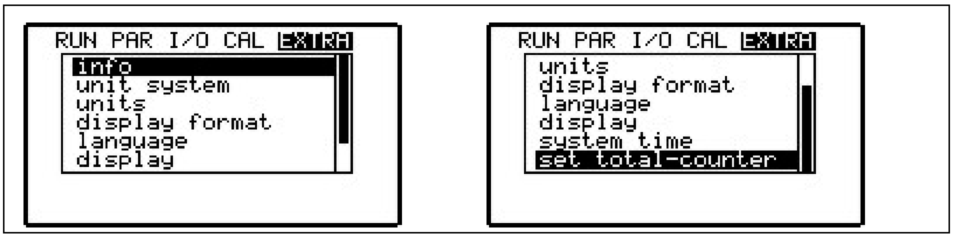


Fig. 8-12 Extra submenus

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. 8-13). The menu is subdivided into 4 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.

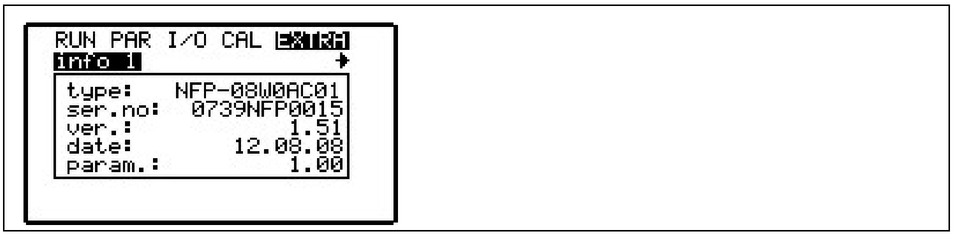


Fig. 8-13 System information

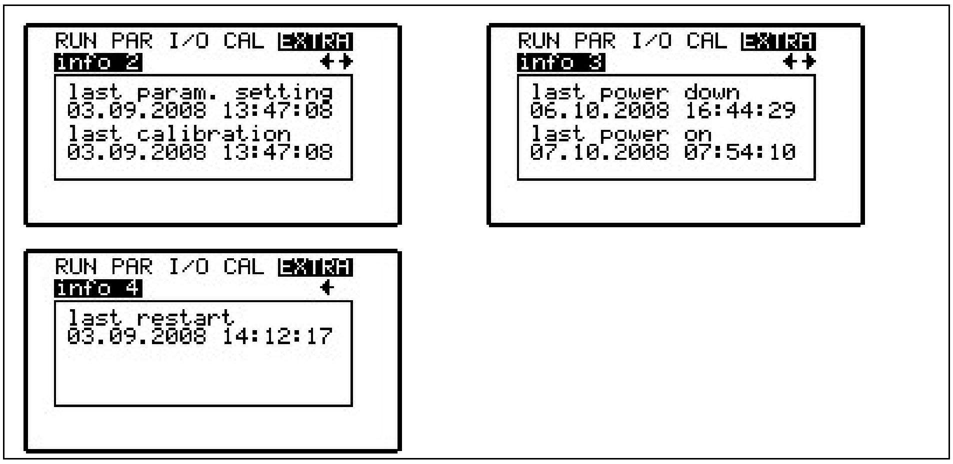


Fig. 8-14 Additional system information

Unit System Here you can select between the metric system (litre, cubic meters, cm/s etc) English system (ft, in, gal/s, etc.) and American system (fps, mgd. etc.).

Units This menu contains the following sub menus:

- Flow
- Velocity
- Total

For each of these 3 measured values you can select a unit which appears on the display. Depending on the unit system selected, there are various units available.

Display format Choose display formats for velocity and totals here. There are 4 different options to select from (see Fig. 8-15).
The unit automatically determines the decimal digit position of the current flow rate indication and hence cannot be set to a fixed position.

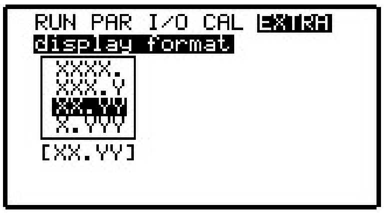


Fig. 8-15 Selecting the display format

Language select from German, English or French

Display allows to adjust display settings regarding contrast. Use key >down< to decrease; and >up< to increase values.

System Time In order to perform various memory functions, the unit includes an internal system clock saving dates of year, weekdays and week numbers. The clock settings can be modified if required (different time zones, summer time / winter time etc.).
First select the menu point “Info”:

Fig. 8-16 System time submenu

The complete system time is indicated after the settings have been confirmed:

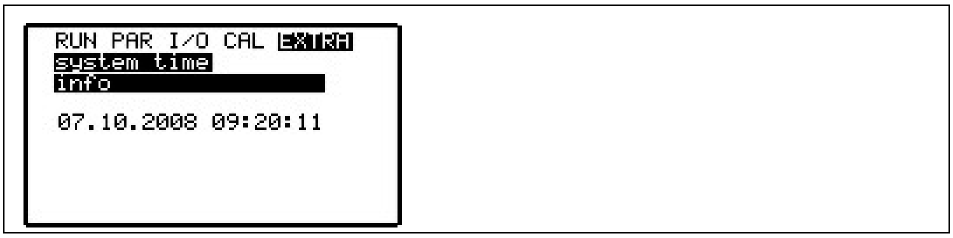


Fig. 8-17 System time

This menu point is for indicating purposes only. Hence the system time cannot be adjusted here. Modifications can be carried out in the individual menus “Date” and "Time“.
Select between 12 h or 24 h mode in >Set format< submenu.

Set total counter

This menu allows to newly set the totaliser indicated on the main screen. This feature is normally going to performed in case of replacing a transmitter which has to indicate the same value as before replacement.
After the new value has been set confirm using the "Enter“ key and type in the code number “2718“

9.5 Parameter Menu (PAR)

This menu is the most extensive and most important regarding the NFP settings. It nevertheless is sufficient in most cases to set only some essential parameters, which usually are:

- name of measurement place
- pipe diameter
- analog output (function, measurement range and measurement span)
- relay output (function and values)

All other functions are additions which are required in special cases only.

