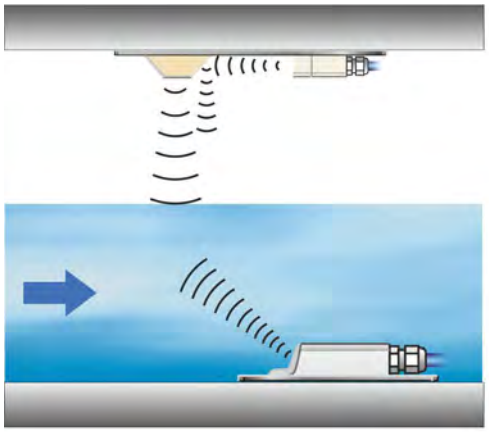
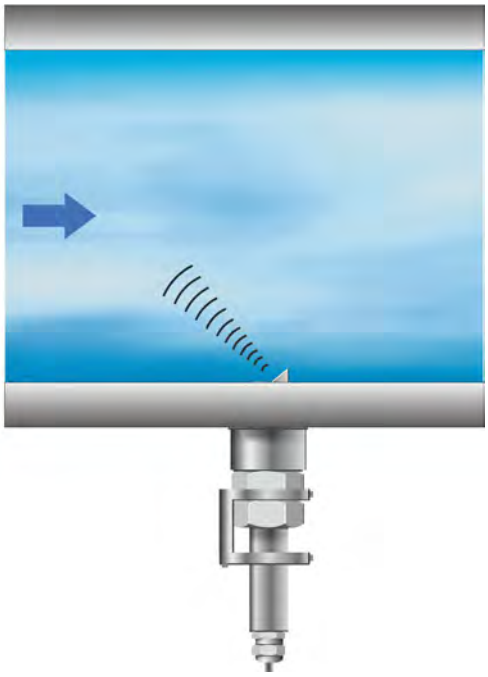
FLOW

Mounting Instruction

Cross Correlation and Doppler Sensors





Revised Instruction Manual Rev. 09 / 24.08.2026

Original Instruction Manual: German, Rev. 09 / 04.05.2026

Use
Mounting Instruction Manual always as a unit with the
Technical Description for Correlation Sensors and external Electronic Box
or the
Technical Description for Doppler Sensors

measure analyse optimise

NIVUS GmbH • Im Taele 2 • 75031 Eppingen, Germany • www.nivus.com
Phone: +49 7262 9191-0 • Fax: +49 7262 9191-999 • info@nivus.com

NIVUS AG, Switzerland

Hauptstrasse 35
8750 Glarus, Switzerland
Phone +41 55 6452066
Fax +41 55 6452014
info@nivus.ch
www.nivus.ch

NIVUS Austria

Mühlbergstraße 33B
3382 Loosdorf, Austria
Phone +43 2754 5676321
Fax +43 2754 5676320
austria@nivus.com
www.nivus.de

NIVUS Sp. z o.o., Poland

Ul. Boleslawa Krzywoustego 4
81-035 Gdynia, Poland
Phone +48 58 7602015
biuro@nivus.pl
www.nivus.pl

NIVUS France SAS

28 rue de Londres
75009 Paris, France
Phone +33 1 89708767
info@nivus.fr
www.nivus.fr

NIVUS Ltd., United Kingdom

Unit 2D Middlemarch 4020
Middlemarch Business Park
Siskin Parkway East
Coventry, CV3 4SU
Phone +44 8445 332883
nivusUK@nivus.com
www.nivus.co.uk

NIVUS Middle East (FZE)

Prime Tower
Business Bay Dubai
31st floor, office C-3
P.O. Box: 112037
Phone +971 4 4580502
middle-east@nivus.com
www.nivus.com

NIVUS Korea Co. Ltd.

