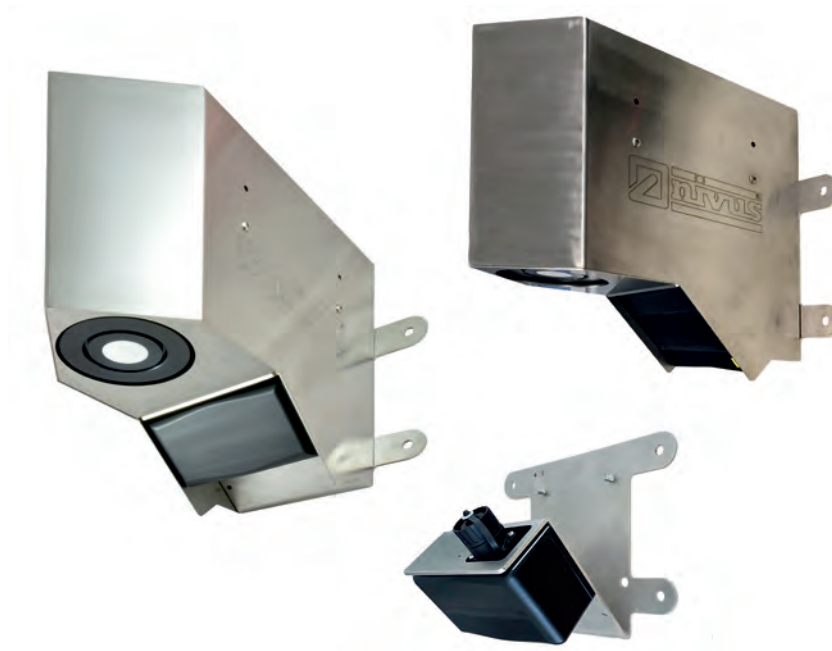


Technical Description / Mounting Instruction for OFR Radar Sensors



Revised Instruction Manual

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measure analyse optimise

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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 a member company of the NIVUS-Group must be contacted for clarification.

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Names

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General

1 About this Manual

**Important**

READ CAREFULLY BEFORE USE.

KEEP IN A SAFE PLACE FOR LATER REFERENCE.

This instruction manual is for the OFR radar sensors and serves their intended use. This instruction manual is oriented exclusively to qualified expert personnel.

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

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




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 Manuals for Transmitters:
 - NivuFlow 550
 - NivuFlow 7550
 - NivuFlow Mobile 550
- Technical Description Ex Separation Module iXT0
- Instruction manual for i-Series sensors and software HART PC

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

Representation	Meaning	Remarks
	(Action) Step	Execute action steps. Should action steps be numbered observe the specified order of the steps.
	Cross-reference	Refers to further or more detailed information.
>Text<	Parameter or menu	Indicates a parameter or a menu that is to be selected or is described.
	Refers to a documentation	Refers to an accompanying documentation.

Tab. 1 Structural elements within the manual

1.3 Abbreviations used

1.3.1 Colour code for wires and single conductors

The abbreviations of colours for wire and single conductor labelling 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 Information on the Valuation of Accident Levels



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

DANGER

Warning in high degree of risk



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

WARNING

Warning in medium degree of risk and personal injury



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

CAUTION

Warning in personal injury or property damage



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

WARNING

Danger by electric voltage



Indicates a medium-risk, **imminently** hazardous situation caused by electric shock which will result in death or (serious) injury if not avoided.



Important Note

Contains information that needs to be highlighted.
Indicates a potentially harmful situation that may damage the product or something in its environment if not avoided.



Note

Contains tips or information.

2.2 Warning Notices on the Device (optional)



General Warning Notice

This symbol refers the operator or user to content in this manual. Consideration of the information contained herein is necessary to maintain the protection provided by the unit for installation and in operation.



Protective earth connection

This symbol refers to the protective conductor terminal of the device. Depending on the type of installation, the unit may only be operated with a suitable protective earth connection in accordance with applicable laws and regulations.



Fig. 2-1 Warning Label ESD Protection

3 Special safety and Precautionary Measures

When working with the NIVUS equipment, the following safety and precautionary measures must be observed and followed generally and at all times. These warnings and notes are not repeated for each description within the document.

WARNING



Check danger due to explosive gases

Before starting assembly, installation and maintenance work, be sure to check that all regulations on safety at work have been observed and that there is no possible risk of explosive gases. Use a gas warner for the check.

When working in the sewer system, make sure that no electrostatic charge can occur:

- *Avoid unnecessary movements to reduce the building-up of static charges.*
- *Discharge any static electricity present on your body before you start installing the sensor.*

Disregarding may result in personal injury or damage to the system.

WARNING



Germ Contamination

Due to the frequent use of the sensors in the waste water sector, parts can be contaminated with dangerous germs. Therefore, appropriate precautions must be taken when coming into contact with cables and sensors.

Wear protective clothing.

WARNING



Observe Occupational Safety Regulations!

Before and during mounting works, compliance with all work safety regulations must always be ensured.

Disregarding may lead to personal injury.

WARNING***Do not disable Safety Devices!***

It is strictly forbidden to disable the safety devices or to change their mode of operation. Disregarding may result in personal injury or damage to the system.

WARNING***Disconnect the System from Mains Power***

Disconnect the system from the mains power before starting maintenance, cleaning and/or repair work (only by qualified personnel). Disregarding may lead to electric shock.

***Commissioning only by qualified Personnel***

The entire measuring system may only be installed and commissioned by qualified personnel.

4 Warranty

The sensor was functionally tested prior to shipping. When used for the intended purpose (see Chap. "6 Intended Use") and in compliance with the instructions, the applicable documents (see Chap. "1.1 Applicable Documentation") and the safety information and instructions contained therein, no functional restrictions are to be expected and flawless operation should be possible.



Please also refer to the following chapter "5 Disclaimer".

***Limitation of Warranty***

In case of disregarding the safety notes and instructions in this document, the companies of the NIVUS-Group reserve the right to limit the warranty.

5 Disclaimer

The companies of the NIVUS-Group assume no liability

- for consequential damages resulting from a change in this document. The companies of the NIVUS-Group reserve the right to change the contents of the document including this disclaimer without prior notice.
- for personal injury or damage to property resulting from **failure to comply** with the **applicable regulations**. For connection, commissioning and operation of the sensors, all information and higher-level legal regulations of the country (in Germany e.g. the VDE regulations), such as valid Ex regulations as well as the safety and accident prevention regulations applicable to the respective individual case shall be observed.
- for personal injury or damage to property resulting from **improper handling**. For safety and warranty reasons, all work on the equipment that goes beyond the installation and connection measures may only be carried out by NIVUS personnel or by persons or companies authorised by NIVUS.
- for personal injury or damage to property resulting from the operation of the equipment in a **technically faulty** condition.
- for personal injury or damage to property resulting from **improper use**.

- for personal injury or damage to property resulting from failure to observe the **safety instructions** in this instruction manual.
- for missing or incorrect readings due to **improper installation** and for any consequential damage resulting therefrom.

6 Intended Use



Note

*The sensor is intended exclusively for the purpose mentioned below. Any other use beyond this, any conversion or modification of the sensor without written agreement with the companies of the NIVUS-Group is considered improper use.
The companies of the NIVUS-Group are not liable for any damage resulting from this.
The operator alone bears the risk.*

The radar sensors are for contactless measurement of the surface velocity of liquid media in part filled pipes, flumes and canals.

The measured surface velocity is used to determine the average flow velocity, which is required to determine the flow rate.

The sensor types OFR-EVG and OFR-EV0 are approved for use in Ex Zone 1.



See Chap. "7 Ex Protection" or "18 Equipment/Device Versions".

The radar sensors are designed and produced according to the current state of the art and the recognised safety rules at the time of publication of this document. Nevertheless, risks of personal injury or damage to property cannot be completely ruled out.

The permissible maximum limit values in Chapter "17 Specifications" must be observed. All cases of use deviating from these limit values, which have not been approved by NIVUS GmbH in writing, are excluded from the liability of the NIVUS-Group.

7 Ex Protection

The sensor types EVG and EV0 are designed for use in areas with explosive atmospheres of zone 1.

The following conditions must be observed:

- When connected to the NivuFlow 550 / 7550 permanent transmitters it is **essential** to install a Type iXT Ex separation module between sensor and transmitter (according to the transmitter instruction manual).
- Maintenance and repair shall only be carried out **outside** the Ex area.

DANGER



Danger by electrostatic Discharge

Do **not** wipe the sensor with a dry cloth.

In case of disregard, the explosion protection of the device is no longer given due to possible static charge.

Possible ignition in an explosive atmosphere poses a danger to the user's life.

Sensor Approvals

➡ See Chap. "17 Specifications".



Validity of the Ex Approval

The Ex approval is only valid in conjunction with the corresponding marking on the nameplate of the sensors.

The Ex-versions of the sensors are matched to the NIVUS transmitters regarding the assessment of intrinsically safe electrical systems according to EN 60079-25.

When using transmitters from other manufacturers, the operator must carry out a system assessment in accordance with EN 60079-25.

The technical data required here for the Ex version of the sensors can be found in the EU type examination certificate for the iXT Ex separation module.



Declarations of Conformity and Test Certificates

For installation and commissioning, the EU declarations of conformity and test certificates of the approving body must be strictly observed.

8 Duties of the Operator



Important Note

In the EEA (European Economic Area), the national transposition of the Framework Directive (89/391/EEC) as well as the associated individual directives and, 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, must be observed and complied with.

In Germany, the Ordinance on Industrial Safety and Health must be complied with.

Obtain the local operating licence and observe the associated conditions. In addition, you must comply with environmental protection requirements and local legal requirements for the following:

- Safety of personnel (accident prevention regulations)
- Safety of work equipment (protective equipment and maintenance)
- Product Disposal (Waste Management Act)
- Materials Disposal (Waste Management Act)
- Cleaning (Cleaning Agents and Disposal)

Connections

As the operator, before activating the device, make sure that the local regulations (e.g. for the electrical connection) have been observed during installation and commissioning.

Keep the Instruction Manual for future Reference

Keep the instruction manual in a safe place and ensure that it is always available and can be consulted by the user of the product.

Hand over the Instruction Manual

When selling the instrument, this instruction manual must be handed over with it. The manual is part of the standard delivery.

9 Requirements for the Personnel

Installation, commissioning and maintenance may only be carried out by personnel who fulfil the following conditions:

- Qualified personnel with appropriate training
- Authorisation by plant operator



Qualified Personnel

in the sense of these instructions or the warnings on the product itself are persons who are familiar with the installation, assembly, commissioning and operation of the product and who have the qualifications appropriate to their job, such as

- I. training and instruction or authorisation to switch circuits and devices/systems on and off, to earth and to label them in accordance with the standards of safety technology.*
- II. Training or instruction in accordance with safety technology standards in maintenance and use of appropriate safety equipment.*
- III. First Aid Training*

Delivery, Storage and Transport

10 Scope of Delivery

The standard delivery of the OFR radar sensor comprises:

- Radar sensor (according to delivery documents)
- Technical description / mounting instructions (with EU Declarations of Conformity) including all information required for connection, installation and operation of the radar sensor.

