

Technical Instructions

Extension Module NFE



Revised manual

Document revision 01 / 12.04.2019

Original Manual: German / rev. 01 as of 09.04.2019

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Important Note

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Translation

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

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Names

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Document modifications

Rev.	Modifications	Editor in charge	Date
01	Addresses updated; Document modifications added; Chapters "1.3.1 Colour code for wires and single conductors", "3 Safeguards and Precautions", "16.2 Corresponding connecting cables", "18.9.1 Cable types and assignment", "18.9.2 Permissible cable length", "18.9.3 Transmitter connection to extension module(s) (direct and indirect)" and Table 5 in chapter "18.9.4 NIC-, NIS-, NIS0 and NOS-Sensor Connection" modified	MoG	12.04.2019
00	First version based on the German document	MoG	08.06.2018

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General

1 About this manual

**Important Note**

READ CAREFULLY BEFORE USE.

KEEP IN A SAFE PLACE FOR LATER REFERENCE.

This Instruction manual is intended for the initial start-up of the unit depicted on the title page. This manual is oriented exclusively to qualified expert personnel.

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

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

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

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

Instructions on how to operate NivuFlow 600 or NivuFlow 650 transmitters as well as the connectable NOS, NIS and NIC series sensors are part of the according Instruction Manual/Technical Description.

The installation of flow velocity sensors is described in the "Installation Instruction for Transit Time Sensors". This Installation Instruction is a part of the standard sensor delivery and shall be read necessarily prior to sensor installation.

1.1 Applicable documentation

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

- Instruction Manual for Flow Measurement Transmitter NivuFlow 600 resp. NivuFlow 650
- Technical Instructions for Transit Time Sensors
- Installation Instructions for Transit Time Sensors

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

1.2 Signs and definitions used




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

Table 1 Structural elements within the manual

1.3 Abbreviations used

1.3.1 Colour code for wires and single conductors

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

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

Safety Instructions

2 Used symbols and signal words

2.1 Valuation of the accident level



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

DANGER

Warnings in high degree of risk



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

WARNING

Warnings in medium degree of risk



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

CAUTION

Warnings in low-risk or property damages



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

WARNING

Danger by electric voltage



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



Important Note

*Contains information that should be highlighted.
Indicates a potentially damaging situation which can result in a damage of the product or an object in its environment.*



Note

Contains information and facts.

2.2 Warning notices on the product (option)



General warning label

This symbol is for operators to refer to this instruction manual. Observing the information contained therein is required in order to maintain protection measured provided by the instrument during installation procedures and operation.



Protective conductor

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

3 Safeguards and Precautions

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

WARNING



Check danger through explosive gases

Prior to beginning mounting, installation and maintenance make sure to observe any regulations on safety at work as well as to check the potential risk due to explosive gases. Use a gas warner to check.

When working in the channel system make sure to avoid electrostatic charge:

- *Avoid unnecessary movements to minimise the risk of static energy accumulating.*
- *Discharge any possible static electricity from your body before you begin to install sensors.*

Disregarding may lead to personal injury or damage your equipment.

WARNING



Germ contamination

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

Wear protective clothing.

WARNING



Observe occupational safety regulations

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

Disregarding may lead in personal injury.

WARNING



Do not disable safety devices

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

Disregarding may lead in personal injury.

WARNING



Disconnect the systems from mains

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

Disregarding may lead to electric shocks.



Putting into operation by trained experts only

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

Integrated buffer battery

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

4 Liability disclaimer

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

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

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

Operate the transmitter only in technically perfect working order.

Improper Use

Not being operated in accordance with the requirements may impair the safety. The manufacturer is not responsible for failures resulting from improper use.

5 Use in accordance with the requirements



Note

The instrument is intended solely for the purpose described below.

Modifying or using the instruments for any other purposes without the manufacturer's written consent will not be considered as use in accordance with the requirements.

The manufacturer cannot be held responsible for any damage resulting from improper use. The user alone bears any risk.

The extension module is used to extend the signal paths between series NOS, NIS and NIC flow velocity sensors and the NivuFlow types 600 and 650 transmitters.

The unit is equipped with active components used to convert and amplify sensor signals and therefore must be powered by an active supply voltage.

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

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

6 User's Responsibilities



Important Note

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

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

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

Connections

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

7 Personnel requirements

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

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



Qualified personnel

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

- I. Training, instruction or authorisation to activate/deactivate, isolate, ground, and mark electric circuits and devices/systems according to the safety engineering standards.*
- II. Education and instruction according to the standards of safety engineering regarding the maintenance and use of adequate safety equipment*
- III. First aid training*

Delivery, storing and transport

8 Delivery

The standard delivery of the extension module NFE contains:

- Extension module NFE
- 2x worm drive clamps, clamping range \varnothing 34...82 mm
- 10x locking bolts, \varnothing 9 mm, length 30 mm
- 2x anchor bolts, FAZ 6/10A4
- The Technical Instructions including the certificate of conformity. It contains any relevant information on how to operate the device.

Check additional accessories (e. g. connecting cable) depending on your order and according to the delivery note.

9 Reception inspection

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



Important note

Mistakes cannot be rectified later.

10 Storing

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

11 Transport

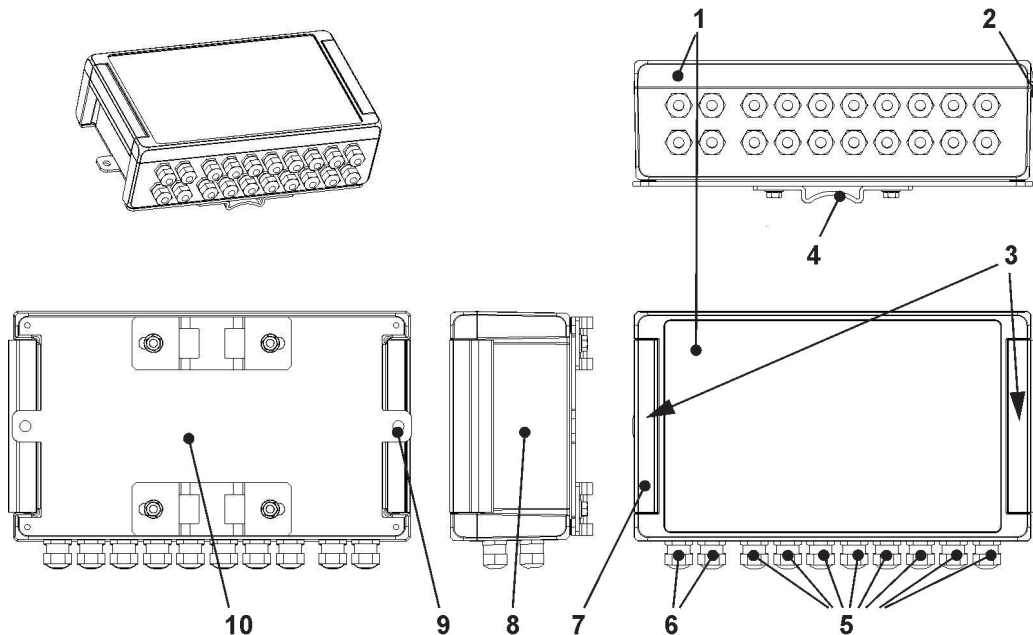
Do not expose the system to heavy shocks or vibrations. Use the original packaging for transport.