#2301, M-Dong Technopark IT Center,
32 Songdogwahak-ro, Yeonsu-gu,
INCHEON, Korea 21984
Phone +82 32 2098588
Fax +82 32 2098590
jhkwon@nivuskorea.com
www.nivuskorea.com

NIVUS Vietnam

238/78 Phan Trung Street
Tan Tien Ward, Bin Hoa City
Dong Nai Province, Vietnam
Phone +84 94 2623979
jhkwon@nivuskorea.com
www.nivus.com

NIVUS Africa

3rd floor, block no. 3
75th Fadan Area
Abo Rawash Industrial Zone
Giza, Egypt
Phone +20 2 35393975
Fax +20 2 35393976
sales@nivusaf.com
www.nivus.com

NIVUS Technologies India Pvt. Ltd.

5th Floor, 502, RMZ KEPPEL
One Paramount, 10
Mount Poonamallee High Road
Porur, Chennai-600116, TN
India
Phone +91 44 6923 0047
india@nivus.com
www.nivus.in

Copyrights and Property Rights

The contents of this document including tables and drawings are proprietary to NIVUS GmbH and are not to be reproduced or copied without express written permission.

Violations oblige to compensation.

Written Permission required

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

Translation

If the device is sold to a country in the European Economic Area (EEA) this instruction manual must be translated into the language of the country in which the device is to be used.

Should the translated text be unclear, the original instruction manual (German) must be consulted or a member company of the NIVUS-Group must be contacted for clarification.

Copyright

No part of this publication may be reproduced, transmitted, sold or disclosed without prior permission. All rights reserved.

Names

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

Revision History

Revision	Date	Modifications		Editor
09	2026-08-24	NIVUS Addresses updated; Chap. "*2.6 Intended Use*" updated; New CSM pipe sensors CSM-V100M / CSM-V100S included and, in turn, previous pipe sensor CSM-V100R removed: Chap. "*3 Sensor Overview*", "*4.2.3 In full pipelines*" and "*5.4 Pipe Sensors*" changed/supplemented and Chap. "*5.4.5 CSM Pipe Sensor: Drilling into Pipeline and Mounting*" removed; Chap. "*8.3 Ball Valve*", "*8.4 Drill Bit*" and "*9 Accessories and Spare Parts*" updated; "Air Hose" changed to "Capillary Tube" and the according use / or respective procedure changed: Chap. "*5.2.1.3 Wedge sensor with integrated pressure measurement cell*" and "*5.2.5 Cable routing*". minor changes in wording and layout		MoG
08	2024-11-11	NIVUS addresses updated; Chap. "1.1 About this Instruction Manual" and "2.5 Ex Protection" updated; Chap. "2.6 Intended Use" supplemented; Chap. "3 Sensor Overview", "4.1 Selecting Calming Sections", "4.2.1 In part filled Flumes", "5.3.2 Mounting Plate Construction" and "7.2.1 with Pipe Measuring Section" updated; Chapters "Colour codes for cables and individual wires", "Warranty" and "Disclaimer" removed due to the reference to the mandatory affiliation and co-use of the Technical Descriptions of the sensors; minor changes in wording and layout		MoG
07	2020-07-09	Corrections: New Creation: Removed: Modifications:	Fig. 5-25: Caption Chap. 5.4.5.6: Determining the Insertion Depth L Chap. 8.2.3: Cross-reference Chap. 1.4: Warranty All chapters on "Drilling into fully filled pipes" as instructed by the TM; Chap. 8.4 and Chap. 9: Drill bit Ø 36 mm and extension Page 2: Branch Office France Chap. 5.4.1, Chap. 5.4.4.2, Chap. 5.4.5.3 and Chap. 5.4.5.6: Adaptations to exclusive drilling in empty pipes Chap. 10.2: Notice "EU WEEE Directive"	KG
06	2019-07-31	Complete Revision		KG