Check additional accessories according to the order against the delivery note.

11 Inspection upon Receipt

Check the delivery for completeness and apparent intactness immediately after receipt. Report any transport damage immediately to the delivering carrier. Also send a written report to NIVUS GmbH in Eppingen.

Incomplete deliveries must be addressed in writing within two weeks to your responsible representative or directly to the head office in Eppingen.



Observe the two-week deadline

Complaints received later will not be recognised.

12 Storage

Observe the minimum and maximum values for external conditions such as temperature and humidity according to Chapter "17 Specifications".

Protect the sensors from corrosive or organic solvent vapours, radioactive radiation and strong electromagnetic radiation.

13 Transport

Protect the sensors from strong impacts, shocks, jolts or vibrations.

Transport must be carried out in the original packaging.

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

14 Return

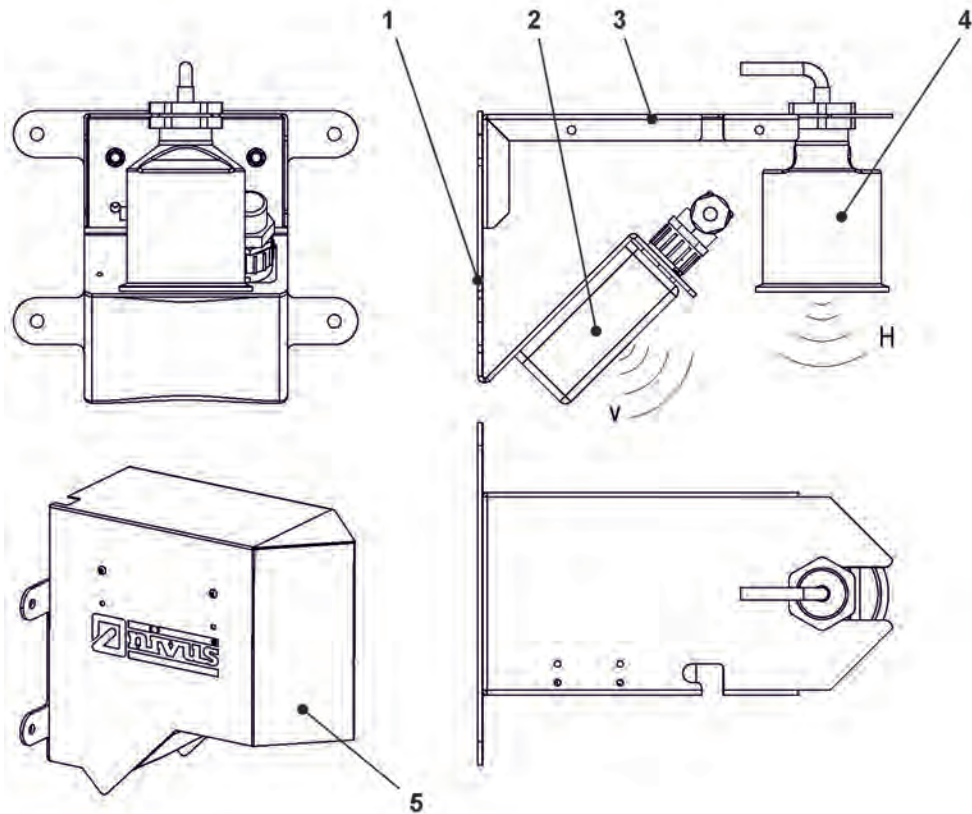
In the event of a return, send the unit to NIVUS GmbH in Eppingen carriage paid and in the original packaging.

Items that have not been sufficiently franked will not be accepted!

Product Description

15 Product Construction and Overview

15.1 Sensor(s) with holders



- 1 Holder for OFR radar sensor
- 2 OFR radar sensor
- 3 Holder for i-Series sensor (option)
- 4 i-Series sensor (option)
- 5 Enclosure (option, in connection with holder for i-Series sensor)