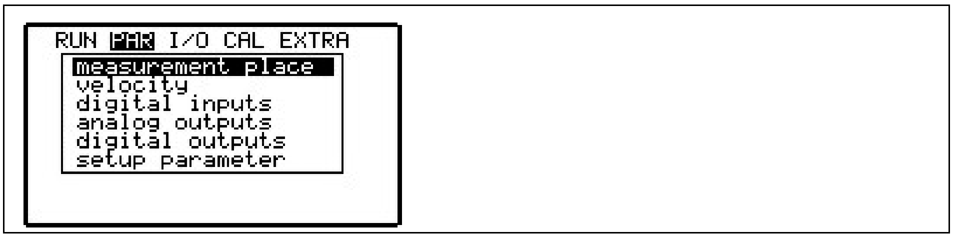


Fig. 8-18 Parameter Menu

9.5.1 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.

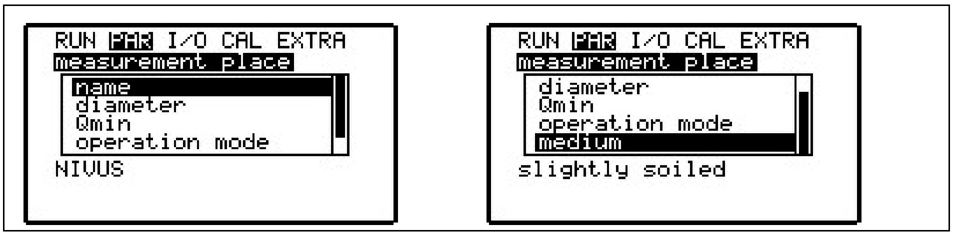
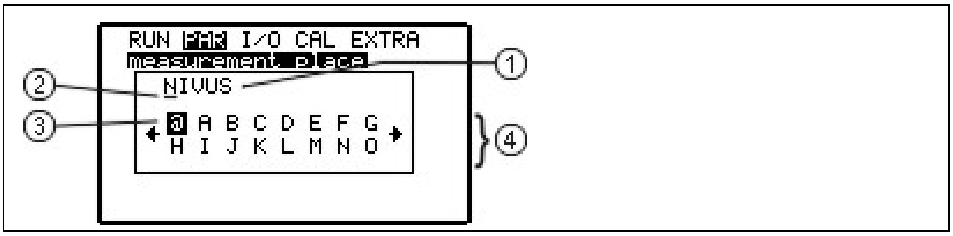


Fig. 8-19 Submenu measurement place

Name (of measurement place)

NIVUS recommends to coordinate and to define names according to names stated in the respective documents. Names may contain up to 15 letters.
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 activated by pressing the „up“ and „down“ arrow keys.
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. 8-20). Use the keys >down< and >up< to jump across 2 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.
Delete unused characters by entering space.
By pressing the both keys >right< + >down< or >up< you can move the cursor to the right. Using >left< + >down< or >up< will move the cursor to the left.
You can obtain the same movements as well if you move the cursor to the rightmost or leftmost edge of the table by using the key >left< or >right<.
As soon as the cursor has reached the rightmost or leftmost edge of the table it will jump to the desired position by one step on pressing the key >left< or >right< again.
Exit this part of the program with ESC. Decide to accept the new name, to correct the new name (= Back) or to abort the procedure subsequently (see Fig. 8-21).



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

Fig. 8-20 Setting the name of the measurement place

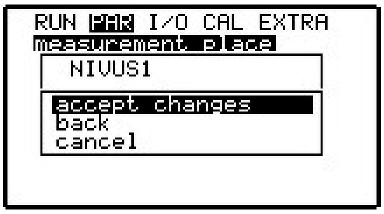


Fig. 8-21 Accepting the new measurement place name

Diameter

Enter the **accurate inner diameter** of the measurement place here.

Please note:
*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 inner pipe diameter inevitably leads to a faulty calculation of the cross-sectional area resulting in faulty calculated flow readings!*

Qmin

This parameter serves to suppress lowest movements or apparent volumes arising. 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.
The parameter is mainly used in permanently full large pipelines with partially low movements or to suppress indication and output of low leakage volumes.

Operation mode

This parameter is for adjustment to existing applications. Distinguish between

- cyclic (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)
- continuous operation (mostly moving medium within pipeline)

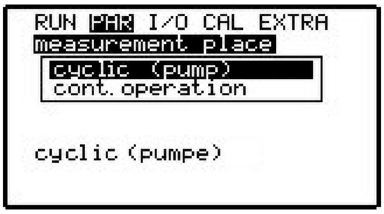


Fig. 8-22 Operation mode

Medium

It turns out to be helpful to limit the various measurable media according to their damping characteristics of the different measurable media and to determine this selection here.

Fig. 8-23 Select medium

Slightly soiled Unsoiled media as well as media with low gas or particle contents such as rain water, raw water, process water, processed waste water etc.

Dirty Dirty media such as untreated wastewater.

Heavily dirty Media with high solid contents such as sewage sludges. Even apparently clean or slightly polluted media with very high gas contents such as aerated wastewater are part of this category.

9.5.2 Parameter Menu „Flow Velocity“

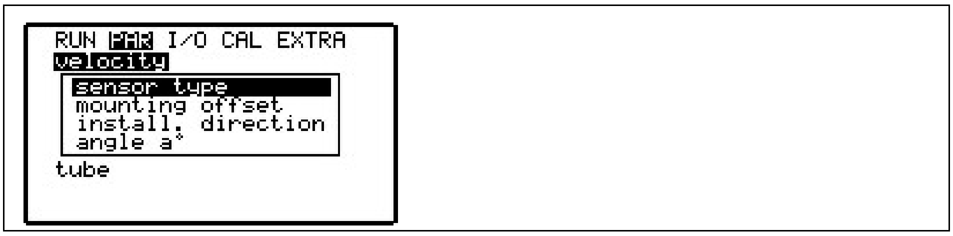


Fig. 8-24 Submenu flow velocity

Sensor type This parameter (type “pipe sensor”) can currently not be modified.

Mounting offset The value 10 mm relates to the distance between the centre of the transmitter crystal and the pipe wall
The offset shall be modified only if the sensor has not been installed flush with the pipe wall as recommended.