Table of Contents

Copyrights and Property Rights 3

Revision History 4

1 General 8

1.1 About this Manual 8

1.2 Applicable Documentation 9

1.3 Signs and Definitions used 9

1.4 Article Names 9

2 Safety Instructions 10

2.1 Symbols and Signal Words used / Information on the Valuation of Accident Levels 10

2.2 Special safety and Precautionary Measures 11

2.3 Safety Information on Pipe Sensors 12

2.4 Requirements for the Personnel 13

2.5 Ex Protection 13

2.6 Intended Use 14

2.7 Duties of the Operator 14

3 Sensor Overview 16

4 Sensor Positioning in the Measurement Section 18

4.1 Selecting the Measurement Section 18

4.2 Sensor Positioning Examples 19

4.2.1 In partially filled channels 19

4.2.2 In structured, partially filled channels 26

4.2.3 In full pipelines 28

5 Sensor Mounting 31

5.1 Principles of Sensor Mounting 31

5.2 Wedge Sensors 32

5.2.1 Information on Wedge Sensor Mounting 32

5.2.1.1 Basics 32

5.2.1.2 Wedge sensor without integrated pressure measurement cell 33

5.2.1.3 Wedge sensor with integrated pressure measurement cell 34

5.2.1.4 Wedge sensor with integrated water-ultrasound 36

5.2.2 Required Tools and Material 36

5.2.3 Alignment of Wedge Sensors 37

5.2.4 Fastening the Sensor 37

5.2.5 Cable routing 37

5.3 OCL and DSM Air-Ultrasonic Sensors 41
5.3.1 Information on Mounting Air-Ultrasonic Sensors....41
5.3.2 Mounting plate construction....42
5.3.3 Sensor Positioning....43
5.3.4 Required Tools and Material 43
5.3.5 Permanent fastening in the pipe....44
5.3.6 Temporary fastening in the pipe 44
5.4 Pipe Sensors 45
5.4.1 Notes on pipe sensor installation 45
5.4.2 Required Tools and Material 46
5.4.3 Aligning Pipe Sensors 46
5.4.4 Pipe Sensors: Drilling in pipeline and installation....48
5.4.4.1 Overview of Components....48
5.4.4.2 Notes on drilling in pipelines 50
5.4.4.3 Drill into drained pipeline and attach nozzle 51
5.4.4.4 Notes on Sensor Mounting 52
5.4.4.5 Prepare sensor mounting....52
5.4.4.6 Install pipe sensor 54
5.4.4.7 Fastening Element: Overview of Components 56
5.4.4.8 Prepare the mounting of the fastening element....57
5.4.4.9 Mount the fastening element....57

6 Maintenance and Cleaning 59

7 Sensors in the Control Section 60

7.1 Basic Technical Control Information....60
7.2 Construction of the Control Section....60
7.2.1 With Pipe Measuring Section 60
7.2.2 In the Channel 63

8 Mounting Accessories and Tools 65

8.1 Welding Nozzle....65
8.1.1 Description....65
8.1.2 Installation Examples....66
8.2 Tapping Saddle....67
8.2.1 Description....67
8.2.2 Installation Examples....69
8.2.3 Installation....69
8.3 Ball Valve....74
8.4 Drill Bit....75

8.5 Cutting paste 75
8.6 Sensor Protection Sheet 76
8.7 Wedge support 76
8.7.1 Description 76
8.7.2 Installation Examples 77
8.8 Cable Protection Sheets 78
8.9 Float 80
8.9.1 Description 81
8.9.2 Parallel rods 82
8.9.2.1 Description 82
8.9.2.2 Determining the correct length 83
8.9.2.3 Adjust length 83
8.9.3 Notes on float installation in turbulent media 84
8.9.4 Installing the pipe sensor 85
8.9.5 Maintenance and Cleaning 86

9 Accessories and Spare Parts 87

10 Dismantling/Disposal 89

10.1 Dismantling 89
10.2 Disposal 89

Index 90

1 General

1.1 About this Manual

Important Notice

READ CAREFULLY BEFORE USE.

KEEP IN A SAFE PLACE FOR LATER REFERENCE.

These **mounting instructions** for cross-correlation and Doppler sensors are intended for the professional and correct installation and intended use of the sensors shown in the sensor overview (see Chapter "*3 Sensor Overview*" on page *16*). This instruction manual is oriented exclusively to qualified expert personnel.

The mounting instructions are a supplement to the **Technical Description Cross Correlation Sensors and external Electronic Box** or to the **Technical Description Doppler Sensors**, which contains all basic information on the cross correlation and Doppler sensors, such as explosion protection, specifications, dimensions, maintenance and repair as well as topics on warranty and liability, intended use, delivery, storage and transport, declarations of conformity and type examination certificates and much more.