Fig. 15-1 Device Construction OFR Radar Sensor

15.2 Sensor Dimensions OFR Radar Sensor

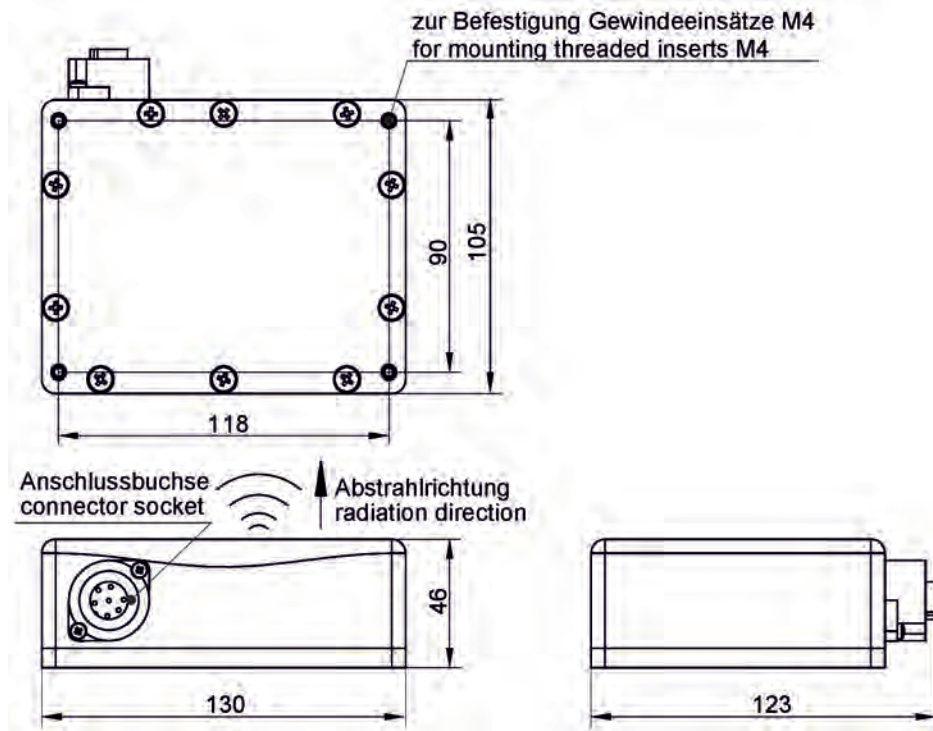


Fig. 15-2 Dimensions OFR Radar Sensor Types H00/EVG in Sensor Enclosure

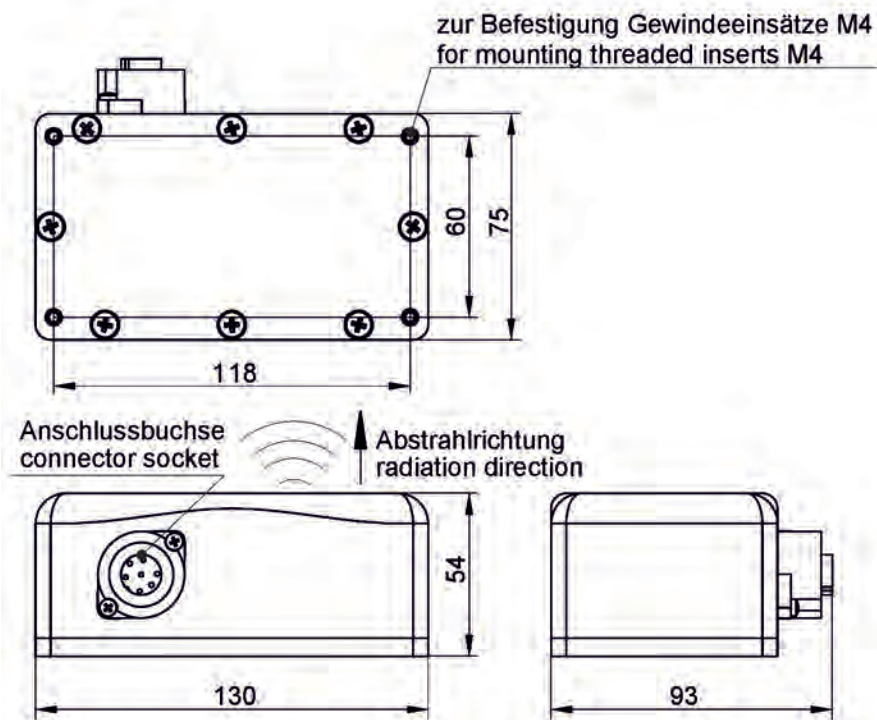


Fig. 15-3 Dimensions OFR Radar Sensor Types G00/EV0 in Sensor Enclosure

15.3 Dimensions of Sensor Holders

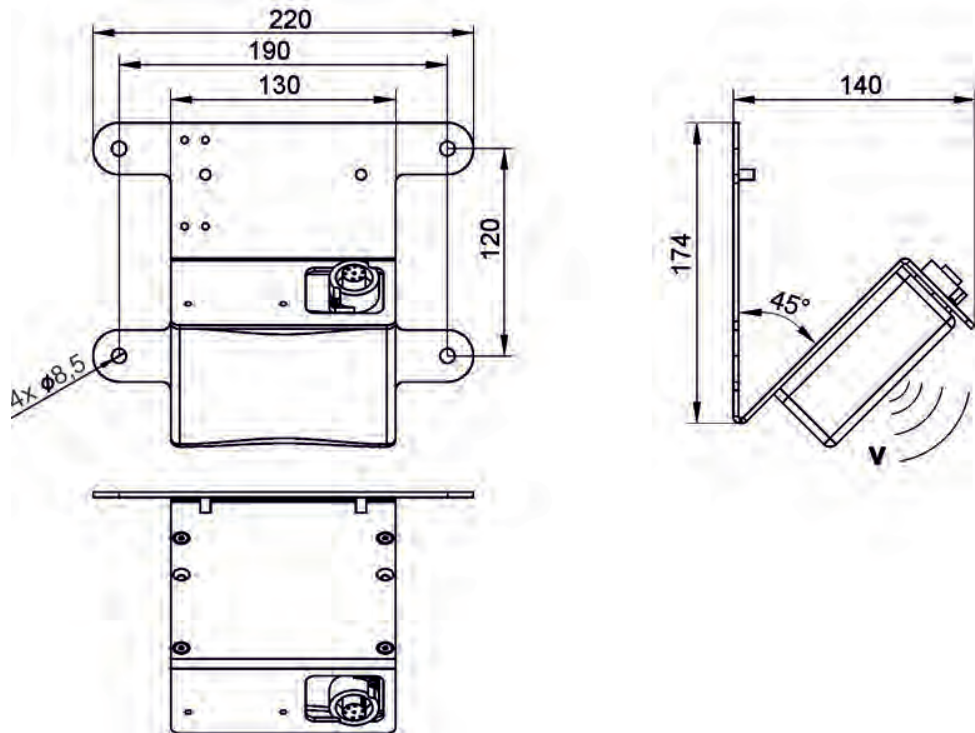


Fig. 15-4 Sensor Holder OFR Radar Sensor

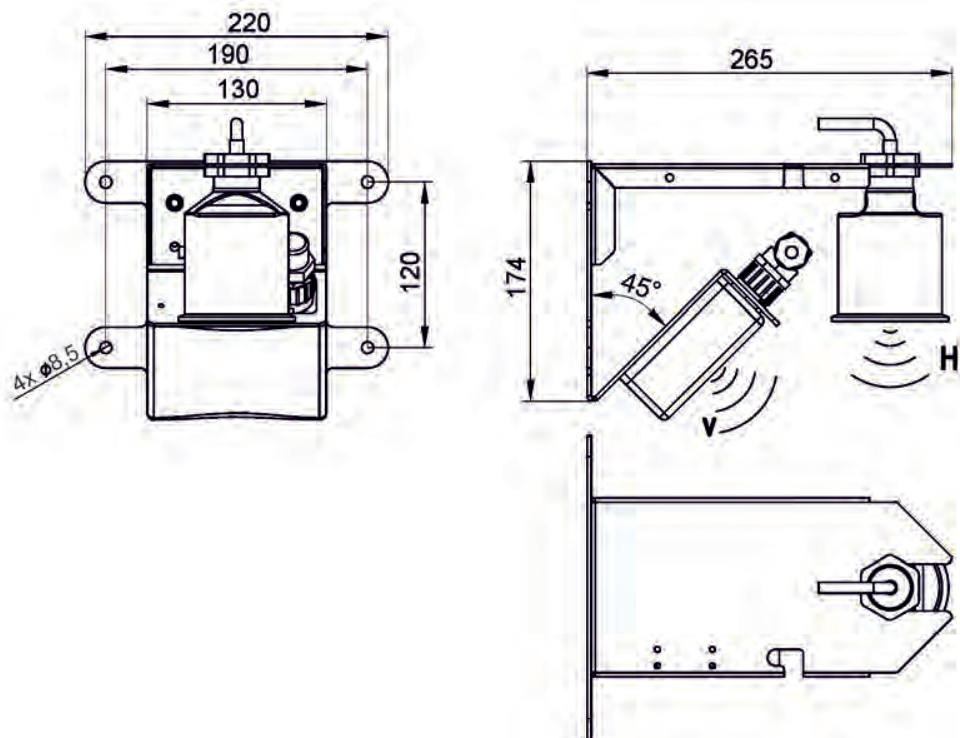


Fig. 15-5 Sensor Holder (Combi) OFR Radar Sensor and i-Series Sensor

16 Device ID

The information in this manual only applies to the sensor type indicated on the title page. The nameplate is located at the entrance of the cable into the sensor body as well as at the end of the cable. The nameplate is protected against weathering and abrasion by means of a transparent heat shrink tubing and contains the following information:

- Name and address NIVUS GmbH
- CE label
- Marking of the series and type with article number and serial number
- Year of manufacture: the first four digits of the serial number refer to the year of manufacture and the week number (2134.....)
- For Ex version sensors additionally the Ex protection marking.

It is important for all queries and spare parts orders that the article number and serial number of the respective device are specified correctly. This is the only way to ensure proper and fast processing.

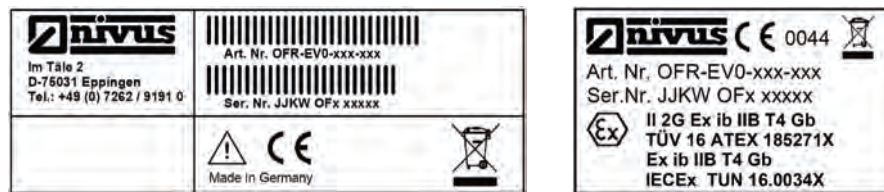


Fig. 16-1 Nameplates OFR Radar Sensor Type EV0

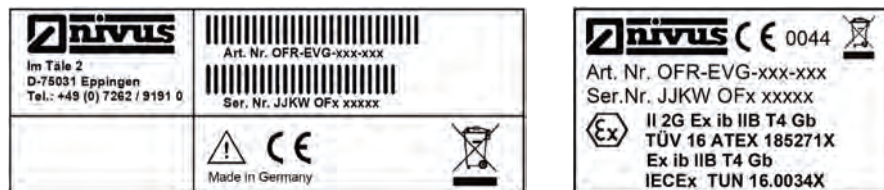


Fig. 16-2 Nameplates OFR Radar Sensor Type EVG

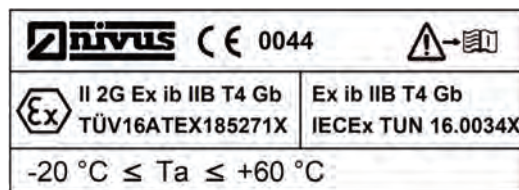


Fig. 16-3 Additional Nameplate (only for Ex Sensors)




Check nameplates

Check by means of the nameplates whether the supplied device corresponds with your order.



The EU Declaration(s) of Conformity and the EU Type Examination Certificate can be found at the end of this instruction manual.

17 Specifications

Measurement Principle/Frequency	Radar Doppler, 24 GHz, ISM-Band
Measurement Range	0.15...15 m/s
Measurement Distance d (see also Fig. 20-7)	0.3...10 m
Measurement Uncertainty	Flow Velocity (v_{average}) $\pm 5\%$ * of measurement value
Ex Approvals (option) / other Approvals (option)	ATEX: TÜV 16 ATEX 185271X IECEX: 16.0034X  II 2G Ex ib IIB T4 Gb
Protection	IP68, fully encapsulated
Enclosure Material	POM high-performance composite
Operation Temperature	-30 °C...+70 °C -20 °C...+60 °C in Ex-Zone 1
Storage Temperature	-30 °C...+70 °C
Cable Lengths	10 / 15 / 20 / 30 / 50 / 70 / 100 m
Cable Type	LiYC11Y 2x1.5 +1x2x0.34 mm ²
Outside Cable Diameter	8.5 mm

Tab. 2 Specifications

* The measurement uncertainty in relation to the volumetric flow Q depends on the measurement uncertainties of the geometric cross-section A.

The information on the measurement uncertainty refers to rectangular or circular profiles and an installation height between 0.3 and 5 m above the canal surface as well as the requirement for free discharge.

If the application and installation conditions deviate from the recommendations in this manual, the measurement errors can increase up to $\pm 10\%$.

18 Equipment/Device Versions

18.1 Radar Sensors


The radar sensors are available in different constructions and for various measurement place conditions.

The article number is located at the entrance of the cable into the sensor body as well as at the end of the cable on a nameplate applied to the cable sheath. This nameplate is protected against weathering and abrasion by means of a transparent heat shrink tubing. In addition, the connection terminal designation of the sensor and a note are attached to the end of the sensor cable. The exact device type can be specified by means of the article number.

OFR-	Surface radar: 24 GHz sensor for contactless measurement of the surface velocity of liquid media			
	H00	Highly resistant plastic housing, IP68, for use in areas at risk of flooding; with strongly bundled radiation characteristic; area of application: for narrow canals (narrow detection range)		
	EVG	Highly resistant plastic housing, IP68, for use in areas at risk of flooding; with strongly bundled radiation characteristic; area of application: for narrow canals (narrow detection range); for use in Ex zone 1		
	G00	Highly resistant plastic housing, IP68, for use in areas at risk of flooding; with wide radiation characteristic; area of application: for wide canals (wide detection range)		
	EVO	Highly resistant plastic housing, IP68, for use in areas at risk of flooding; with wide radiation characteristic; area of application: for wide canals (wide detection range); for use in Ex zone 1		
		Cable Connection to Sensor		
		S	Plug connection (special connection cable required) (see Chap. "18.2 Connection Cable")	
		D	Direct connection	
		000	Digit required for technical system reasons	
			Cable length	
		00	System-dependent with cable connection "S" (plug connection)	
		10	10 m	
		15	15 m	
		20	20 m	
		30	30 m	
		50	50 m	
		70	70 m	
		99	100 m	
		XX	Special length	
			Sensor Connection	
		0	System-dependent with cable connection "S" (plug connection)	
		K	Cable end pre-assembled, for connection to the NivuFlow 7550/550 (iXT Ex separation module, overvoltage protection equipment)	

					M	Cable end pre-assembled, for connection to the NivuFlow Mobile 550
OFR-			000			

Tab. 3 Product Structure OFR Radar Sensor

 Accessories see Chapters "18.2 Connection Cable" and "21 Accessories and Installation Aids".

18.2 Connection Cable

Article Number	Name
ZUB0 OFR NF 10	Connection cable, 10 m, pre-configured with plug OFR to NivuFlow 7550/550
ZUB0 OFR NF 15	Connection cable, 15 m, pre-configured with plug OFR to NivuFlow 7550/550
ZUB0 OFR NF 20	Connection cable, 20 m, pre-configured with plug OFR to NivuFlow 7550/550
ZUB0 OFR NF 30	Connection cable, 30 m, pre-configured with plug OFR to NivuFlow 7550/550
ZUB0 OFR NF 50	Connection cable, 50 m, pre-configured with plug OFR to NivuFlow 7550/550
ZUB0 OFR NF 70	Connection cable, 70 m, pre-configured with plug OFR to NivuFlow 7550/550
ZUB0 OFR NF 99	Connection cable, 100 m, pre-configured with plug OFR to NivuFlow 7550/550
ZUB0 OFR NF XX	Connection cable, special length, pre-configured with plug OFR to NivuFlow 7550/550
ZUB0 OFR NFM 10	Connection cable, 10 m, pre-configured with plug OFR to NivuFlow Mobile 550
ZUB0 OFR NFM 15	Connection cable, 15 m, pre-configured with plug OFR to NivuFlow Mobile 550
ZUB0 OFR NFM 20	Connection cable, 20 m, pre-configured with plug OFR to NivuFlow Mobile 550
ZUB0 OFR NFM 30	Connection cable, 30 m, pre-configured with plug OFR to NivuFlow Mobile 550
ZUB0 OFR NFM 50	Connection cable, 50 m, pre-configured with plug OFR to NivuFlow Mobile 550
ZUB0 OFR NFM 70	Connection cable, 70 m, pre-configured with plug OFR to NivuFlow Mobile 550
ZUB0 OFR NFM 99	Connection cable, 100 m, pre-configured with plug OFR to NivuFlow Mobile 550
ZUB0 OFR NFM XX	Connection cable, special length, pre-configured with plug OFR to NivuFlow Mobile 550

Tab. 4 Associated pre-configured Connection Cables

 Additional accessories see Chapter "21 Accessories and Installation Aids".