12 Return

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

Product specification

13 Overview



- 1 Enclosure cover
- 2 Cover hinge (2 parts; can be mounted on left or right side)
- 3 Screws for fixation of cover on enclosure (below latches)
- 4 Clamps for pipe mounting, clamping range \varnothing 35...80 mm
- 5 16x cable gland M16x1,5 or dummy plugs for connection of sensors
- 6 4x cable gland M16x1,5 or dummy plugs for connection of transmitter
- 7 Latch
- 8 Enclosure
- 9 Hole for fixation on wall
- 10 Rear wall

Fig. 13-1 Overview

14 Device identification

The instructions contained within this manual are valid only for the type of device specified on the title page. The name plate is fixed on top of the enclosure and contains the following:

- Name and address of the manufacturer
- CE label
- Serial and type ID incl. article number and serial number
- Year of manufacture: the first four digits of the serial number represent the year and the week number of manufacture (1915 NFE

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

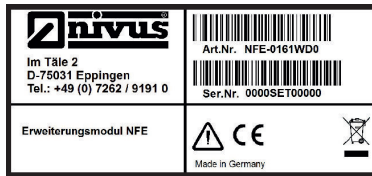


Fig. 14-1 NFE-Set nameplate (same for all NFE within ordered set)

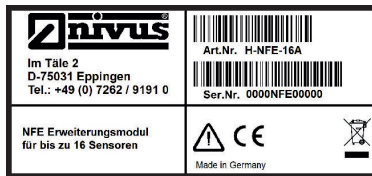


Fig. 14-2 NFE A, B, C or D nameplate (individual for each NFE within set)



Check the nameplates

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

Check the nameplates for correct specification of the power supply (part of the article no.).



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

15 Specifications

Power supply	12 V DC, $\pm 15\%$ (from transmitter NF 6xx)
Power consumption	Typ. 1 W
Enclosure	Material: Aluminium Weight: approx. 3.100 g
Protection	IP68 (1.2 m depth / 2 hrs.)
Operating conditions	Protection class I Pollution degree 2
Operating temperature	-20 °C...+65 °C
Storage temperature	-30 °C...+70 °C
Max. humidity	80 %, non-condensing
Flow velocity sensors	Up to 16x Type NOS, NIS and NIC
Data circuits	RS485 galvanically connected to sensor circuit $U_s \leq 5\text{ V}$

Table 2 Specifications

Flow measurement transmitter

Construction and description of the according flow transmitters as well as the respective specifications can be taken from the accompanying instruction manuals.

Sensors

Construction and description of the according sensors as well as the respective specifications can be taken from the accompanying instruction manuals or technical descriptions.

16 Configuration

16.1 Device Types

The NFE extension modules are available in different versions. The tables below provide an overview on the different device versions.
The devices vary in terms of connectable transmitters and the number of connectable sensors and therefore the number of linked extension modules.
The current type of device is indicated by the article number, which can be found on a weatherproof label on the enclosure.
From this article key the type of device can be specified.

NFE-	Extension modules		
	Device		
	0	for NivuFlow 600	
	5	for NivuFlow 650	
	Paths/Construction		
	081W	1 extension module to connect up to 8 sensors (4 acoustic paths); construction: field enclosure	
	082W	2 extension modules to connect up to 16 sensors (8 acoustic paths); construction: field enclosure	
	084W	4 extension modules to connect up to 32 sensors (16 acoustic paths); construction: field enclosure	
	161W	1 extension module to connect up to 16 sensors (8 acoustic paths); construction: field enclosure	
	162W	2 extension modules to connect up to 32 sensors (16 acoustic paths); construction: field enclosure	
	164W	4 extension modules to connect up to 64 sensors (32 acoustic paths); construction: field enclosure	
	Power supply		
	D0	12 V DC	
NFE-			D0

Table 3 Type key for extension modules NFE

16.2 Corresponding connecting cables

Special connection cables are required to connect the extension modules to NivuFlow 600 and NivuFlow 650 flow meters and to interconnect the extension modules with each other. **One connection cable** (supply, communication and signal in all) is required **per extension module**.

NFE0 COMC Connecting cable from measurement transmitter to one NFE resp. between the NFEs

		Cable length
	001	Less than 1 m
	010	1x 10 m
	030	1x 30 m
	050	1x 50 m
	100	1x 100 m
	150	1x 150 m
	200	1x 200 m
NFE0 COMC		

Table 4 Type key for the connecting cables

Installation and Connection

17 General Installation Instructions

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

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.

18 Installation and Connection



Important hints on installation

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

18.1 General

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

- Direct sunlight (use weatherproof cover if necessary)
- Heat emitting objects (max. ambient temperature see chapter “15 Specifications”)
- Objects with strong electromagnetic fields (e. g. frequency converters or similar)
- Corrosive chemicals or gas
- Mechanical shocks
- Installation close to footpaths or travel ways
- Vibrations
- Radioactive radiation

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

18.2 Enclosure Dimensions

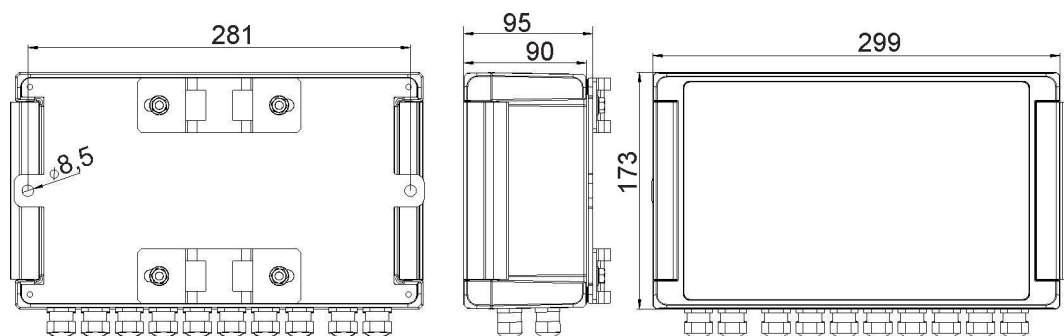


Fig. 18-1 Enclosure

18.3 Hints on how to avoid electrostatic discharge (ESD)

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

WARNING



Disconnect the unit from mains power

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

Disregarding may lead to electric shocks.

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

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

18.4 Opening and Closing the Extension Module

Opening

1. Open lateral latches (Fig. 13-1 no. 7) on extension module (possibly by using a slot screwdriver).
2. Unscrew both screws (Fig. 13-1 no. 3) underneath the latches provided the screws are tightened.
3. Open cover.

Closing

1. Make sure the cover gasket is free of dirt and foreign materials.
2. Close cover.
3. Tighten both screws (Fig. 13-1 no. 3) underneath the latches firmly.
4. Lock lateral latches (Fig. 13-1 no. 7) on extension module.

18.5 Changing the Hinge Side

The cover hinge is fastened on the left-hand side on delivery unless ordered otherwise. This can be changed, however, with little effort.

1. Open cover as described in chapter 18.4.
2. On the hinge side unscrew the four Torx screws used to fasten the hinge. Remove both parts of the hinge and put the cover aside.
3. Remove the small tin plate (cover stop) on the other side of the housing by unscrewing both Torx screws.
4. Fasten the small tin sheet to the other side of the housing by carefully tightening both Torx screws.
Due to the construction and to avoid damages use merely low torque.

5. Fasten the hinge (both parts assembled) to cover and housing by carefully tightening the four Torx screws.
6. Close the cover as described in chapter 18.4.

18.6 Fastening the Extension Module



Front panel

Do not remove the front panel (Fig. 18-6, Fig. 18-7) (above circuit board).