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 to set “negative“ here.

angle a° The Beam angle of 45° relates to a sensor which is mounted vertically to pipe wall and flow direction. This angle must not be modified as soon as this requirements have been met.

9.5.3 Parameter Menu „Digital Input“

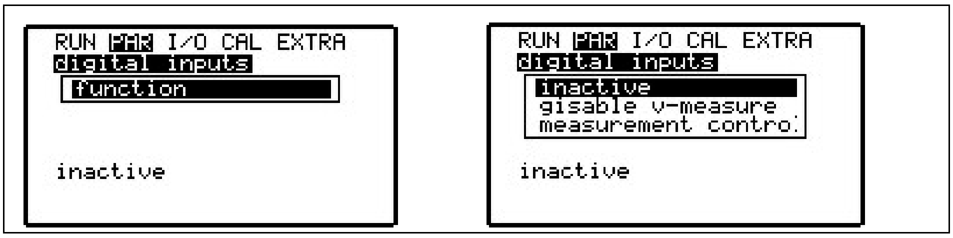


Fig. 8-25 Digital inputs – submenu

The NFP comes with one digital input (digital input 1, see connection plan Fig. 6-3) to release the flow velocity measurement or to switch over between operation modes. 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.

*The digital input **2** described in Fig. 6-3 has no function and cannot be driven by the transmitter. Please leave this input disconnected!*

Not active

The digital input is not active.

Control v-measurement

The digital input is used to lock/release the measurement by external control signals (such as flood message, threshold for detection start or similar).
The following points are available as soon as the release has been activated:

- Logic (toggle between inverse and non-inverse mode)
- Name (the digital input name may consist of up to 3 characters which will be indicated on main screen as well as in the overview menu; see Fig. 8-3. Set the name as described in Chapter 8.5.1).

Control measurement values

In hydraulically critical applications it is possible to externally switch over between operation modes via the digital input.
The following points are available as soon as the digital input has been activated:

- Logic (toggle between inverse and non-inverse mode)
- Name (the digital input name may consist of up to 3 characters which will be indicated on main screen as well as in the overview menu; see Fig. 8-3. Set the name as described in Chapter 8.5.1).

9.5.4 Parameter Menu "Analog Output"

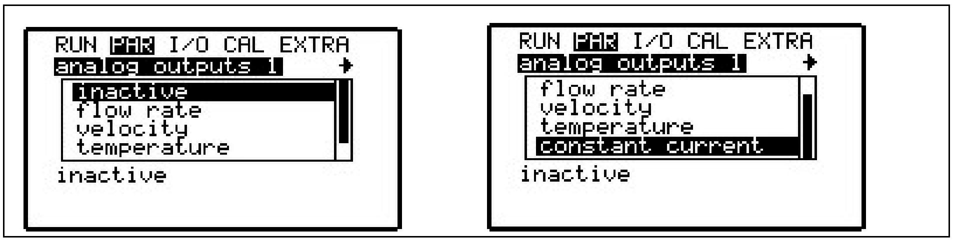


Fig. 8-26 Analog output

The NFP has 1 or 3 free programmable analog outputs depending on the unit type.

Any of the 3 analog outputs can be set and chosen independent of the transmitter type. However the outputs are available as hardware only if the respective transmitter type has been ordered and delivered (see Fig. 4-5).

Select the analog outputs as described in chapter 7.4 using the arrow keys >right< and >left<. After choosing the function the points shown in Fig. 8-26 are available.

Flow rate

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

Velocity

Output of measured average velocity.

Temperature
Output of 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 >check error< (see Fig. 8-27).
For constant current enter the desired initial current (see Fig. 8-30).

Output span
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.
Define either 4-20 mA or 0-20 mA here as span.

Value at 4mA
Input of measurement values at 0/4 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
If this mode has been unlocked by setting to „active“ another point will be added to Fig. 8-26 as described in Fig. 8-28.

Value at errors
This parameter is to define the desired analog output condition if an error should occur. The following functions are available:
- Hold last value
- constant 0.0 mA
- constant 3.6 mA
- constant 4.0 mA
- constant 20.457 mA

(see also Fig. 8-29)