Function Description

19 Functional Principle of Flow Velocity Determination

The measurement method used to determine the surface velocity is based on the Doppler principle.

The surface radar sensor type OFR is mounted **against** (positive) or **with** (negative) the flow direction and above* the water surface and aligned parallel to the flow direction.

* The OFR radar sensor requires a minimum "air space" between sensor and medium for measurement (signal transmission/reception); even at maximum levels.

The radar sensor emits an electromagnetic signal. This signal hits the surface structure of the liquid and is reflected by surfaces orthogonal to the signal (such as waves) and detected by the sensor.



Note on the Radar Measurement Method

The radar measurement method necessarily requires a certain rough surface structure/surface ripple as a reflection surface. Without these reflective surfaces, measurement dropouts or failure of the measurement system may occur.

The resulting frequency shift (between the signal emission and the reception of the reflected signal) is used by the system to calculate the surface velocity of the liquid.

The calculated surface velocity is then used to determine the average flow velocity using complex hydraulic algorithms.

These complex algorithms have been developed for free discharge.

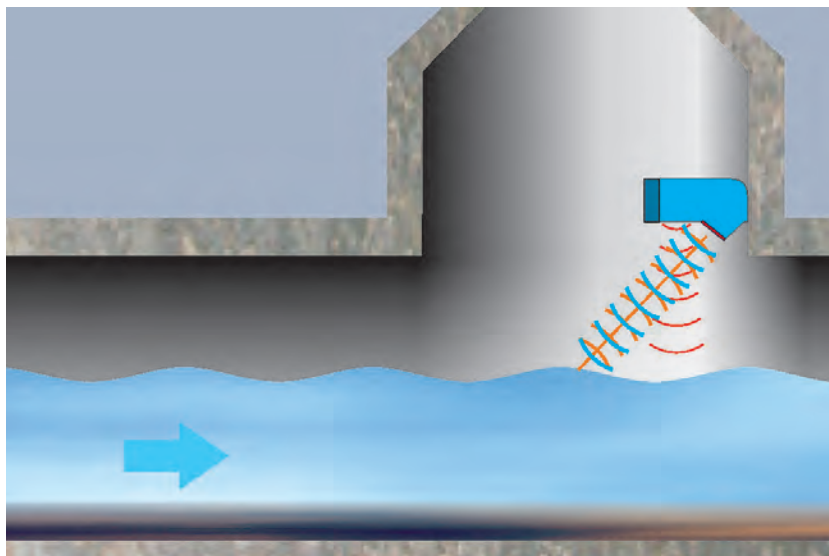


Fig. 19-1 Measuring using Surface Radar

Installation

20 Installation of Sensors

20.1 General Installation Regulations



Expert knowledge required

To avoid damage to the radar sensor, the work described in this section of the instructions must only be carried out by competent personnel.

The executing company must have extensive expertise and sufficient experience in the installation and commissioning of ultrasonic measurement systems in part filled applications.

Otherwise, contact the NIVUS commissioning service or an authorised specialist company.

WARNING



Security Measures

Before beginning mounting works, compliance with all work safety regulations must always be checked. Likewise, any possible danger from explosive gases must be prevented at all costs. If necessary, take the necessary measures to avert danger.

Disregarding may cause personal injury.

CAUTION



Observe Occupational Safety Regulations

The installation of radar sensors and the laying of cables may require the use of divers. The use of divers requires the observance of special occupational safety regulations. This deployment must be prepared separately and the according approvals must be obtained from the appropriate bodies.

A contracted installation company must have the appropriate expertise and valid approvals for underwater installation.



Obtain Approvals

Prior to installing sensors on bridge piers, embankments, groynes, etc., permission must be obtained from the competent authority(ies) for the laying of cables and the operation of the installations in public waters.

Before starting the installation work, it is essential to read the preceding General Installation Instructions and the instructions for fastening sensors.

Disregarding may result in interference with the measurements. NIVUS GmbH expressly point out that all permits and work regulations must be obtained or observed.

The sensors used must be fixed permanently and reliably.

Use only non-corrosive fastening material.

The optionally supplied fastening material is designed for normal flow conditions at the measurement place and must not be installed in the flood area.

Observe the following conditions when mounting the sensors (e.g. use the brackets available from NIVUS GmbH):

- The horizontal directional adjustment should be independent of the vertical adjustment.
- Align vertically and horizontally to $\pm 2^\circ$ accuracy.
- Make sensor mounting easily removable for maintenance or cleaning purposes so that no divers or special equipment is required.

- If possible, design the installation in such a way that no new alignment is necessary after maintenance.

20.2 Selecting Measurement Places

20.2.1 General Conditions

Homogeneous hydraulic conditions are a prerequisite for a functioning, high-quality measurement. Therefore, when selecting the measuring section, the required hydraulic calming sections in the upstream and downstream sections must be given the necessary attention.

The measurement place itself must be characterised by a constant flow cross-section in which a representative flow profile can form and the surface flow velocity becomes typical.

Falls, bed jumps, fixtures, channel profile changes, slope changes or lateral supply lines directly upstream of, in or downstream the measurement must be avoided at all costs!

The drawings Fig. 20-1 to Fig. 20-5 provide examples on well-suited, less suitable and problematic applications. These drawings serve to illustrate suitable measurement places. The drawings also show any critical hydraulic conditions that may exist.

For assistance in selecting or assessing the planned measurement place, contact your NIVUS representative or the product management department at NIVUS GmbH in Eppingen (see Chap. "22.2 Customer Service Information").

The following documents must be provided for the assessment of the measurement place:

- Sketches or drawings
- Photos/videos (smartphone quality is sufficient) of the planned measurement place

20.2.2 Special Conditions for Measuring in part filled Applications

In addition to the conditions mentioned in Chapter "20.2.1 General Conditions" the following special criteria must be observed:

- Basically, there must be moving waves on the surface at the selected measuring point. A smooth surface cannot reflect the radar waves towards the sensor.
- The river bed should have a stable formation and no sediments or scouring (carved swirl holes).
- A defined shape and a stable formation on the bank are important and must not be prone to change.
- There should be no herbaceous plumes, stones, piles, bed jumps, thresholds, etc. within the sensor's detection range. These influence the flow profile and can lead to incorrect measurements.
- The surface of the measuring point should not be influenced, even temporarily, by avoidable environmental influences such as changes in surface velocity caused by gusts of wind, foaming caused by sewage, shipping, driftwood, etc.
- The hydraulic conditions at the measurement place should basically correspond to free discharge. If this is not the case, NIVUS recommend an on-site calibration of the measurement system to reduce the measurement deviations as far as possible. Contact the NIVUS customer service (see Chap. "22.2 Customer Service Information").
- Mount the sensor system protected from heat and direct sunlight, use the NIVUS sensor cover (see Chap. "21.2 Cover for Radar Sensor and Level Sensor") if necessary.
- Avoid necessarily when selecting the mounting place:
 - Corrosive chemicals and gases
 - Radioactive radiation
 - Electro-magnetic radiation

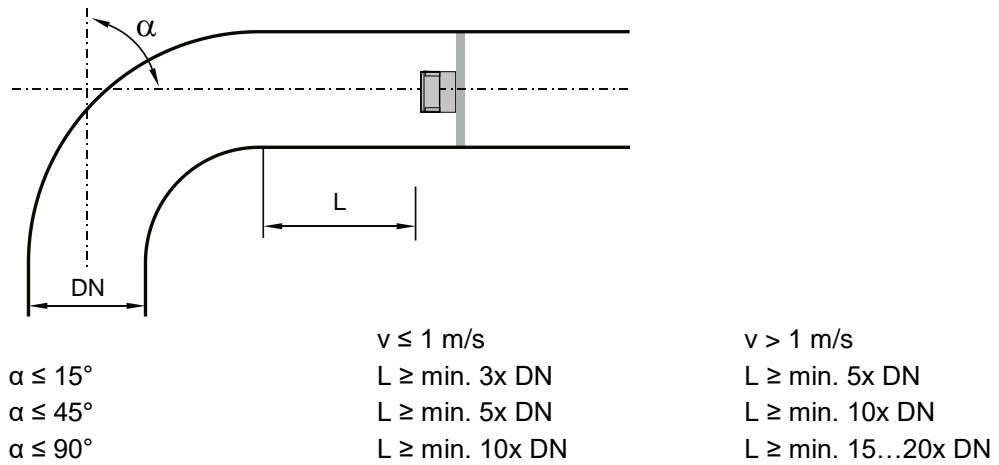
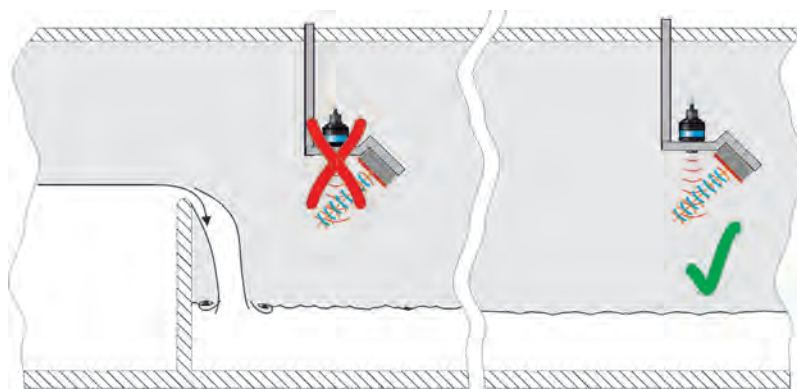
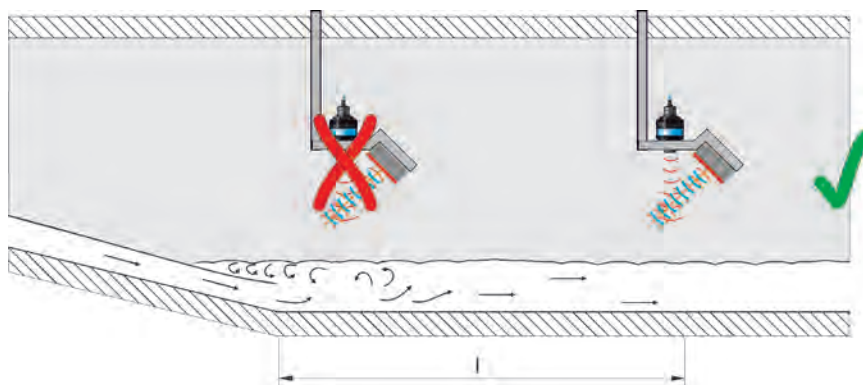