Tightness of the terminal housing

Lock the terminal compartment of the enclosure using the cover, both screws and the lateral latches to prevent the ingress of water or dirt.

Fastening Options

The extension module can be either fastened on a tube/mounting stand (Ø 35...80 mm) or on walls.

- **Tube mounting** requires using the clamps on the rear side of the module as well as both accompanying worm drive clamps.
- For **wall mounting** use the Ø 8.5 mm drill holes on the rear side of the module as well as both accompanying anchor bolts.



Installation Direction

For both fastening options observe that both cable ducts face downward.

General

To guarantee the IP68 protection class (1.2 m depth / 2 hrs.) unused cable ducts shall be locked using the accompanying locking bolts prior to commissioning. Moreover, both screws (Fig. 13-1 no. 3) shall be tightened firmly and the latches (Fig. 13-1 no. 7) shall be locked.

18.7 Possible Connection Configurations

18.7.1 Using 1 Extension Module

When only one NFE is used all sensor pairs are connected to this NFE.

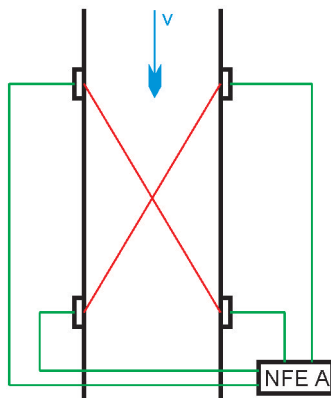


Fig. 18-2 Connection configuration for 1 NFE

18.7.2 Using 2 Extension Modules



Labelling of extension modules

When using two extension modules each module can be identified as "A" or "B" by the last digit of the article number as shown in "NFE A, B, C or D nameplate (individual for each NFE in the set)" (Fig. 14-2).

2 NFEs lengthwise

In this configuration all sensors **along the flow direction** are connected to one NFE and all sensors **against the flow direction** are connected to the other NFE.

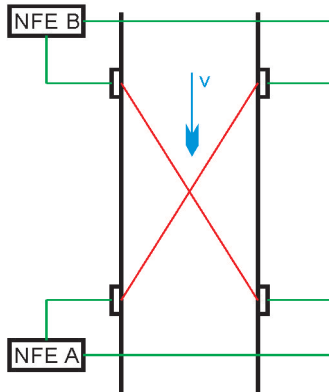


Fig. 18-3 Connection configuration for 2 NFEs lengthwise

2 NFEs crosswise

In this configuration all sensor pairs (independent from flow direction) installed on the **left side of the channel** are connected to the NFE mounted left and all sensor pairs on the **right side of the channel** are connected to the NFE mounted right.

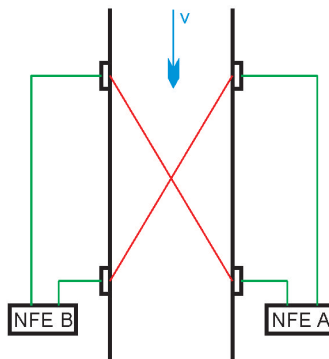


Fig. 18-4 Connection configuration for 2 NFEs crosswise

18.7.3 Using 4 Extension Modules



Labelling of extension modules

When using four extension modules each module can be identified as "A", "B", "C" or "D" by the last digit of the article number as shown in "NFE A, B, C or D nameplate (individual for each NFE in the set)" (Fig. 14-2).

This configuration combines the "2 NFEs crosswise" and "2 NFEs lengthwise" configurations with each other. Here, the sensors on the **right side towards** the flow direction are connected to one NFE, the sensors on the **left side towards** the flow direction to a second NFE, sensors on the **right side along** the flow direction to a third NFE and sensors on the **left side along** the flow direction to a fourth NFE.

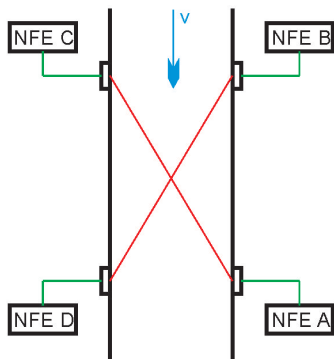
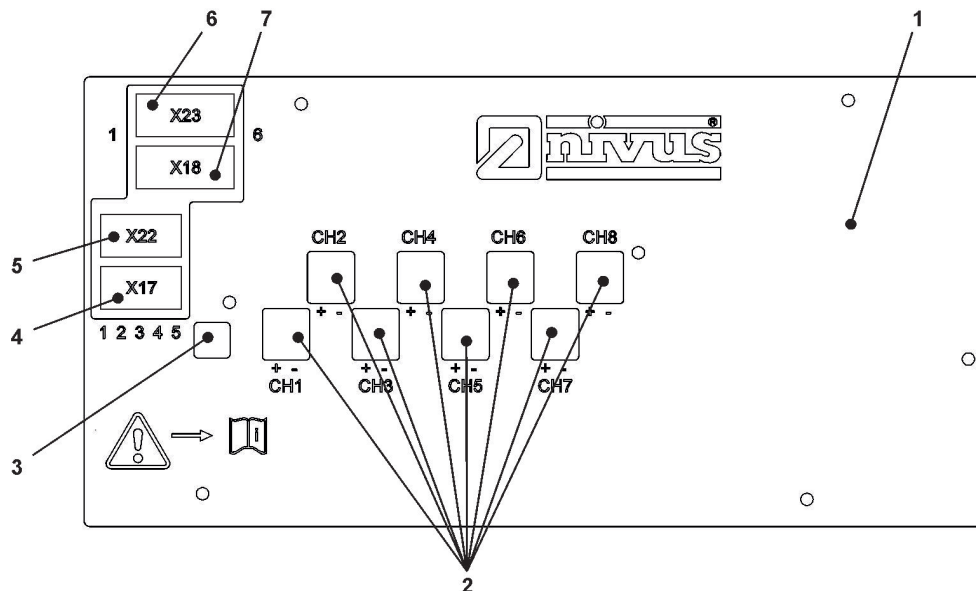


Fig. 18-5 Connecting 4 NFEs

18.8 Front Plate Layout

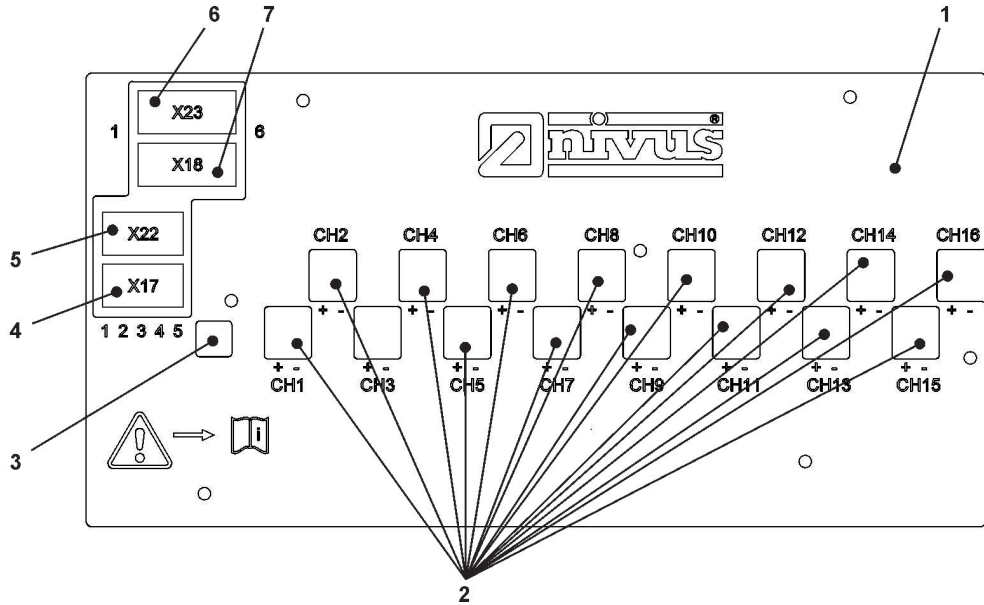
Depending on the device version the extension modules are either equipped for 4 paths or for 8 paths and hence vary in terms of the front plate layout.