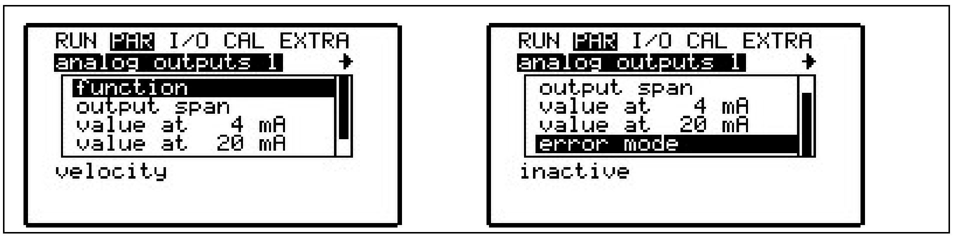


Fig. 8-27 Analog outputs – submenu

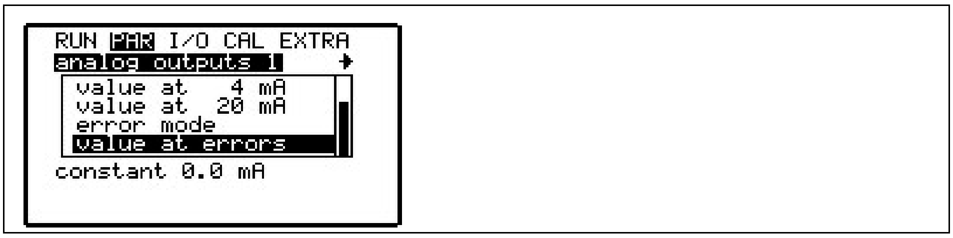


Fig. 8-28 Analog outputs – extended submenu

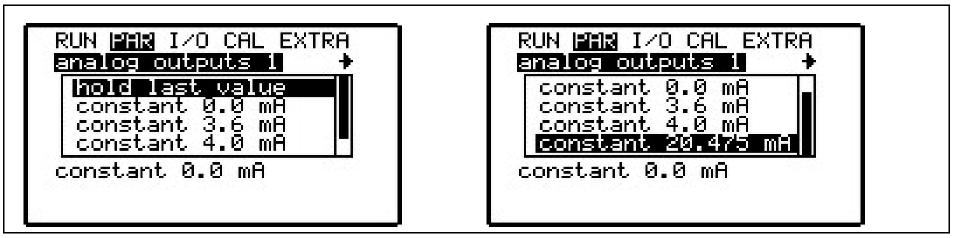


Fig. 8-29 Programming error output

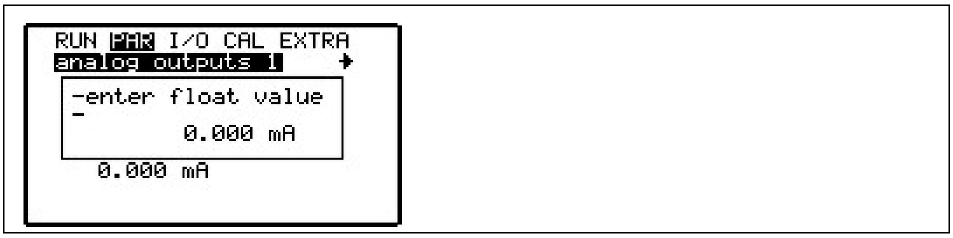


Fig. 8-30 Programming constant current

9.5.5 Parameter Menu „Relays“

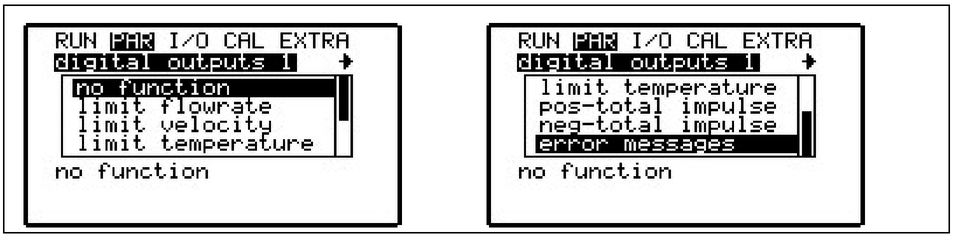


Fig. 8-31 Relay functions

This menu allows to define 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 relay 1 and 2 using the "left“ and "right“ arrow keys.

Limit flow rate 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)

Limit velocity 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).

Limit temperature 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).

Pos-total impulses

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

Neg-total impulses

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

Error messages

Relay will energise in case of error messages.

Positive and negative volume impulses as well as error messages can be assigned to only one relay. It is not possible to assign 2 positive total impulses with different volume impulses to both relays.

After the relay function has been defined another window will appear enabling to define the function parameters depending on the function chosen. If having flow, velocity and temperature selected as limit contacts the respective parameters are ON and OFF points, ON and OFF delays as well as modifications of the name which might come into effect on the screen (see Fig. 8-32).
In case of impulse output these parameters are replaced on the screen by the parameters impulse duration and value (see Fig. 8-33).

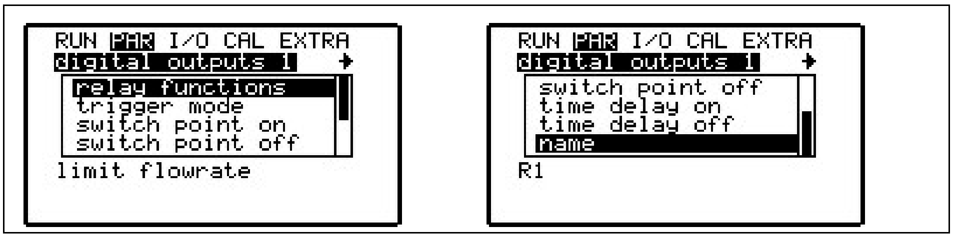


Fig. 8-32 Limit value parameter

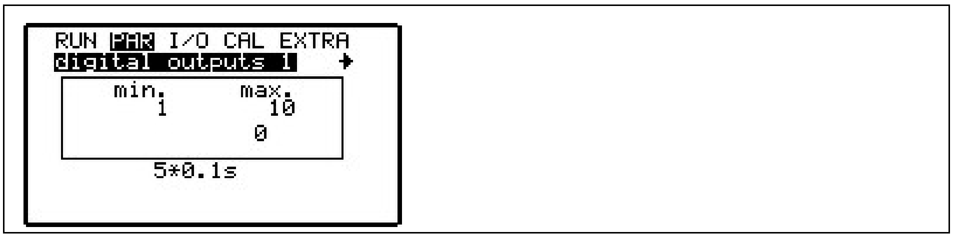


Fig. 8-33 Impulse parameters

If the limit value function has been selected the options below have the following functions:

Trigger 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.

Switch point on

Defines the "ON" point for the selected limit value.

Switch point off

Defines the "OFF" point for the selected limit value.

Time delay on

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.

Time delay off

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 3 characters max. which will be indicated in main menu and in overview menu (see Fig. 8-3.). Set the name as described in chapter 8.5.1.
If the impulse function has been selected the options below have the following functions:

Impulse duration

- Set impulse duration from 0.1 to 1.0 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.

9.5.6 Parameter Menu „Settings“

Fig. 8-34 Settings – submenu

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

Damping

Set the system damping from 1 - 600 seconds.

Service mode

Additional system setting options are going to be revealed as soon as a special code has been entered. It is possible to modify e.g. beam angle or medium sound velocity, transmit voltages or special adjustments regarding the transmitter crystal drive. 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.

System reset

Enables a general reset of the measurement transmitter. Selecting this point will bring up the screen on the next page:

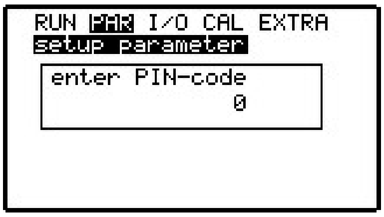


Fig. 8-35 Execute system reset

Entering the PIN-Codes >2718< will cause the NFP to execute a general reset. The unit will be in initialising mode subsequently which requires the operation language to be set.

Fig. 8-36 Choose language

The NFP will now overwrite the flash memory restarting the program. Before re-start (see Fig. 8-37) the unit briefly indicates unit ID and software version (see Fig. 8-38).
A few seconds later the unit will return to factory default condition.