Fig. 20-1 Position Sensor behind curves or bends



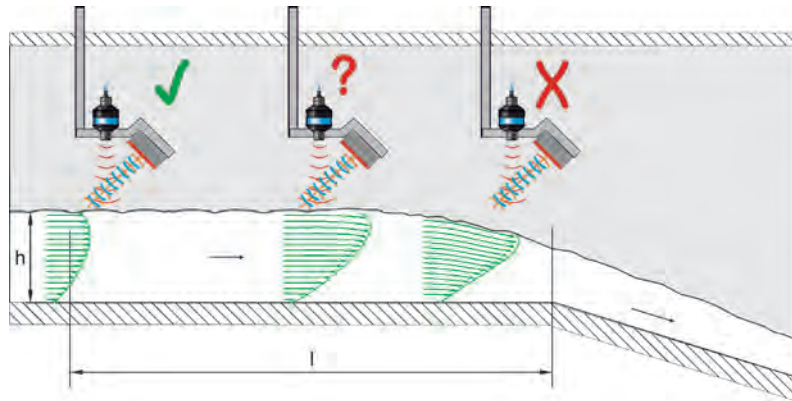
- × = Error! Undefined flow conditions
- ✓ = Distance sufficient for even flow (depending on application 10...50x DN)

Fig. 20-2 Measuring behind fall – eddying



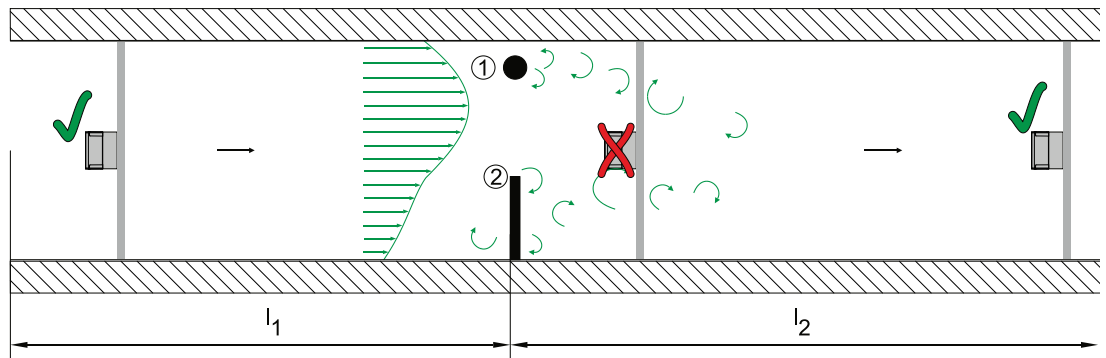
- × = Error! Change in slope = change of flow profile
- ✓ = Distance; depending on slope and flow velocity value
 $l = \text{min. } 20x \text{ DN}$

Fig. 20-3 Error due to change in slope



- ✘ = Error! Transition from flowing to shooting
Faulty height and velocity measurement
- ? = Critical measurement point, not recommended! Beginning of the jet lowering
- ✓ = Distance $l = \text{min. } 5 \times h_{\text{max}}$ at installation place

Fig. 20-4 Error due to changing flow profile upstream of change in slope or fall



- ① = Fixtures
- ① = Obstruction
- h_{max} = maximum filling level
- ✘ = Error due to eddying!
- ✓ = Distance l_1 (upstream of obstruction) = min. $5 \times DN$
Distance l_2 (downstream of obstruction) = min. $10 \times DN$
in flow velocities $> 1 \text{ m/s}$

Fig. 20-5 Error due to fixtures or obstructions (top view)

20.3 Selecting the appropriate Sensor Type

20.3.1 Mounting Reference Point on the Sensor

The radar sensor is mounted at 45° to the channel. In order to determine the mounting height (H_m in Fig. 20-6) precisely, it is necessary to always use the centre of the sensor face when measuring/mounting.

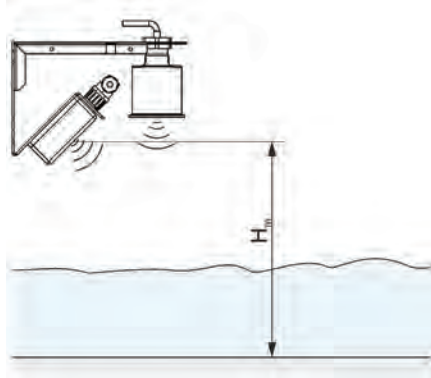


Fig. 20-6 Centre of Radar Sensor / Sensor Face

20.3.2 Detection Range

Radar sensors do not gather point or line values for velocity determination, but surface/area information. The sensors detect reflections from such a surface (also called measurement window) and transmit the resulting surface velocities to the connected transmitter.

The size of this measurement window and thus the respective detection area varies with

- the selected sensor type and its beam angle
- the mounting position of the sensor to the surface

The **detection range** should be kept as **small** as possible, taking into account the conditions specified in Chapter "20.2 Selecting Measurement Places". This gives the measurement system a delimited and representative impression of the defined area of the channel and enables it to determine/calculate **highly accurate** measured values.

If the conditions required in chapters "20.2 Selecting Measurement Places" or "20.3.4 Mounting Position to the Surface" cannot be achieved at the measuring point, it is essential to consult NIVUS GmbH or your local representative/branch office before installation. The measuring system must obtain a representative overall impression of the channel. However, the **measurement deviations** in such complex hydraulic situations are usually greater than in comparable homogeneous, calmed flow situations.

20.3.3 Beam Angle

The two basic OFR radar sensor types H00/EVG and G00/EV0 are manufactured with fixed, unchangeable beam angles.

- H00/EVG:
bundled beam characteristic (narrow beam angle) with
vertical 12°
horizontal (α) 12°
- G00/EV0:
wide beam characteristic (large beam angle) with
vertical 23°
horizontal (α) 45°

The different types enable the selection of the optimal sensor combination for the given installation situation already during the planning of the measuring point.

20.3.4 Mounting Position to the Surface

Mounting Instructions

- Ensure proper installation. Improper handling may result in injury and/or damage to the sensors.
- Follow applicable legal or company guidelines.
- Changing water levels lead to different distances to the OFR radar sensors. It is essential to observe the (minimum) "air space" between the surface and the sensor (see also Chap. "19 Functional Principle of Flow Velocity Determination").

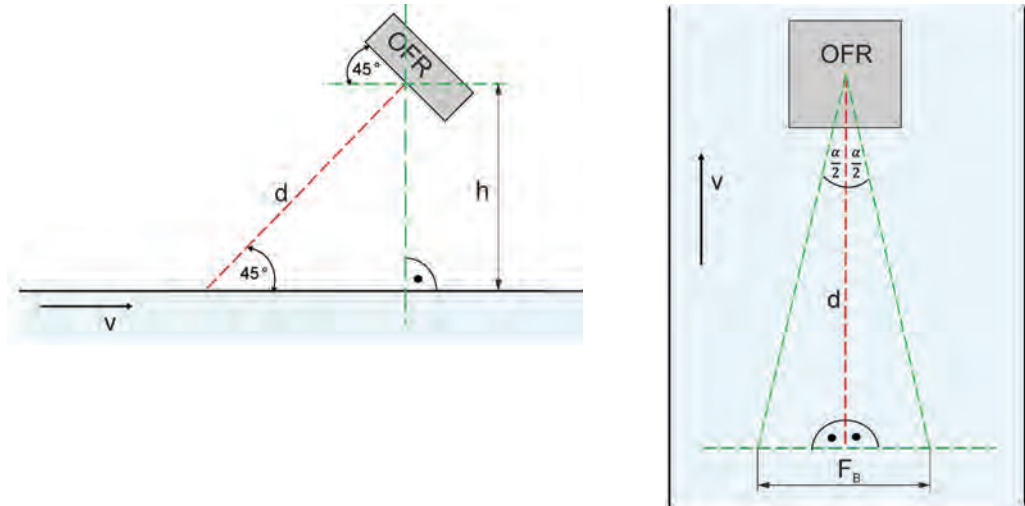


Note

A highly accurate, vibration-free and firm mounting as well as the correct alignment of the sensors are absolutely necessary for a functioning measurement.

Mounting Details

- **Angle:**
it is mandatory that the radar sensors are mounted at an angle of **45° to the channel surface** (Fig. 20-7 Fig. 1). Compliance with this angle is ensured when using the original NIVUS mounting accessories (see Chap. "21 Accessories and Installation Aids"). If other brackets/mounting options are used, it is essential to **ensure** that this angle is set **unchangeably**.
- **Installation direction:**
The radar sensors can be installed in any direction **against** (positive) or **with** (negative) the flow direction (v).
- **Relative to the channel width:**
The mounting position relative to the channel width also determines the alignment of the measuring window. Optimally, the radar sensor is mounted **in the centre** of the channel and **close** ($h = 0.2...7.0$ m) to the water surface. Most other mounting positions can be partially compensated by the measuring system, but basically the following conditions should be observed:
 - Positioning of the measuring window beyond the edge of the channel should be avoided. Shape-related flow situations that cannot be evaluated may prevail in such areas.
 - The **width of the measurement window** should be a **maximum of 30 % of the channel width**.
 - The slower the flow velocity, the closer the radar sensor should be positioned to the centre of the channel.
 - If the radar sensor has to be mounted outside the middle 30 % of the channel, it should be mounted as close as possible above the channel surface (preferably with a max. distance h of 1 m).
- **Measurement distance:**
The measurement distance d of $\sim 0.3...10$ m from the centre of the sensor face to the water surface must be taken into account.
- **Ratio of measurement window width to mounting height:**
For the OFR radar sensor basic types, observe the respective ratio between measurement window width F_B and mounting height h .
 - H00/EVG (with beam angle $\alpha = 12^\circ$): $F_B = 0,297 \cdot h$
 - G00/EV0 (with beam angle $\alpha = 45^\circ$): $F_B = 1,172 \cdot h$



- v = Flow direction
- d = Measurement distance
- h = Mounting height
- F_B = Measurement window width
- α = Beam angle

Fig. 20-7 Mounting position / relation measurement window width and mounting height



Transfer the exact sensor position into the parameter settings

After mounting the sensors, their positions must be measured in relation to the channel shape and the according parameters must be set in the transmitter.

Enter the required information (depending on the transmitter used) as accurately as possible, as the quality of the measurement results depends on it.

20.4 Electrical Installation

WARNING

Warning of Electric Shock



Work on the electrical connections may only be carried out when the power supply is switched off.

Observe the electrical data given on the nameplate. Disconnect the supplying transmitter from the mains!

Disregarding may lead to electric shock.

For the electrical installation, comply with the legal regulations of the country (such as VDE 0100 in Germany).

For installation in wet environments or in areas where there is a risk of flooding, additional protection, e.g. by means of a residual current device (RCD), may be required.

Check whether the power supply of the units must be integrated into the EMERGENCY STOP concept of the plant.

Complete the installation of transmitters and sensors before applying the operating voltage. Check whether the installation is correct.

Please note that installation may only be carried out by qualified personnel. Follow further (country-specific) legal standards, regulations and technical codes.