- 1 Front plate for max. 4 paths
- 2 Clamps CH1 to CH8
- 3 Slide switch ON/OFF / termination resistor
- 4 Connection X17 for power supply and to control the NFE via the transmitter
- 5 Connection X22 for power supply and to control the next NFE

- 6 Connection X23 for signal transmission between both NFEs
- 7 Connection X18 for signal transmission between NFEs and transmitter

Fig. 18-6 Front plate for 4 paths



- 1 Front plate for max. 8 paths
- 2 Clamps CH1 to CH16
- 3 Slide switch ON/OFF / termination resistor
- 4 Connection X17 for power supply and to control the NFE via the transmitter
- 5 Connection X22 for power supply and to control the next NFE
- 6 Connection X23 for signal transmission between both NFEs
- 7 Connection X18 for signal transmission between NFEs and transmitter

Fig. 18-7 Front plate for 8 paths

18.9 Electrical Installation

18.9.1 Cable types and assignment

Transmitter and NFE extension modules are connected using one combined cable.

Supply and communication:

- NFE power supply 12 V DC
- Data communication with NFE via RS485 interface
- Colours of conductor: red, blue, green and white

Signal:

- Special configuration for transmission of analog sensor signals
- One conductor pair for transmission (Pulse); conductor colours: brown and white
- One conductor pair for reception (Receive); conductor colours: yellow and white

18.9.2 Permissible cable length



Limited total length of cable bundle

The maximum total cable length between the transmitter and the last sensor within a bundle is 300 m.

*The total length **includes** a possible daisy chain from NFE to NFE.*

Between extension module and sensors

- Cable length: max. 100 m
- Cable type: the appropriate sensors are delivered including the connected cables

Between extension module and transmitter

- Cable length: max. 200 m
 - for a configuration with 4 NFEs both (cable)sections 1 and 2 must be added: section 1 (transmitter to first NFE) + section 2 (first NFE to second NFE)
- Cable type: use connecting cable, Type NFE0 COMC

18.9.3 Transmitter connection to extension module(s) (direct and indirect)



Important Note

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

WARNING



Disconnect the unit from mains power

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

Disregarding may lead to electric shocks.

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



Front panel

Do not remove the front panel (Fig. 18-6) (above circuit board).

Tightness of the terminal housing

Lock the enclosure by using the cover, both screws as well as the lateral latches to prevent the terminal compartment from the ingress of water or dirt water and dirt.

The conductors for **supply and communication** are connected to connection X2 (clamps 11...15) of the transmitter (12 V DC).

For mounting and connection provide **appropriate junction terminals** (e. g. terminal blocks) for configurations utilising two or four extension modules in order to connect the required supply and communication wires electrically parallel.

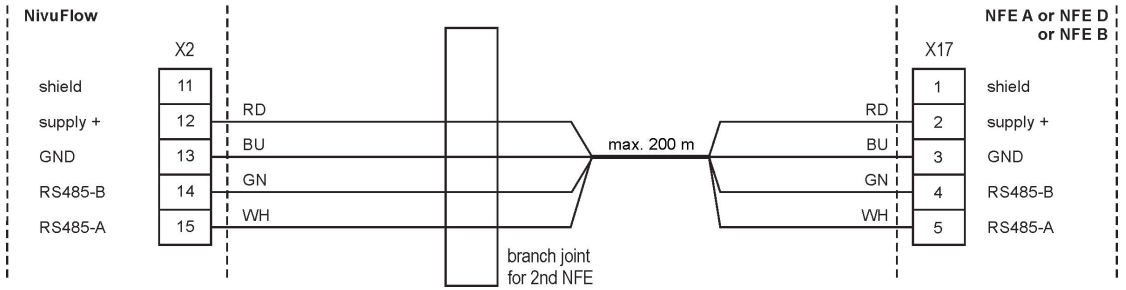


Fig. 18-8 Connection NivuFlow supply to NFE A or NFE D

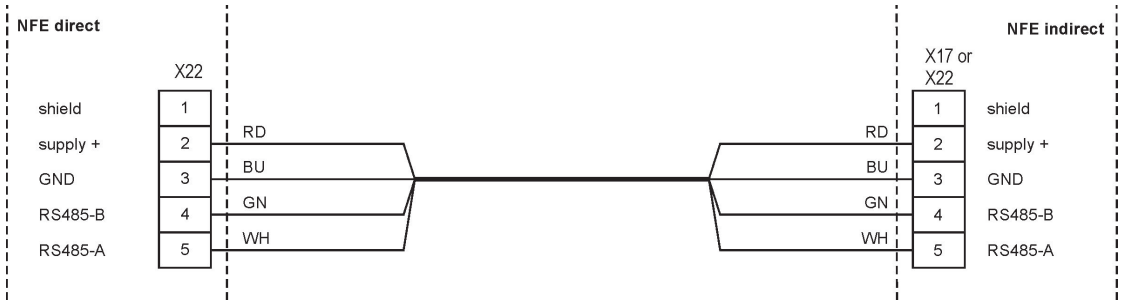


Fig. 18-9 Connection NFE supply directly to NFE indirect

The **signal conductors** of two extension modules can be connected to the X3 connection of the transmitter:

- Signal cable from NFE A according to Fig. 18-10 to connection X3 (clamps 6...11) of transmitter
- Signal cable from NFE B (if using two NFEs) according to Fig. 18-11 to connection X3 (clamps 12...17) of transmitter