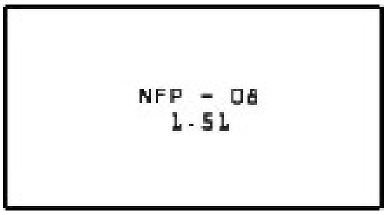


Fig. 8-37 Unit version screen

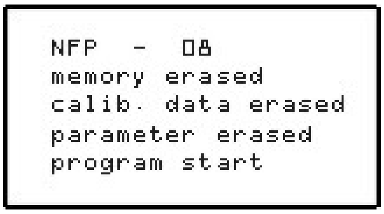


Fig. 8-38 New program start NFP

9.6 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.

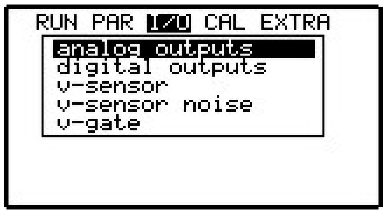


Fig. 8-39 I/O submenu

The menu basically allows to indicate 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.

Analog outputs

Indication of analog values on D/A-converter.

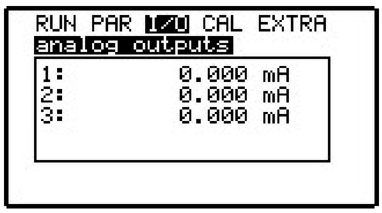


Fig. 8-40 Analog output signal screen

Digital Outputs

Screen digital values of relay 1 and 2

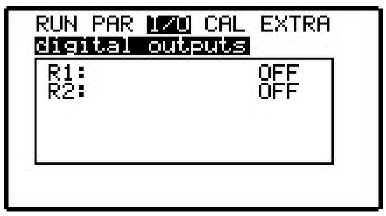
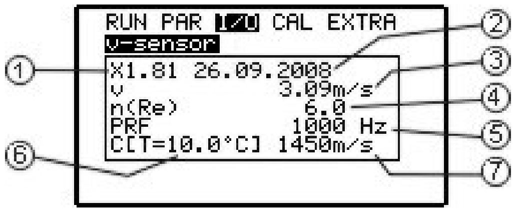


Fig. 8-41 Status of relay outputs

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. 8-42 Status of sensors and velocity evaluation

Use "left“ and "right“ arrow keys to browse through more service screens.
The velocity graph is the same as under RUN/Graphics and represents the velocity distribution of individual gates within the pipeline.
This graph enables to assess the prevailing hydraulic conditions.

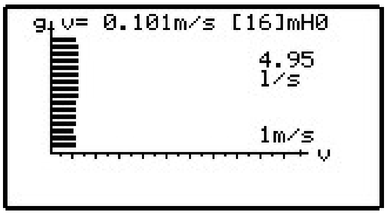


Fig. 8-43 Velocity graph

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.

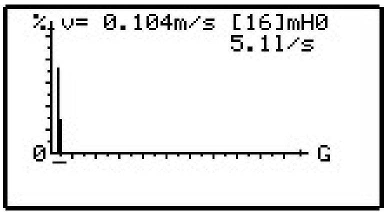


Fig. 8-44 Velocity distribution diagram

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

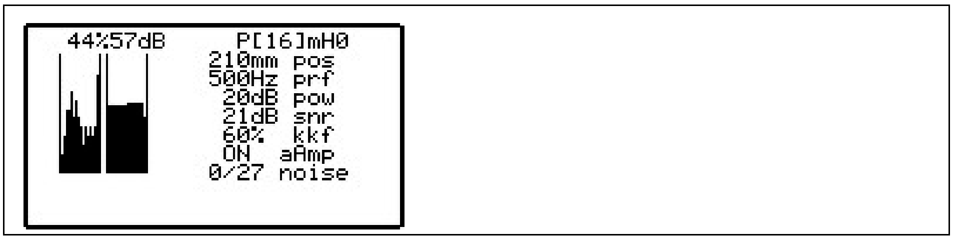


Fig. 8-45 System info screen

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 [mean] should be around 0 or slightly higher. The peak value [max] should not exceed 6 – 8 dB significantly.

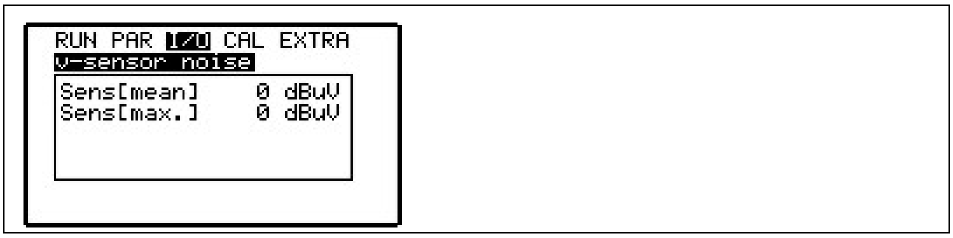
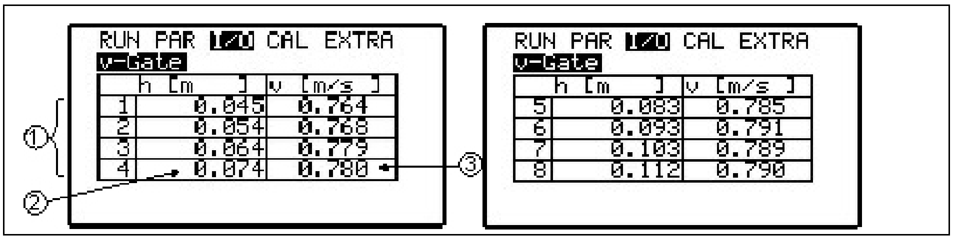


Fig. 8-46 Sensor noise

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

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 gate.
The screen is divided into 4 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. 8-47 Table of velocity distribution

9.7 Calibration and Calculation Menu (CAL)

This menu allows to adapt analog outputs to following systems as well as to simulate relay switching events and analog outputs.