20.4.1 Sensor Cable Laying



Important Note

To avoid disturbance due to electrical interference, the sensor cable must not be laid close to (or parallel to) motor supply lines and power lines.

The (exposed) installation of sensors in/above open channels, canals or water bodies always requires careful pre-planning. An inspection of the measurement place is absolutely necessary. The installation requirements must be agreed in detail.

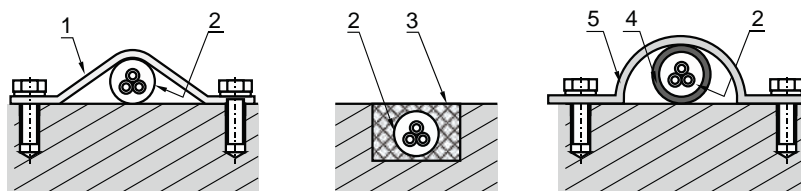


Risk of Cable Break

The minimum bending radius of the standard signal cable is 10 cm. With smaller radii there is a risk of cable breakage.

The sensor cable must be laid in accordance with the regionally applicable installation regulations (e.g. VDE).

According cable covers and/or cable conduits can be acquired from NIVUS (see Chapter "21 Accessories and Installation Aids").



- 1 Stainless Steel Sheet/Cable Cover, e.g. Type ZMS 140
- 2 Cable
- 3 Permanently Elastic Material
- 4 Cable Conduit
- 5 Pipe Clamp

Fig. 20-8 Mounting proposal for cable laying

20.5 Connection to Transmitter

20.5.1 Plug Wirings/Connection to Transmitter

- NivuFlow 550:
see "Instruction Manual Flow Measurement Transmitter for Radar Sensors NivuFlow 550".
- NivuFlow 7550:
see "Instruction Manual Flow Measurement Transmitter NivuFlow 7550 Hybrid Instrument for Radar and Cross Correlation Sensors".
- NivuFlow Mobile 550:
see "Instruction Manual Flow Measurement Transmitter NivuFlow Mobile 550 / NivuFlow Mobile 550 Ex".

20.5.2 Sensor Cable/Cable Extension

The sensors are pre-configured with a cable type LiYC11Y 2x1.5 +1x2x0.34 mm² in different lengths.

The cables for the **NivuFlow Mobile 550** are equipped with a plug. Here, it is **not** possible to extend the cable.

The cables for the permanent transmitter **NivuFlow 550/7550** can be extended, if required. It is essential to observe the following note "Zulässige Kabelverlängerungen" and the following basic conditions.



Observe the permissible cable extensions

Joint extensions of different applications or joint extensions of separate level and flow velocity measurements in a common signal cable are not permitted.



Avoid measurement failure and malfunctions due to improper cable connections

Improper connections that create increased contact resistances or the use of incorrect cables may lead to disturbances or measurement failure.

Basic Conditions for Cable Extension

If the cables are to be extended, the preparation of an intrinsic safety certificate is required. For this, the following **points/specifications** must be considered/included:

- The cable specifications of the cable extension used and the sensor cable.
- When using overvoltage protection elements, additionally their internal capacitance and inductance.
- The capacitances and inductances that can be connected for the supply circuit.
- The capacitances and inductances that can be connected for the RS485 circuit.

Moreover, the following two **conditions** must be met during project planning, selection and installation in accordance with EN 60079-14:

- $C_o \geq C_i + C_k$
- $L_o \geq L_i + L_k$

with

- C_o = Maximum permissible external capacitance of the corresponding iXT circuit.
- C_i = Effective internal capacitance of the OFR sensor and, if used, of the overvoltage protection element for the corresponding circuit.
- C_k = Total cable capacitances of the sensor cable and the cable extension used for the corresponding circuit.
- L_o = Maximum permissible external inductance of the corresponding iXT circuit.
- L_i = Effective internal inductance of the OFR sensor and, if used, of the overvoltage protection element for the corresponding circuit.
- L_k = Total cable inductances of the sensor cable and the cable extension used for the corresponding circuit.

NIVUS Cable Specifications for OFR-x Radar Sensor

- Cable capacitance (blue/red): 100 pF/m
- Cable inductance (blue/red): 0.76 μ H/m

These values are of great importance in an Ex application if the operator has to provide an intrinsic safety certificate for his plant and has to consider the connectable external capacitance C_o or inductance L_o .



The required values can be taken from the type examination certificate in chapter "Approvals and Certificates" or can be requested from NIVUS.

21 Accessories and Installation Aids

21.1 Holders



Use a spirit level or similar

When mounting, make sure that the holder/bracket is mounted exactly vertically and horizontally. A spirit level is recommended as an aid for this purpose.

Holder variants are available for fastening the OFR sensors. These holders/brackets are suitable for mounting on a vertical wall, bridge or similar.



Mounting Information

When ordering the **radar sensor incl. a mounting bracket**, it is shipped already **pre-assembled** to simplify installation on site.

However, if an **i-Series sensor** is also supplied, it will **not** be pre-assembled in the bracket.

The following mounting material is included with the holders as standard:

- 6x fix bolts M8, for easy and secure mounting in a concrete wall.

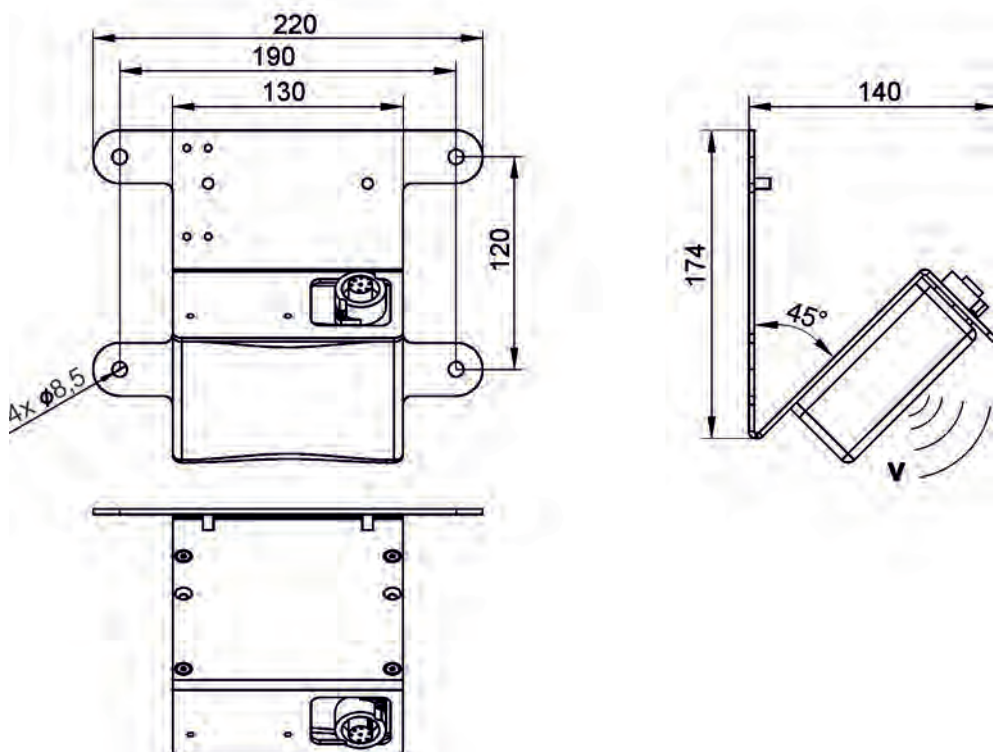


Fig. 21-1 Holder for OFR Radar Sensor (shown with sensor)

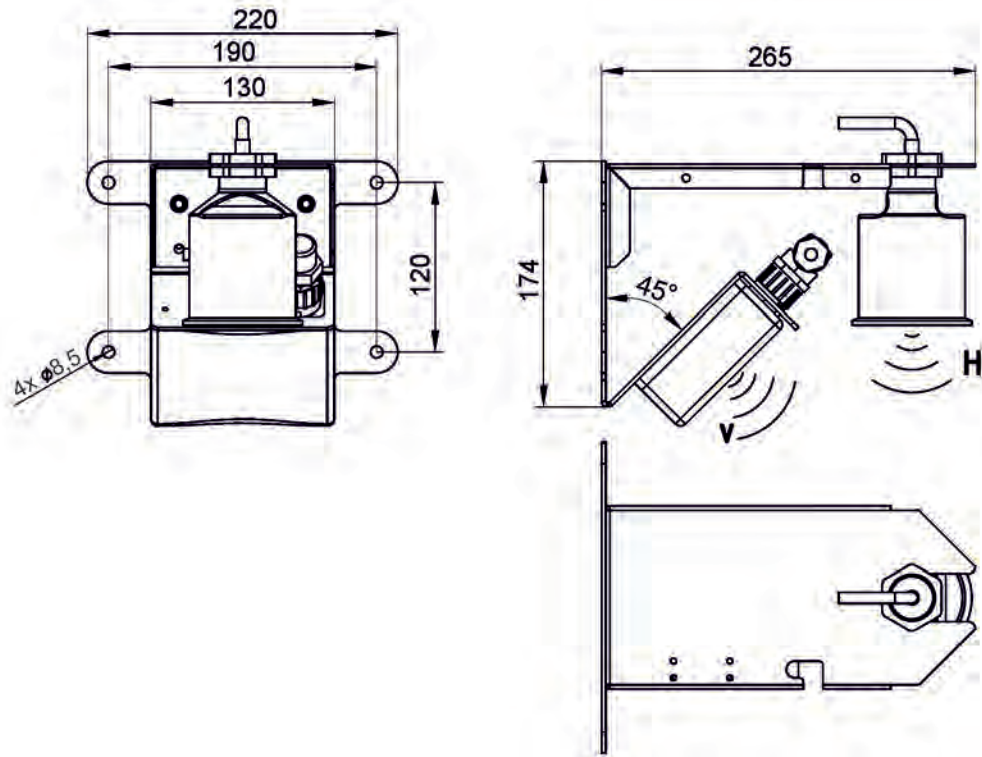


Fig. 21-2 (Combi) Holder for OFR Radar Sensor and i-Series Sensor (shown with sensors)