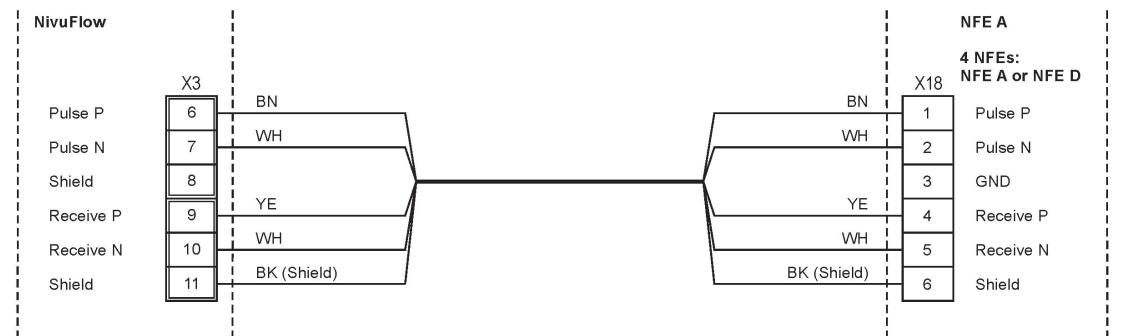


Fig. 18-10 Connection signal transmission NivuFlow - NFE

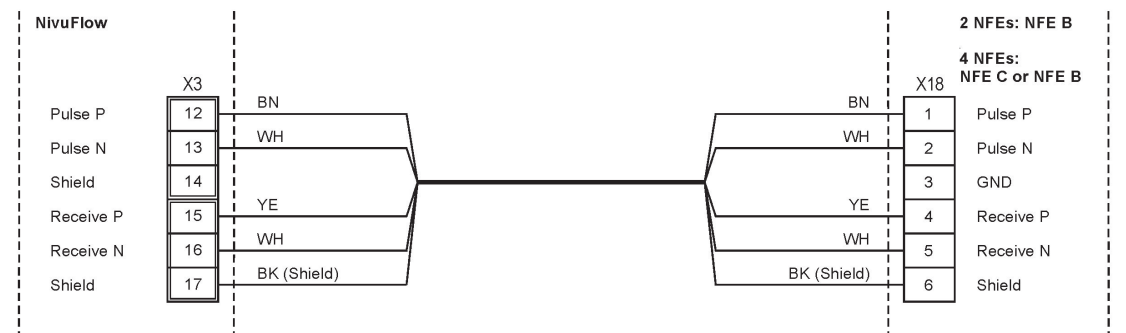


Fig. 18-11 Connection signal transmission NivuFlow - NFE

Connecting four NFEs

If **four NFEs** are used (for max. 64 sensors or 32 paths) the NFEs B and D are **looped through** both directly connected NFEs A and C:

- Connection X23 (NFEs A and C) to connection X18 (NFEs B and D)

Positioning and cable routing when using four NFEs

Position the four NFEs according to Fig. 18-5.

The **signal conductors** can be routed in two ways, preferably (depending on application) using the shorter version (see also Fig. 18-12):

- Version 1:
Signal from transmitter to NFE A and NFE C;
from NFE A to NFE B
from NFE C to NFE D
- Version 2:
Signal from transmitter to NFE D and NFE B;
from NFE D to NFE C
from NFE B to NFE A



Identical length of signal transmission conductors for transit time measurement

For two NFEs:

The cable lengths between transmitter and the directly connected NFEs must be **identical**.

For four NFEs:

The cable lengths (L1) and the directly connected NFEs must be **identical**.

AND

The cable lengths (L2) between the direct and indirect NFEs must be **identical**.

BUT: The cable lengths from the transmitter to the NFEs (L1) or from the connections between direct and indirect NFEs (L2) may **vary**.

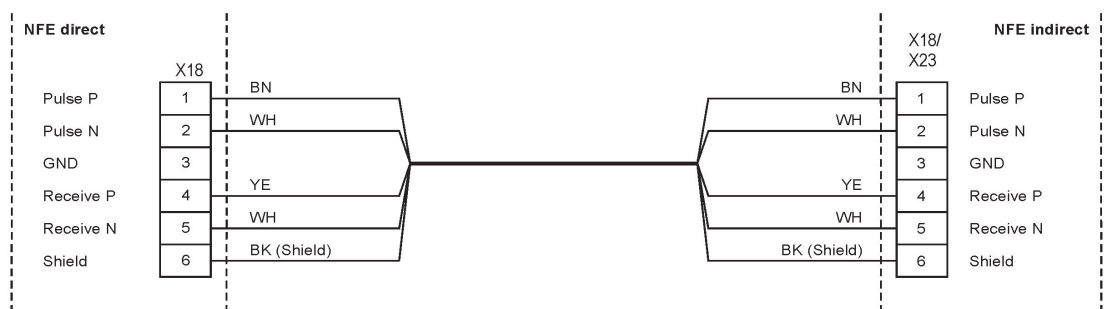


Fig. 18-12 Connection signal transmission NFE direct to NFE indirect

Supply and communication cables shall be laid parallel to the signal cables if possible by using appropriate junction terminals (e. g. terminal blocks).

Identical lengths are not required, the cables, however, should be as short as possible.

18.9.4 NIC-, NIS-, NIS0 and NOS-Sensor Connection

WARNING



Disconnect the unit from mains power

Always disconnect the measurement system from mains prior to connecting any sensors.
Disregarding may lead to electric shocks.



Identical cable lengths for sensor pairs

For sensor pairs belonging together it is mandatory to use identical cable lengths to connect to the related extension modules.

The cables shall **not** be shortened or extended.

Excess cable can be stored e. g. as cable reel in the control cabinet of the measurement system.

Sensor cable structure

The sensors to be connected to the extension modules are equipped with a special sensor cable. The cable consists of two transparent signal wires with coppery and silver-coloured core (Fig. 18-13).

Uncover the cable shield by removing the transparent isolation tape according to the following procedure. It serves a direct shield via the metal cable glands of the extension module.

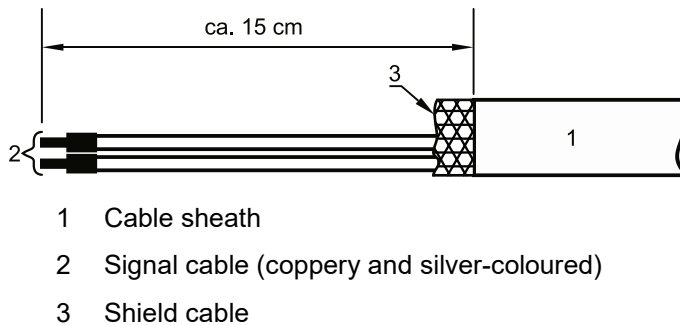


Fig. 18-13 Sensor cable structure

Preparation and Connection of Sensor Cables

The sensor cables are connected to the extension modules via connectors in the terminal clamp compartment.

1. Open the enclosure according to chapter "18.4 Opening and Closing the Extension Module".
2. Unscrew the cable gland from the extension module. Observe spatial proximity to the according connector (see Fig. 13-1, Fig. 18-6 and Fig. 18-7).
3. Remove sleeve nut from the cable gland sleeve.
4. Remove adhesive tape from the sensor cable/cable shield carefully.

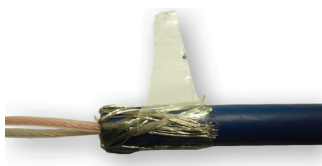


Fig. 18-14 Adhesive tape on sensor cable/cable shield

5. Push the sensor cable through sleeve nut and cable gland sleeve made of metal and rubber.
6. Insert the sensor cable with the cable gland sleeve into the cable duct of the extension module.



Observe the position of the cable shield

Before tightening the cable gland make sure to place the cable shield entirely underneath the metal sleeve.

In case of disregarding the shielding cannot be guaranteed.

7. Position the shield of the sensor cable right on the inner side of the cable gland and attach the cable gland from the outside.



Fig. 18-15 Sensor cable with cable gland sleeve

8. Connect the sensor cable to the terminal strip (possibly using a screwdriver as aid) according to the connection diagram (Fig. 18-16 to Fig. 18-19).
9. Tighten the cable gland on the outside to fasten the sensor cable.
10. Repeat the previous steps the same way for all sensors to connect.
11. Set slide switch (Fig. 18-6 no. 3 or Fig. 18-7 no. 3) to position ON or OFF:
 - configuration 1 NFE, 2 NFEs lengthwise/crosswise: all NFEs to position ON
 - configuration 4 NFEs: directly connected NFEs to position OFF and indirectly connected NFEs to position ON
12. Close the enclosure according to chapter "18.7.1 Using 1 Extension Module".

Sensor Connection Diagrams

The connection of possible sensors is basically identical, varying only if several extension modules are to be used instead of a single one.