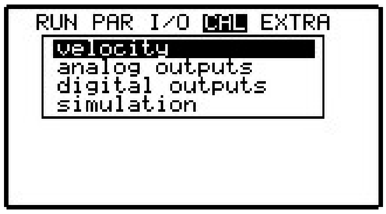


Fig. 8-48 CAL- Menu selection

Velocity

Defines minimum and maximum possible flow velocity to measure.
It is not possible to step over the specified physical limits (see chap. 2.3). However it is possible to narrow down the possible velocity range here (e.g. no measurement of negative velocities by entering [0] as minimum velocity).

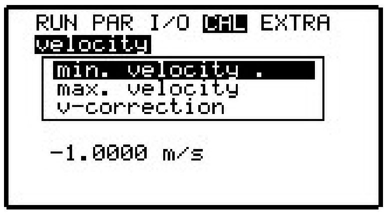


Fig. 8-49 Limit values of flow velocity measurement

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.

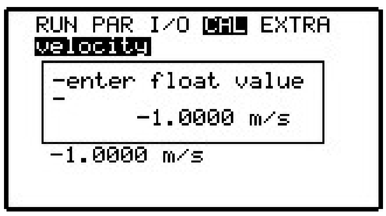


Fig. 8-50 Velocity correction options

Simulation

---

*The simulation of OCM Pro outputs will access any following facility areas **without any safety locking measures**!*

*The simulation of analog inputs and outputs is allowed to be carried out by specialist electricians only which have sound knowledge on the control system of the facility. This requires detailed preparation. **It is absolutely necessary to have a safety person available!***

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.

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 and unforeseeable consequences in case of incorrect or faulty simulation!

Analog outputs

Both analog outputs can be adjusted to following systems and a free programmable output current can be simulated.
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 (see Fig. 8-52).

Fig. 8-51 Calibration of analog outputs

Fig. 8-52 Simulation of analog outputs

Digital outputs

After entering the PIN code >2718< (safety function) it is possible to simulate the real switching events (ON and OFF) of both relays using the ENTER key.

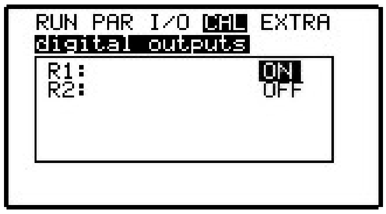
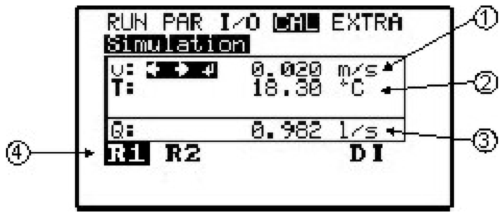


Fig. 8-53 Simulation of relay outputs

Simulation

After entering the PIN code >2718< (safety function) select between velocity and medium temperature by using the arrow keys “up” and “down”. Pressing arrow keys ”left” or “right” will increase or decrease the simulated flow velocity 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.

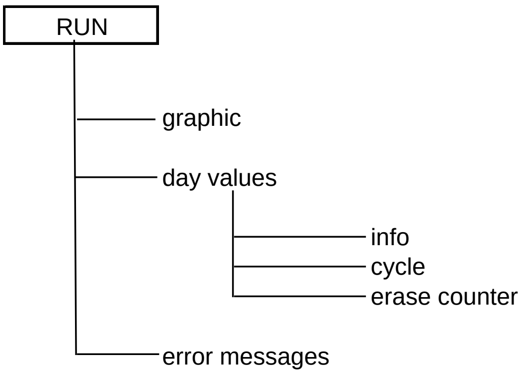


1 Simulated flow velocity
2 Simulated medium temperature
3 Calculated simulated flow value
4 Programmed relay activated by simulation

Fig. 8-54 Simulation mode

10 Parameter Tree

10.1 Parameter Menu RUN



10.2 Parameter Menu PAR

Part 1

- PAR
  - measurement place
    - name — NIVUS
    - diameter — 0,25
    - Qmin — 0
    - operation mode
      - cyclic (pump) — x
      - continuous operation
    - medium
      - slightly soiled — x
      - dirty
      - heavily dirty
  - velocity
    - sensor type — pipe
    - mounting offset — 0,01
    - istall. direction — positive
    - angle α° — 45
  - digital inputs
    - function
      - inactive — x
      - gisable v-measurement
      - measurement control
      - logic
        - inverse: NO — x
        - inverse: YES
      - name — DI
  - analog outputs
    - function
      - inactive — x
      - flow rate
      - velocity
      - temperature
      - constant current

Part 2

- continue with act. function
  - output span
    - 0-20mA
    - 4-20mA — x
  - value at 0/4mA
  - value at 20mA
  - error mode
    - inactive — x
    - active
  - value at errors
    - hold last value
    - constant 0,0 mA — x
    - constant 3,6 mA
    - constant 4,0 mA
    - constant 20,475 mA
- digital outputs
  - relay funtions
    - no function
    - limit flowrate
    - limit velocity
    - limit temperature
    - pos-total impulse
    - neg-total impulse
    - error message
      - trogger mode
        - normally open — x
        - normally closed
      - switch point on
      - switch point off
      - ime delay on — 0
      - time delay off — 0
      - name — R1
    - only when relays function is "impulse"
      - impulse duration — 5
      - amount — 1
- setup parameter
  - damping — Mai 20
  - service mode
    - Serv-Code
  - load factory setup

10.3 Parameter Menu I/O

- I/O
  - analog outputs
  - digital outputs
  - v-sensor
  - v-sensor noise
  - v-gate

10.4 Parameter Menu CAL

- CAL
  - velocity
    - min velocity: -1,0000
    - max velocity: 4,0000
    - v-correction: 1,0000
    - switch point (M/H): 0,9 m/s
  - analog outputs
    - match
    - simulation: 0
  - digital outputs
  - simulation

10.5 Parameter Menu EXTRA

- Extra
  - info (1-4)
    - (page 1)
    - (page 2)
    - (page 3)
    - (page 4)
  - unit system
    - metric — x
    - UK-english
    - US-english
  - units
    - flow rate
    - veloc.
    - total
  - display format
    - veloc.
    - total
  - language
    - Deutsch — x
    - english
    - Français
  - display
    - contrast — 50%
  - system time
    - info
    - set date
    - set time
    - set format
      - 24h — x
      - 12h
  - set total-counter — 0

11 Troubleshooting

Error	Possible Reason	Correction
No indication of flow (0)	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	Check sensor installation (towards flow direction, installation parallel to flow direction).
		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.
	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 Fig. 4-5 Type key for NFP measurement transmitter).
Display >Error Sensor<	Connection	Check cable connection. Wiring on terminal strip switched? Cables firmly connected to plugs (retighten screws, pull at cable ends)? Insulation of single wires unintentionally clamped in? Plug and socket firmly put together?
	Communication	Communication to sensor disturbed. Can be checked by selecting Menu >I/O/Doppler-Info. Sensors should be indicated in the first line of the following screen. Otherwise check as described under "Connection“.
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.