21.2 Cover for Radar Sensor and Level Sensor

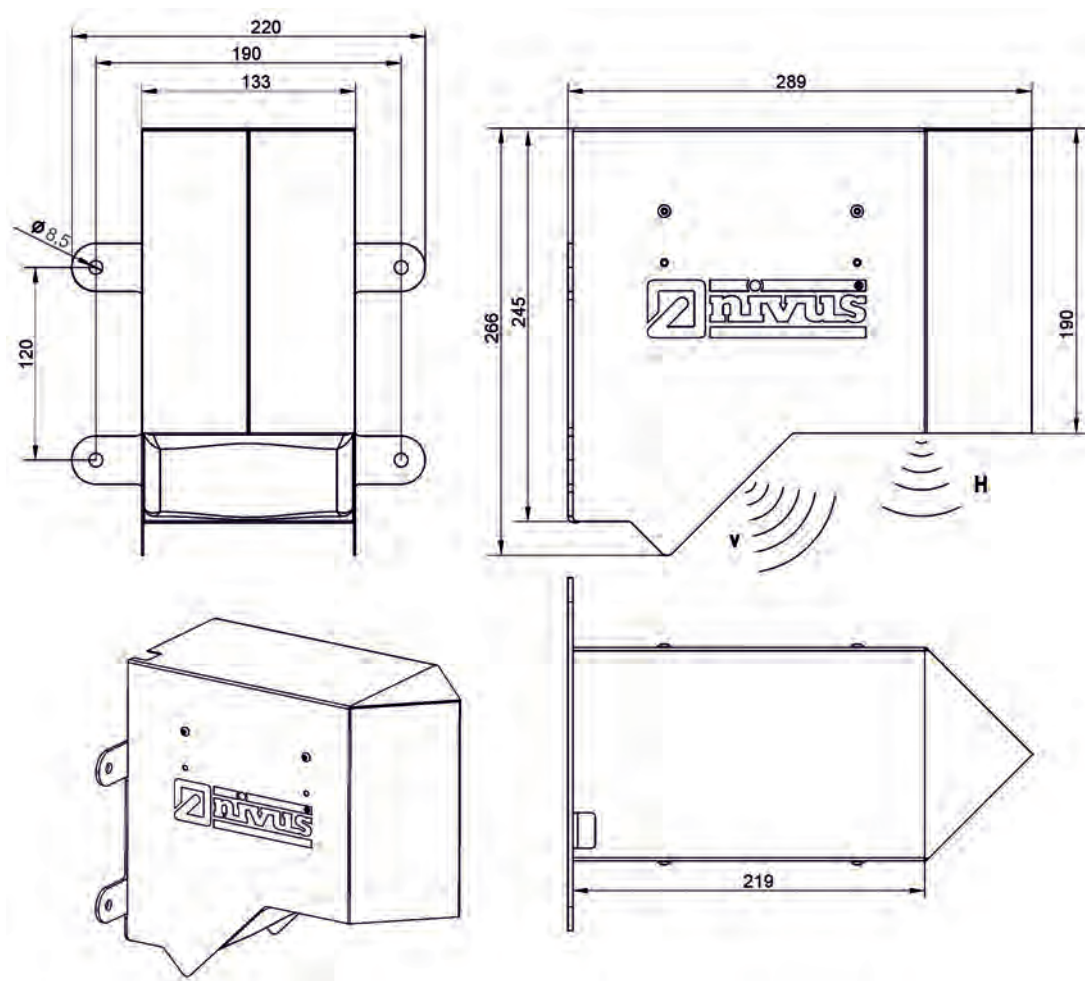


Fig. 21-3 Cover (shown with sensors)

21.3 Overview

Article Number	Name
ZUB0 OFR MO 00	Holder bracket for OFR surface radar sensor, without level sensor, without cover
ZUB0 OFR MO L0	Holder bracket for OFR surface radar sensor, receptacle for level sensor, without cover
ZUB0 OFR MO LV3	Holder bracket for OFR surface radar sensor, receptacle for level sensor, with enclosure/cover for Type NMIO 03
ZUB0 OFR MO LV6	Holder bracket for OFR surface radar sensor, receptacle for level sensor, with enclosure/cover for Types NMIO 06 and NMIO 10

Tab. 5 Accessories - Holders

➡ You can find connection cables to connect the sensors to the transmitters in Chap. "18.2 Connection Cable".

More accessories and spare parts can be found in the current NIVUS price list.

Maintenance and Cleaning

WARNING



Disconnect the System from Mains Power

Disconnect the unit from the mains and secure the higher system against being switched on again before starting maintenance, cleaning and/or repair work (only by qualified personnel).

Disregarding may lead to electric shock.

WARNING



Check danger due to explosive gases

Before starting assembly, installation and maintenance work, be sure to check that all regulations on safety at work have been observed and that there is no possible risk of explosive gases. Use a gas warner for the check.

When working in the sewer system, make sure that no electrostatic charge can occur:

- Avoid unnecessary movements to reduce the building-up of static charges.
- Discharge any static electricity present on your body before you start installing the sensor.

Disregarding may result in personal injury or damage to the system.

WARNING



Germ Contamination

Due to the frequent use of the sensors in the waste water sector, parts can be contaminated with dangerous germs. Therefore, appropriate precautions must be taken when coming into contact with cables and sensors.

Wear protective clothing.

22 Maintenance

22.1 Maintenance Interval

The OFR radar sensor is virtually calibration-, maintenance- and wear-free by design.

Nevertheless, NIVUS recommend an **annual check** of the entire measuring system by o the NIVUS customer service.

Depending on the area of application of the measuring system, the maintenance interval may vary. The scope of maintenance and its intervals depend on the following factors:

- Measurement principle of the sensors
- Material wear
- Measurement medium and channel hydraulics
- General regulations for the operator of the measurement system
- Environmental conditions

In addition to the annual maintenance, NIVUS recommend a complete maintenance of the measuring system by the NIVUS customer service after **ten years at the latest**.

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

22.2 Customer Service Information

For the recommended annual inspection of the entire measuring system or complete maintenance after ten years at the latest, contact our customer service:

NIVUS GmbH - Customer Centre

Phone +49 7262 9191-922

customercenter@nivus.com

23 Cleaning

WARNING



Disconnect the System from Mains Power

Make sure that the device is disconnected from mains power.

Disregarding may lead to electric shock.

DANGER



Danger by electrostatic Discharge

Clean the device only with a damp cloth.

In case of disregard, the explosion protection of the device is no longer given due to possible static charge.

The device then poses a danger to the life of the user and can cause the ignition of an explosive atmosphere.



Damage caused by hard Objects

Never use hard objects such as wire brushes, rods, scrapers or similar to clean the sensor.

The use of high-pressure cleaners may damage the sensor and lead to measurement failure and is therefore strictly prohibited.

Risk of damage to the sensor.

The measurement place must be checked at regular intervals.

If necessary, cleaning or clearing of vegetation must be carried out.

For cleaning, you can use a brush with plastic bristles, street broom or similar.

Do not use aggressive cleaning agents or solvents. Instead, it is better to use mild household cleaners or soap suds.

Do not remove any parts from the sensor when cleaning.

The radar sensor must always have a "free sight" to the surface of the medium to be measured.

24 Dismantling/Disposal

Improper disposal may be harmful to the environment.

- ➡ Dispose of device components and packaging materials in accordance with the applicable local environmental regulations for electrical products:
 1. Disconnect the device from mains power, if connected.
 2. Remove conneted cables from the device.



EU WEEE Directive

This symbol indicates that the requirements of Directive 2012/19/EU on waste electrical and electronic equipment must be observed when disposing of the device. Die NIVUS GmbH support and promote the recycling or environmentally sound, separate collection/disposal of waste electrical and electronic equipment to protect the environments and human health. Observe the local laws and regulations on disposal.

NIVUS GmbH are registered with the EAR, therefore public collection and return points in Germany can be used for disposal.

25 Installation of Spare Parts and Wearing Parts

We expressly draw your attention to the fact that spare parts and accessories which have not been supplied by us have also not been tested and approved by us. The installation and/or use of such products may therefore negatively alter or invalidate the design properties of your measurement system.

NIVUS are not liable for damage caused by the use of non-original parts and non-original accessories.

- ➡ See also Chap. "21 Accessories and Installation Aids".

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Approvals and Certificates

DE / EN / FR	<p>EU Konformitätserklärung <i>EU Declaration of Conformity</i> <i>Déclaration de conformité UE</i></p> <p>Für das folgend bezeichnete Erzeugnis: <i>For the following product:</i> <i>Le produit désigné ci-dessous:</i></p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <table border="0" style="width: 100%;"> <tr> <td style="width: 20%;">Bezeichnung:</td> <td>Oberflächenradar</td> </tr> <tr> <td><i>Description:</i></td> <td><i>surface radar</i></td> </tr> <tr> <td><i>Désignation:</i></td> <td><i>surface radar</i></td> </tr> <tr> <td>Typ / Type:</td> <td>OFR-G00... OFR-H00...</td> </tr> </table> </div> <p>erklären wir in alleiniger Verantwortung, dass die auf dem Unionsmarkt ab dem Zeitpunkt der Unterzeichnung bereitgestellten Geräte die folgenden einschlägigen Harmonisierungsvorschriften der Union erfüllen: <i>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:</i> <i>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:</i></p> <ul style="list-style-type: none"> <li style="display: inline-block; width: 45%;">• 2014/53/EU <li style="display: inline-block; width: 45%;">• 2011/65/EU <p>Bei der Bewertung wurden folgende einschlägige harmonisierte Normen zugrunde gelegt bzw. wird die Konformität erklärt in Bezug auf die nachfolgend genannten anderen technischen Spezifikationen: <i>The evaluation assessed the following applicable harmonised standards or the conformity is declared in relation to other technical specifications listed below:</i> <i>L'évaluation est effectuée à partir des normes harmonisées applicable ou la conformité est déclarée en relation aux autres spécifications techniques désignées ci-dessous:</i></p> <ul style="list-style-type: none"> <li style="display: inline-block; width: 30%;">• EN 61010-1:2010 + A1:2019 <li style="display: inline-block; width: 30%;">• EN 62311:2008 <li style="display: inline-block; width: 30%;">• EN 300 440 V2.2.1 <li style="display: inline-block; width: 30%;">• EN 61326-1:2013 <p>Diese Erklärung wird verantwortlich für den Hersteller: <i>This declaration is submitted on behalf of the manufacturer:</i> <i>Le fabricant assume la responsabilité de cette déclaration:</i></p> <p style="margin-left: 40px;">NIVUS GmbH Im Taele 2 75031 Eppingen Germany</p> <p>abgegeben durch / <i>represented by / faite par:</i> Marcus Fischer (Geschäftsführer / <i>Managing Director / Directeur général</i>)</p> <p>Eppingen, den 24.02.2023</p> <p>Gez. <i>Marcus Fischer</i></p>	Bezeichnung:	Oberflächenradar	<i>Description:</i>	<i>surface radar</i>	<i>Désignation:</i>	<i>surface radar</i>	Typ / Type:	OFR-G00... OFR-H00...	 <p>NIVUS GmbH Im Taele 2 75031 Eppingen</p> <p>Telefon: +49 07262 9191-0 Telefax: +49 07262 9191-999 E-Mail: info@nivus.com Internet: www.nivus.de</p>
Bezeichnung:	Oberflächenradar									
<i>Description:</i>	<i>surface radar</i>									
<i>Désignation:</i>	<i>surface radar</i>									
Typ / Type:	OFR-G00... OFR-H00...									