Overview on possible sensor connection configurations

Path No.	Sensor		Connection			
	No.	Direction	1 NFE	2 NFEs lengthwise	2 NFEs crosswise	4 NFEs
1	S1.1	Upstream Looking	A_CH1	A_CH1	A_CH1	A_CH1
	S1.2	Downstream Looking	A_CH2	B_CH1	B_CH1	C_CH1
2	S2.1	Upstream Looking	A_CH3	A_CH2	B_CH2	D_CH1
	S2.2	Downstream Looking	A_CH4	B_CH2	A_CH2	B_CH1
3	S3.1	Upstream Looking	A_CH5	A_CH3	A_CH3	A_CH2
	S3.2	Downstream Looking	A_CH6	B_CH3	B_CH3	C_CH2
4	S4.1	Upstream Looking	A_CH7	A_CH4	B_CH4	D_CH2
	S4.2	Downstream Looking	A_CH8	B_CH4	A_CH4	B_CH2
5	S5.1	Upstream Looking	A_CH9	A_CH5	A_CH5	A_CH3
	S5.2	Downstream Looking	A_CH10	B_CH5	B_CH5	C_CH3
6	S6.1	Upstream Looking	A_CH11	A_CH6	B_CH6	D_CH3
	S6.2	Downstream Looking	A_CH12	B_CH6	A_CH6	B_CH3
7	S7.1	Upstream Looking	A_CH13	A_CH7	A_CH7	A_CH4
	S7.2	Downstream Looking	A_CH14	B_CH7	B_CH7	C_CH4

Path No.	Sensor		Connection			
	No.	Direction	1 NFE	2 NFES lengthwise	2 NFES crosswise	4 NFES
8	S8.1	Upstream Looking	A_CH15	A_CH8	B_CH8	D_CH4
	S8.2	Downstream Looking	A_CH16	B_CH8	A_CH8	B_CH4
9	S9.1	Upstream Looking	-	A_CH9	A_CH9	A_CH5
	S9.2	Downstream Looking	-	B_CH9	B_CH9	C_CH5
10	S10.1	Upstream Looking	-	A_CH10	B_CH10	D_CH5
	S10.2	Downstream Looking	-	B_CH10	A_CH10	B_CH5
11	S11.1	Upstream Looking	-	A_CH11	A_CH11	A_CH6
	S11.2	Downstream Looking	-	B_CH11	B_CH11	C_CH6
12	S12.1	Upstream Looking	-	A_CH12	B_CH12	D_CH6
	S12.2	Downstream Looking	-	B_CH12	A_CH12	B_CH6
13	S13.1	Upstream Looking	-	A_CH13	A_CH13	A_CH7
	S13.2	Downstream Looking	-	B_CH13	B_CH13	C_CH7
14	S14.1	Upstream Looking	-	A_CH14	B_CH14	D_CH7
	S14.2	Downstream Looking	-	B_CH14	A_CH14	B_CH7
15	S15.1	Upstream Looking	-	A_CH15	A_CH15	A_CH8
	S15.2	Downstream Looking	-	B_CH15	B_CH15	C_CH8
16	S16.1	Upstream Looking	-	A_CH16	B_CH16	D_CH8
	S16.2	Downstream Looking	-	B_CH16	A_CH16	B_CH8
17	S17.1	Upstream Looking	-	-	-	A_CH9
	S17.2	Downstream Looking	-	-	-	C_CH9
18	S18.1	Upstream Looking	-	-	-	D_CH9
	S18.2	Downstream Looking	-	-	-	B_CH9
19	S19.1	Upstream Looking	-	-	-	A_CH10
	S19.2	Downstream Looking	-	-	-	C_CH10
20	S20.1	Upstream Looking	-	-	-	D_CH10
	S20.2	Downstream Looking	-	-	-	B_CH10
21	S21.1	Upstream Looking	-	-	-	A_CH11
	S21.2	Downstream Looking	-	-	-	C_CH11
22	S22.1	Upstream Looking	-	-	-	D_CH11
	S22.2	Downstream Looking	-	-	-	B_CH11
23	S23.1	Upstream Looking	-	-	-	A_CH12
	S23.2	Downstream Looking	-	-	-	C_CH12
24	S24.1	Upstream Looking	-	-	-	D_CH12
	S24.2	Downstream Looking	-	-	-	B_CH12
25	S25.1	Upstream Looking	-	-	-	A_CH13
	S25.2	Downstream Looking	-	-	-	C_CH13
26	S26.1	Upstream Looking	-	-	-	D_CH13
	S26.2	Downstream Looking	-	-	-	B_CH13
27	S27.1	Upstream Looking	-	-	-	A_CH14
	S27.2	Downstream Looking	-	-	-	C_CH14
28	S28.1	Upstream Looking	-	-	-	D_CH14
	S28.2	Downstream Looking	-	-	-	B_CH14
29	S29.1	Upstream Looking	-	-	-	A_CH15
	S29.2	Downstream Looking	-	-	-	C_CH15
30	S30.1	Upstream Looking	-	-	-	D_CH15
	S30.2	Downstream Looking	-	-	-	B_CH15
31	S31.1	Upstream Looking	-	-	-	A_CH16
	S31.2	Downstream Looking	-	-	-	C_CH16
32	S32.1	Upstream Looking	-	-	-	D_CH16
	S32.2	Downstream Looking	-	-	-	B_CH16

Table 5 Possible sensor connection configurations

When a **single NFE** is used, connect the sensor **against the flow direction** of sensor pair 1 to terminal CH1 and the sensor **along the flow direction** to terminal CH2. Then connect the second sensor pair to CH3 and CH4, the third sensor pair to CH5 and CH6 and so forth.

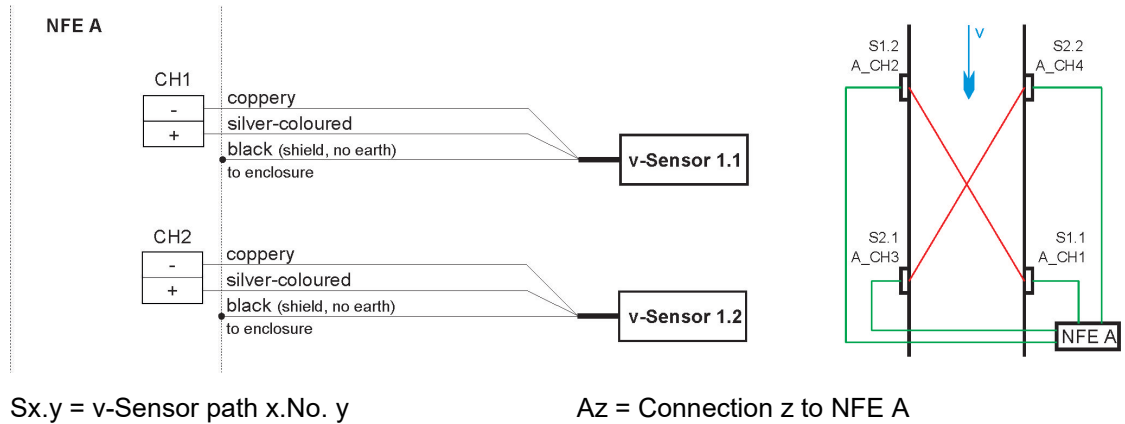


Fig. 18-16 Sensor connection diagram for single NFE

When using **two or four NFEs** connect each sensor pair to the clamps with the same identification on different NFEs. Both sensors to CH1, to CH2, CH3 and so forth.