Unplausible measurement values	Hydraulically unsuitable measurement place	See "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 level signal, 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)?
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.
		In case of using 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.

12 Lists of Resistiveness

The standard materials of active pipe sensor parts with medium contact are:

- Stainless steel V4A (pipe sensor jacket)
- PPO GF30 (sensor body)
- PEEK (sensor crystal cover)

More materials which however normally do not have any medium contact:

- Polyurethane (cable sheath and glands)

The sensors are resistant to normal domestic sewages, dirt and rain water as well as mixed water from municipalities and communities. In many industrial plants (such as Bayer, BASF etc.) the resistance does not represent any problems. The sensors nevertheless are not resistant to all substances and substance mixtures.
As a basic principle, damage might occur in case of using chloride media as well as various organic solvents.
Please observe that substance mixtures (several substances being present simultaneously) under certain circumstances may cause catalytic effects which might not occur if the individual substances are in use. Due to infinitely possible combinations these catalytic effects cannot be verified entirely.
If in doubt please contact your NIVUS representative and request a free material sample for long time testing purposes.

For use in special applications with high aggressive or solvent-containing media there are sensors made of full PEEK available with sensor jacket s made of Hastelloy as well as specially coated cables.

12.1 Table of Resistiveness

MEDIUM	FORMULA	CONCEN-TRATION	HDPE	PPO GF30	PUR	PEEK	FEP	V4A
Acetaldehyde	C_2H_4O	40 %	3/3	4	4	1	(1)	(1)
Acetic acid	$C_2H_4O_2$	10 %	1/1	2	3	1	1/1	1/1
Acetic acid methylester	$C_3H_6O_2$	tech. clean	1/0	3	0	1	1/0	1/1
Aceton	C_3H_6O	40 %	1/1	4	4	1	(1)	1/1
Allyl alcohol	C_3H_6O	96 %	1/3	2	0	1	1/1	1/1
Aluminium chloride	$AlCl_3$	10 %	1/1	2	0	1	1/1	3/4
Aluminium chloride	$(NH_4)Cl$	aqueous	1/1	1	0	1	1/1	1/2L
Ammonium hydroxide	$NH_3 + H_2O$	5 %	1/1	2	4	1	1/1	1/1
Anilin	C_6H_7N	100 %	1/2	3	4	1	1/1	1/0
Benzene	C_6H_6	100 %	3/4	3/4	2	1	1/1	1/1
Benzyl alcohol	C_7H_8O	100 %	3/4	3	2	1	1/1	1/1
Boric acid	H_3BO_3	10 %	1/1	1	1	1	1/1	1/1
Bromic acid	$HBrO_3$	konz.	0/0	0	3	1	0/0	(4)
Butanol	$C_4H_{10}O$	tech. clean	1/1	2	3	1	1/1	(1)
Calcium chloride	$CaCl_2$	spirituous	1/0	1	1	1	1/1	1/2L
Chloric gas	Cl_2		4/4	3	3	1	1/1	1/0
Chloric methane	CH_3Cl	tech. clean	3/0	4	4	1	1/0	1/1L
Chlorine water	Cl_2 x H_2O		3/0	2	0	1	(1)	2/0L
Chlorobenzene	C_6H_5Cl	100 %	3/4	3	4	1	1/1	1/1
Chloroform	$CHCl_3$	100 %	3/4	4	4	1	1/1	1/1
Chromate	CrO_3	10 %	1/1	1	0	1	1/1	1/2
Diesel oil	—	100 %	1/3	2	0	1	(1)	(1)
Ethanol	C_2H_6O	96 %	1/0	1	1	1	1/1	1/1
Ethyl acetate	$C_4H_8O_2$	100 %	1/3	3	3	1	1/1	(1)
Ethylen chloride	$C_2H_4Cl_2$		3/3	4	3	1	1/1	1/1L
Ferric-(III)-chloride	$FeCl_3$	saturated	1/1	2	3	2	1/1	4/4
Formaldehyde solution	CH_2O	10 %	1/1	1	2	1	1/1	1/1
Gasoline, unleaded	C_5H_{12} - $C_{12}H_{26}$		2/3	3	2	1	1/1	1/1
Glycerol	$C_3H_8O_3$	90%	1/1	1	2	1	1/1	1/1
Heptane, n-	C_7H_{16}	90%	2/3	1	1	1	1/1	1/1
Hexane, n-	C_6H_{14}	100 %	2/3	1	2	1	1/1	1/1
Hydrofluoric acid	HF	50 %	1/1	2	3	1	1/1	4/4
Isopropanol	C_3H_8O	tech. clean	1/1	1	2	1	1/1	(1)
Magnesium chloride	$MgCl_2$	aqueous	1/1	1	2	1	1/1	1/0L
Potassium hydroxide	KHO	10 %	1/1	1	3	1	1/1	1/1
Potassium nitrate	KNO_3	aqueous	1/1	1	0	1	1/1	1/1
Methanol	CH_4O		1/1	1	2	1	1/1	1/1
Methyl benzene (toluene)	C_7H_8	100 %	3/4	3	3	1	1/1	1/1
Lactic acid	$C_3H_6O_3$	3 %	1/1	1	0	1	1/1	1/1
Mineral oil	—		1/1	1	1	1	1/1	1/1
Sodium bisulphite	$NaHSO_3$	aqueous	1/1	1	0	1	(1)	1/1
Sodium carbonate	Na_2CO_3	aqueous	1/1	1	3	1	1/1	1/1
Sodium chloride	NaCl	aqueous	1/1	1	2	1	1/1	1/2
Sodium hydroxide	NaHO	50 %	1/1	1	3	1	1/1	1/3
Sodium sulphate	Na_2SO_4	aqueous	1/1	1	0	1	1/1	1/1
Nitrobenzene	$C_6H_5NO_2$		3/4	3	4	1	1/1	1/1
Oleic acid	$C_{18}H_{34}O_2$	tech. clean	1/3	1	1	1	(1)	1/1
Oxalic acid	$C_2H_2O_4$ x $2H_2O$	aqueous	1/1	2	0	1	1/1	1/3
Ozone	O_3		3/4	2	2	1	1/1	0/0
Petroleum	—	tech. clean	1/3	3	1	1	(1)	1/1
Essential oils	—		0/0	1	1	1	(1)	1/1
Phenol	C_6H_6O	100 %	2/3	3	2	1	1/1	1/1
Phosphoric acid	H_3PO_4	85 %	1/1	1	0	1	1/1	1/3
Quicksilver-(II)-chloride	$HgCl_2$	aqueous	1/1	1	0	1	1/1	(4)
Nitric acid	HNO_3	1-10 %	1/1	1	3	1	1/1	1/1
Hydrochloric acid	HCl	1-5 %	1/1	1	3	1	1/1	4/4
Carbon disulphide	CS_2	100 %	4/4	2	0	1	1/1	1/1
Sulphuric acid	H_2SO_4	40 %	1/1	1	3	1	1/1	2/3
Ethyl alcohol	C_2H_6O	100 %	1/0	1	1	1	1/1	1/1
Carbon tetrachloride (TETRA)	CCl_4	100 %	4/4	3	4	1	1/1	1/1L
Trichloroethylene (TRI)	C_2HCl_3	100 %	3/4	4	4	1	1/1	1/1L
Citric acid	$C_6H_8O_7$	10 %	1/1	1	1	1	1/1	1/1