UK Declaration of Conformity

NIVUS GmbH
Im Tale 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:	Surface Radar Sensor
Type:	OFR-G00... / OFR-H00...

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

- SI 2017 / 1206 The Radio Equipment Regulations 2017
- SI 2012 / 3032 The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

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

- BS EN 61010-1:2010 + A1:2019
- BS EN 62311:2008
- BS EN 300 440 V2.2.1
- BS EN 61326-1:2013

This declaration is submitted on behalf of the manufacturer:

NIVUS GmbH
Im Tale 2
75031 Eppingen
Germany

represented by:

Marcus Fischer (Managing Director)

Eppingen, 24/02/2023

Signed by *Marcus Fischer*

DE / EN / FR



NIVUS GmbH
Im Taele 2
75031 Eppingen

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

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:	"Ex" Oberflächenradar
<i>Description:</i>	<i>"Ex" surface radar</i>
<i>Désignation:</i>	<i>"Ex" surface radar</i>
Typ / Type:	OFR-EV0-xxx...
	OFR-EVG-xxx...

erklären wir in alleiniger Verantwortung, dass die auf dem Unionsmarkt ab dem Zeitpunkt der Unterzeichnung bereitgestellten Geräte die folgenden einschlägigen Harmonisierungsvorschriften der Union erfüllen:

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

nous déclarons, sous notre seule responsabilité, à la date de la présente signature, la conformité du produit pour le marché de l'Union, aux directives d'harmonisation de la législation au sein de l'Union:

- 2014/53/EU
- 2014/34/EU
- 2011/65/EU


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

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

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

- EN 61010-1:2010 + A1:2019
- EN 62311:2008
- EN 300 440 V2.1.1
- EN IEC 60079-0:2018
- EN 60079-11:2012
- EN 61326-1:2013

Ex-Kennzeichnung / *Ex-designation* / *Marquage Ex* :

 II 2G Ex ib IIB T4 Gb

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

TÜV 16 ATEX 185271 X Issue: 00

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

TÜV NORD CERT GmbH, Langemarckstraße 20, 45141 Essen, Germany

(0044)

Diese Erklärung wird verantwortlich für den Hersteller:

This declaration is submitted on behalf of the manufacturer:

Le fabricant assume la responsabilité de cette déclaration:

NIVUS GmbH
Im Taele 2
75031 Eppingen
Germany

abgegeben durch / *represented by* / *faite par:*

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

Eppingen, den 24.02.2023

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:	"Ex" Surface Radar
Type:	OFR-EV0-xxx / OFR-EVG-xxx...

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

- SI 2017 / 1206 The Radio Equipment Regulations 2017
- SI 2016 / 1107 The Equipment and Protective Systems Intended for use in Potentially Explosive Atmospheres 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 61010-1:2010 + A1:2019
- BS EN 62311:2008
- BS EN 300 440 V2.1.1
- BS EN IEC 60079-0:2018
- BS EN 60079-11:2012
- BS EN 61326-1:2013

Ex-designation:



II 2G Ex ib IIB T4 Gb

EU-Type Examination Certificate:

TÜV 16 ATEX 185271 X Issue: 00

Notified Body (Identif. No.):

TÜV Nord CERT GmbH, Langemarckstraße 20, 45141 Essen, Germany

(0044)

This declaration is submitted on behalf of the manufacturer:

NIVUS GmbH
Im Täle 2
75031 Eppingen
Germany

represented by:

Marcus Fischer (Managing Director)

Eppingen, 24/02/2023

Signed by *Marcus Fischer*



(13) **SCHEDULE**

(14) **EU-Type Examination Certificate No. TÜV 16 ATEX 185271 X issue 00**

(15) Description of product

The surface radar sensors type OFR-EV0 and OFR-EVG are intended for contactless velocity measurement on the surface of liquid media particularly in wastewater areas via radar technology.

The permissible ambient temperature range of the sensors is -20 °C ... 60 °C.

Electrical data

Signal- and supply circuit in type of protection Intrinsic Safety Ex ib IIB
(Plug connector only for connection to a certified intrinsically safe circuit
pin 1 [+Vin] maximum values:
pin 6 [GND] $U_i = 10.5 \text{ V}$
 $I_i = 640 \text{ mA}$
 $P_i = 6.72 \text{ W}$
The effective internal capacitance is negligibly small.
Effective internal Inductance: 3.5 μH

RS485 interface in type of protection Intrinsic Safety Ex ib IIB
(Plug connector maximum values:
pin 2 [RxTx+] $U_o = 10.2 \text{ V}$
pin 5 [RxTx-] $I_o = 119 \text{ mA}$
 $P_o = 304 \text{ mW}$
characteristic line: linear
The effective internal capacitance is negligibly small.
Effective internal inductance: 53 μH

	Ex ib	IIB
max. permissible external inductance	10 mH	0.95 mH.
max. permissible external capacitance	2.2 μF	5.1 μF

At connection of the RS485 interface to belonging measuring transducers with active intrinsically safe circuits, the rules for the interconnection of intrinsically safe circuits have to be observed.

Maximum values:
 $U_i = 15.1 \text{ V}$
 $I_i = 168 \text{ mA}$
 $P_i = 634 \text{ mW}$

(16) Drawings and documents are listed in the ATEX Assessment Report No. 16 203 185271.



Schedule to EU-Type Examination Certificate No. TÜV 16 ATEX 185271X issue 00



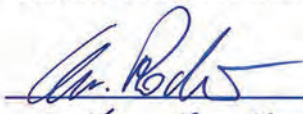

(17) Specific Conditions for Use

1. At the plastic parts there is a danger of ignition by electrostatic discharge.
Observe manual of the manufacturer and warning label.
2. The metallic parts of the protective cover, if used, have to be connected with ground potential.



(18) Essential Health and Safety Requirements

no additional ones

- End of Certificate -

		IECEX Certificate of Conformity	
INTERNATIONAL ELECTROTECHNICAL COMMISSION IEC Certification Scheme for Explosive Atmospheres <small>for rules and details of the IECEx Scheme visit www.iecex.com</small>			
Certificate No.:	IECEX TUN 16.0034X	Issue No: 0	<u>Certificate history:</u> Issue No. 0 (2016-12-14)
Status:	Current	Page 1 of 3	
Date of Issue:	2016-12-14		
Applicant:	NIVUS GmbH Im Talle 2 75031 Eppingen Germany		
Equipment: <i>Optional accessory:</i>	Radar sensor type OFR-EV0 and OFR-EVG		
Type of Protection:	Intrinsic safety "I"		
Marking:	Ex ib IIB T4 Gb		
Approved for issue on behalf of the IECEx Certification Body:		Christian Roder	
Position:		Deputy Head of the IECEx Certification Body	
Signature: (for printed version)			
Date:		2016 - 12 - 14	
<ol style="list-style-type: none">1. This certificate and schedule may only be reproduced in full.2. This certificate is not transferable and remains the property of the issuing body.3. The Status and authenticity of this certificate may be verified by visiting the Official IECEx Website.			
Certificate issued by:	TÜV NORD CERT GmbH Hanover Office Am TÜV 1, 30519 Hannover Germany		
			

	IECEX Certificate of Conformity	
Certificate No:	IECEX TUN 16.0034X	Issue No: 0
Date of Issue:	2016-12-14	Page 2 of 3
Manufacturer:	NIVUS GmbH Im Täle 2 75031 Eppingen Germany	
Additional Manufacturing location(s):		
<p>This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements. This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended.</p>		
STANDARDS:		
The electrical apparatus and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards:		
IEC 60079-0 : 2011 Edition:6.0	Explosive atmospheres - Part 0: General requirements	
IEC 60079-11 : 2011 Edition:6.0	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"	
<p><i>This Certificate does not indicate compliance with electrical safety and performance requirements other than those expressly included in the Standards listed above.</i></p>		
TEST & ASSESSMENT REPORTS:		
A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in		
<u>Test Report:</u>		
DE/TUN/ExTR16.0046/00		
<u>Quality Assessment Report:</u>		
DE/TUN/QAR13.0011/03		

		IECEX Certificate of Conformity	
Certificate No:	IECEX TUN 16.0034X	Issue No:	0
Date of issue:	2016-12-14	Page 3 of 3	
Schedule			
EQUIPMENT:			
<i>Equipment and systems covered by this certificate are as follows:</i>			
The radar sensors type OFR-EV0 and OFR-EVG are used for contact less measurement of the flow rate of liquid media, especially in waste water areas.			
The permissible ambient temperature range is -20 °C ... + 60 °C.			
For further information see attachment.			
CONDITIONS OF CERTIFICATION: YES as shown below:			
1. At the plastic parts there is a danger of ignition by electrostatic discharge. Observe manual of the manufacturer and warning label.			
2. The metallic parts of the protective cover, if used, have to be connected with ground potential.			
Annex:			
Annexe_Surface Radar OFR_XXX_TUN16.0034X.pdf			

TÜV NORD CERT GmbH
 Hanover Office
 Am TÜV 1
 30519 Hannover
 Germany



Page 1 of 1
 Attachment to IECEx TUN 16.0034 Issue 00

The surface radar sensors type OFR-EV0 and OFR-EVG are intended for contactless velocity measurement on the surface of liquid media particularly in wastewater areas via radar technology.

The permissible ambient temperature range of the sensors is -20 °C ... 60 °C.

Electrical data

Signal- and supply circuit in type of protection Intrinsic Safety Ex ib IIB
 (Plug connector only for connection to
 pin 1 [+Vin] a certified intrinsically safe circuit
 pin 6 [GND] maximum values:
 $U_i = 10.5 \text{ V}$
 $I_i = 640 \text{ mA}$
 $P_i = 6.72 \text{ W}$
 The effective internal capacitance is negligibly small.
 Effective internal Inductance: 3.5 μH

RS485 interface in type of protection Intrinsic Safety Ex ib IIB
 (Plug connector maximum values:
 pin 2 [RxTx+] $U_o = 10.2 \text{ V}$
 pin 5 [RxTx-] $I_o = 119 \text{ mA}$
 $P_o = 304 \text{ mW}$
 characteristic line: linear
 The effective internal capacitance is negligibly small.
 Effective internal inductance: 53 μH

	Ex ib	IIB	
max. permissible external inductance		10 mH	0.95 mH
max. permissible external capacitance		2.2 μF	5.1 μF

At connection of the RS485 interface to belonging measuring transducers with active intrinsically safe circuits, the rules for the interconnection of intrinsically safe circuits have to be observed.

Maximum values:
 $U_i = 15.1 \text{ V}$
 $I_i = 168 \text{ mA}$
 $P_i = 634 \text{ mW}$

Specific condition of Use:

1. At the plastic parts there is a danger of ignition by electrostatic discharge.
 Observe manual of the manufacturer and warning label.
2. The metallic parts of the protective cover, if used, have to be connected with ground potential.

P17-F-021 03-10