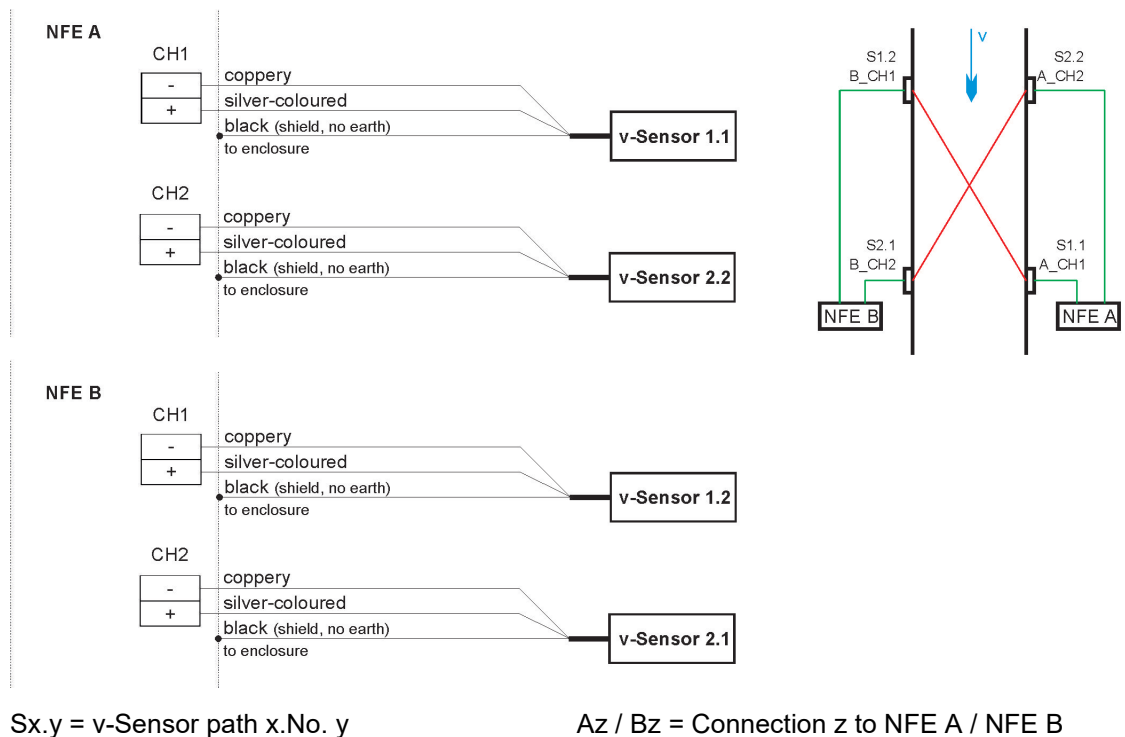


Fig. 18-17 Sensor connection diagram paths 1 and 2 with two NFEs (crosswise)

Connect all paths up to path 8 (NFE 8 sensor version) or up to path 16 (NFE 16 sensor version) according to the previous examples (Fig. 18-17) (see also Table 5).

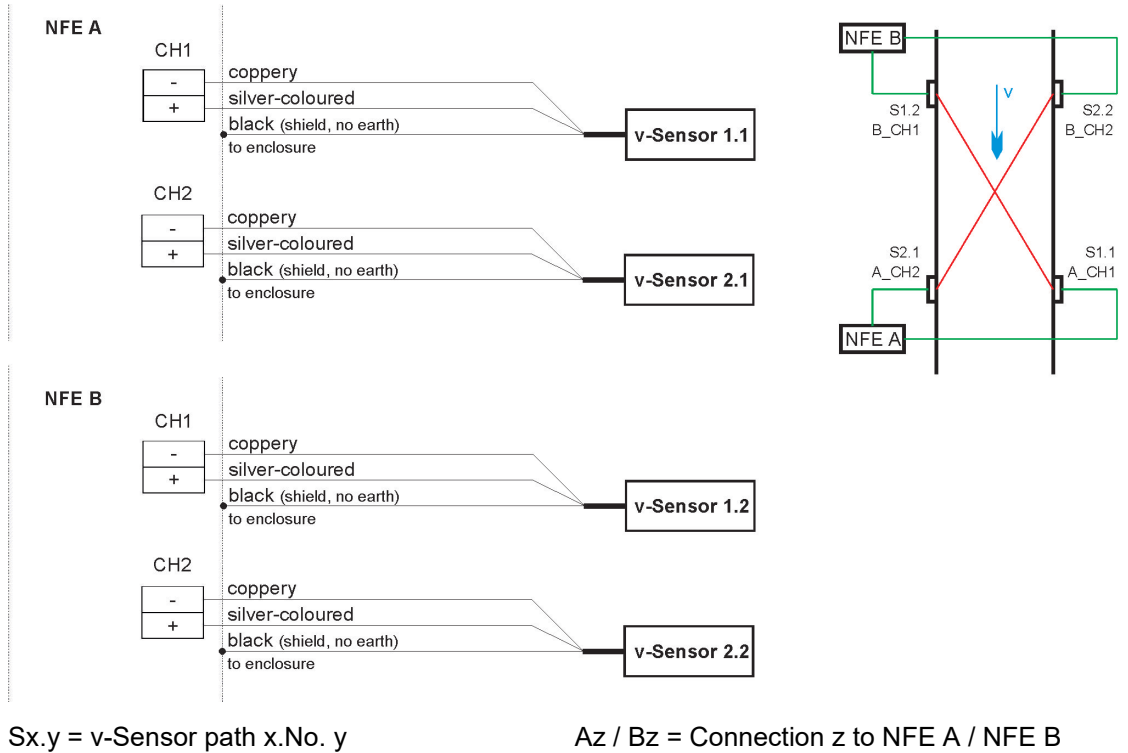


Fig. 18-18 Sensor connection diagram paths 1 and 2 with two NFEs (lengthwise)

Connect all paths up to path 8 (NFE 8 sensor version) or up to path 16 (NFE 16 sensor version) according to the previous examples (Fig. 18-18) (see also Table 5).