12.2 Resistiveness Legend

Resistiveness

There are two values per medium.
left number = value at +20 °C / right number = value at +50 °C.

- 0 no specifications available
- 1 very good resistance/suitable
- 2 good resistance/suitable
- 3 limited resistance
- 4 not resistant
- K no general specifications possible
- L risk of pitting corrosion or stress corrosion cracking
- ( ) estimated value

Material Names

- HDP high-density Polyethylene
- FEP Tetrafluorethylene-Perfluorpropylene (Teflon® FEP)
- V4A stainless steel 1.4401 (AISI 316)
- PVDF Polyvinyldifluoride
- PU Polyurethane
- PEEK Polyetheretherketone
- PPO GF30 Polyphenyloxylene with 30 % glass fibre

13 Maintenance and Cleaning

Due to using the measurement system mostly in the waste water field which may be contaminated with hazardous germs, please ensure to take respective precautions getting in contact with system, transmitter, cables and sensors.

The device Type NFP incl. accompanying flow velocity sensor is designed to be virtually maintenance-free and free of material wear and does not need to be calibrated.
If required clean the transmitter enclosure if with a dry, lint-free cloth. For heavy pollution NIVUS recommends the use of surface-active agents.
The use of abrasive cleansing agents is not allowed.
Peripheral units possibly used such as overvoltage protection devices, fuses etc. shall be inspected regularly according to intervals as determined in external maintenance directives.

If you wish to clean the enclosure surface with a damp cloth please disconnect the unit from mains before.

In heavily polluted media tending to sedimentation it may be necessary to clean the sensor regularly. To do this unscrew the sensor and remove it as soon as the pipeline is pressureless. Clean the sensor using a brush with plastic bristles and water as well as cleansing agents if required. Use a new cutting ring screw joint to subsequently screw the sensor into the nozzle again and tighten it firmly.

We recommend to use a full bore ball valve to lock the nozzle after sensor removal from pressureless filled pipelines.

No hard objects such as wire brushes, rods, scrapers or similar shall be used to clean the sensor. Cleaning by using a water jet is allowed up to a max. pressure of 4 bar (e.g. use water hose).
Using a high pressure cleaner may lead to measurement failures and thus is not allowed.

In various countries it may be necessary to carry out regular maintenance with comparative measurements in particular applications to comply with official regulations. If desired, NIVUS is going to carry out all required verifications, hydraulic and technical assessment, calibration, troubleshooting and repairs if an according maintenance agreement has been contracted. In other countries please gather information on local regulations.

14 Emergency

In case of emergency

- press the emergency-off button of the main system or
- set the slide switch (see Fig. 6-5) on the unit to OFF.

15 Dismantling/Disposal

The device shall be disposed according to the local regulations for electronic products.

16 Table of Pictures

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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:	**"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-00xxxxE… / OCF-R0xxxxE… / NFP-xxxxxxEx…**

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 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 60079-0:2012
- EN 60079-11:2012
- EN 61010-1:2010

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

EG-Baumusterprüfbescheinigung / *EC-Type Examination Certificate / Attestation d'examen «CE» de type:*

IBExU 07 ATEX 1081 (1. Ergänzung)

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

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

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

TÜV Nord CERT GmbH, Am TÜV 1, 30519 Hannover, Allemagne (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
Allemagne

abgegeben durch / *represented by / faite par:*

Marcus Fischer (Geschäftsführer / *Managing Director / Directeur général)*

Eppingen, den 20.04.2016

Gez. *Marcus Fischer*

DE / EN / FR

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EU Konformitätserklärung

EU Declaration of Conformity

Déclaration de conformité UE

Für das folgend bezeichnete Erzeugnis:

For the following product:

Le produit désigné ci-dessous:

Bezeichnung: *Description:* *Désignation:*	**Durchflussmessumformer stationär** *permanent flow measurement transmitter* *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 die nachfolgend genannten anderen technischen Spezifikationen:

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

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

- EN 61326-1:2013
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Im Taele 2
75031 Eppingen
Allemagne

abgegeben durch / *represented by / faite par:*
Marcus Fischer (Geschäftsführer / *Managing Director / Directeur général)*

Eppingen, den 20.04.2016

Gez. *Marcus Fischer*