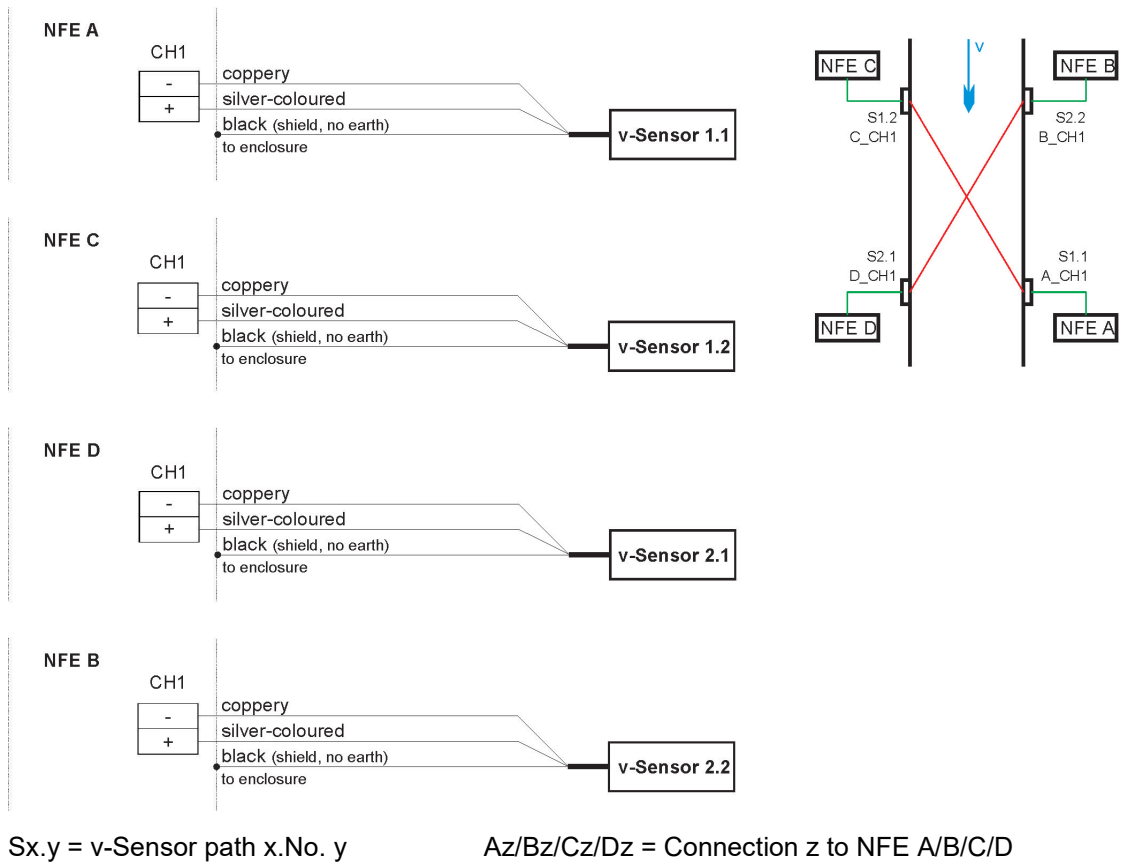


Fig. 18-19 Sensor connection diagram paths 1 and 2 with four NFEs

Connect all paths featuring uneven path numbers (1, 3, 5....) up to path 15 (NFE 8 sensor version) or up to path 31 (NFE 16 sensor version) to NFE A and NFE C according to the previous examples (Fig. 18-19) (see also Table 5).

Connect all paths featuring even path numbers (2, 4, 6...) up to path 16 (NFE 8 sensor version) or up to path 32 (NFE 16 sensor version) to NFE D and NFE B (see also Table 5).

Initial start-up

19 Notes to the user



Required documentation

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

- *Instruction Manual for Flow Measurement Transmitter NivuFlow 600 resp. NivuFlow 650*
- *Technical Instructions for Transit Time Sensors*
- *Installation Instructions for Transit Time Sensors*

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

Before connecting and operating the extension module the instructions below shall be followed.

This Technical Description contains any information relevant for connection and operation of the Extension Module.

The manual is intended for qualified personnel. Appropriate knowledge in the areas of measurement systems, automation technology, control engineering, information technology and wastewater hydraulics are preconditions for putting the NIVUS extension module into operation.

Read this instruction manual carefully in order to guarantee proper function of the extension module.

The NFE shall be wired according to chapter "18.9 Electrical Installation".

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

- +49 (0) 7262 9191 955

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

20 General

The entire measurement system shall not be put into operation before the installation has been finished and checked. It is required to thoroughly familiarise with the instruction manual prior to initial start-up.

After connecting transmitter and sensors, the parameters of the measurement place must be set according to the instruction manual by using the transmitter.

Maintenance and Cleaning

WARNING**Disconnect instrument from mains**

Disconnect the instrument from mains power and safeguard the higher system against restart before you begin maintenance works.

Disregarding may lead to electric shocks.

WARNING**Check danger through explosive gases**

Prior to beginning mounting, installation and maintenance make sure to observe any regulations on safety at work as well as to check the potential risk due to explosive gases. Use a gas warner to check.

When working in the channel system make sure to avoid electrostatic charge:

- Avoid unnecessary movements to minimise the risk of static energy accumulating.
- Discharge any possible static electricity from your body before you begin to install sensors.

Disregarding may lead to personal injury or damage your equipment.

WARNING**Contamination by hazardous germs**

Due to being frequently used in wastewater applications, some portions of the measurement system may be loaded with hazardous germs. This is why precautionary measures shall be taken while being in contact with the system, cables and sensors.

Wear protective clothing.

21 Maintenance

21.1 Maintenance interval

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

NIVUS recommends having the entire measurement system inspected by the NIVUS customer service **once per year**.

Depending on the area of use the maintenance intervals however may vary.

Extent and intervals of maintenance depend on the following conditions:

- Measurement principle of the sensors
- Material wear
- Measurement medium and channel hydraulics
- General regulations for the operator of this measurement plant
- Ambient conditions

NIVUS recommends having the measurement system completely be inspected by the manufacturer **after latest ten years**.

Generally the verification of instruments and sensors is a basic measure in order to improve operational reliability and to increase the lifetime.

21.2 Customer Service Information

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

NIVUS GmbH – Customer Service

Phone +49 (0) 7262 9191 922

Customercenter@nivus.com

22 Cleaning

22.1 Extension module

WARNING



Disconnect instrument from mains

Disconnect the instrument from mains power before cleaning.

Disregarding may lead to electric shock.

Clean the extension module enclosure if required using a dry, lint-free cloth. For stubborn dirt the enclosure can be cleaned using a damp cloth. Do not use sharp cleansing agents or solvents. Light household cleaners or soapy water can be used.

22.2 Sensors and Transmitter

The hints on how to maintain and clean the sensors and the transmitter shall be necessarily observed. These hints can be found in the Technical Instruction and/or the Instructor Manual.

23 Dismantling/Disposal

Improper disposal may be harmful to the environment.

➡ Always dispose equipment components and packaging materials according to applicable local regulations on environmental standards for electronic products:

1. Disconnect the unit from mains power.
2. Use appropriate tools to remove the connected cables from the rear side of the instrument.
3. Remove the extension module from the fastening stake/fastening plate.
4. Remove the buffer battery and make sure that the buffer battery will be disposed of separately.



EC WEEE-Directive logo

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

24 Installation of spare parts and parts subject to wear and tear

We herewith particularly emphasise that replacement parts or accessories not supplied by NIVUS moreover are not certified and approved by NIVUS too. Installation and/or the use of such products hence may negatively influence predetermined constructional characteristics of the measurement system or even lead to instrument failures. NIVUS cannot be held responsible for any damage resulting due to the use of non-original parts and non-original accessories.

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Approvals and Certificates

DE / EN / FR

EU Konformitätserklärung

EU Declaration of Conformity

Déclaration de conformité UE

Für das folgend bezeichnete Erzeugnis:

For the following product:

Le produit désigné ci-dessous:



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

Bezeichnung:	Erweiterungsmodule
<i>Description:</i>	<i>extension modules</i>
<i>Désignation:</i>	<i>modules d'extension</i>
Typ / Type:	NFE-...

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
- 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

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 Täle 2
75031 Eppingen
Allemagne

abgegeben durch / *represented by / faite par:*

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

Eppingen, den 27.04.2018

Gez. *Marcus Fischer*

UK Declaration of Conformity

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

For the following product:

Description:	Extension modules
Type:	NFE-...

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

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

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

- BS EN 61326-1:2013

This declaration is submitted on behalf of the manufacturer:

NIVUS GmbH
Im Taele 2
75031 Eppingen
Germany

represented by:

Ingrid Steppe (Managing Director)

Eppingen, 20/10/2022

Signed by *Ingrid Steppe*