Both instructions for the Cross Correlation or Doppler sensors must be used as a unit.

Before starting assembly, read the mounting instructions carefully and completely; they contain important information about the 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 the NIVUS GmbH 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.

- The **wiring diagrams** for sensors, transmitters and data loggers are listed in the respective operating instructions / technical descriptions.
- The description of the **operation** of the transmitters/data loggers is part of the respective operating instructions.

Validity of this Manual

In addition to the sensors in the current NIVUS delivery programme, some of these installation instructions also apply to sensors that are/will no longer be available at present or in the near future.

1.2 Applicable Documentation

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

- Technical Description for Correlation Sensors and Electronic Box
- Technical Description for Doppler Sensors
- Mounting Instructions for RMS Pipe Mounting Systems
- Instruction Manual(s) for Transmitters/Data Loggers

These instructions are included with the accessories, the respective sensors or transmitters/data loggers or can be downloaded from the NIVUS homepage.

1.3 Signs and Definitions used

Representation	Meaning	Remarks
⇨	Cross-reference	Reference to further or 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. 1-1 Structural elements within the manual

1.4 Article Names

- OCL Air-ultrasonic sensor
- KDA Doppler Sensor
- KDO Doppler Sensor
- POA Cross Correlation Sensor
- CS2 Cross Correlation Sensor
- CSP Cross Correlation Sensor
- CSM Cross Correlation Sensor
- DSM Air-Ultrasonic Sensor

2 Safety Instructions

2.1 Symbols and Signal Words used / 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 of 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 Notice

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 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 and avoid electrostatic charge

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 modify or 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

Danger due to electric shock!

When drilling in wet rooms or in filled pipes, dangerous fault currents can occur and lead to personal injury.

- *Use an electronic personal protection adapter.*

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.

CAUTION

Risk of damage to the unit and malfunctions

Check sensor suitability for the application.
*The **specifications** for the sensors can be found in the Technical Description for Correlation Sensors and external Electronic Box or in the Technical Description for Doppler Sensors.*

Commissioning only by qualified Personnel

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

2.3 Safety Information on Pipe Sensors

WARNING

Risk of personal injury

The safety information on the pipe sensor is part of the delivery. Disregarding may lead to personal injury.

- *Observe Safety Information*
- *Do not remove the Safety Information*

!!! Important Notes - Please Observe !!!

1 Line under Pressure! Depressurise before changing the sensor.
2 Never operate the pipe sensor without fastening element.
3 The cable must not be damaged on the outer sheath.
4 Avoid kinks in the sensor cable.
5 Before installation - follow the instructions in the instruction manual.

Fig. 2-1 Safety instructions on the pipe sensor

2.4 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

2.5 Ex Protection

CAUTION

The Ex protection expires due to damage

Damage to components may invalidate the explosion protection.

Protect the sensors from shocks, falls or other damage.

The Ex version of the sensors is designed for use in areas with explosive atmospheres of zone 1.

ATEX / IECEx II 2G Ex ib IIB T4 Gb / Ex ib IIB T4 Gb

All information on Ex protection, certificates and type examination certificates for the sensors can be found in the Technical Description for Correlation Sensors and external Electronic Box or in the Technical Description for Doppler Sensors.

2.6 Intended Use

Strictly observe and comply with guidelines and requirements

The sensors are intended exclusively for the purpose mentioned below. Any other use beyond this, any conversion or modification of the mounting systems 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.

Check whether the sensor is suitable for the application. Observe

- the permissible maximum limit values

and

- the section entitled "Intended Use" in the accompanying Technical Description.

The specifications for the sensors and lots of other can be found in the Technical Description for Correlation Sensors and external Electronic Box or in the Technical Description for Doppler Sensors.

2.7 Duties of the Operator

Strictly observe and comply with guidelines and requirements

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 measurement system, make sure that the local regulations (e.g. for the electrical connection) have been observed during installation and commissioning.

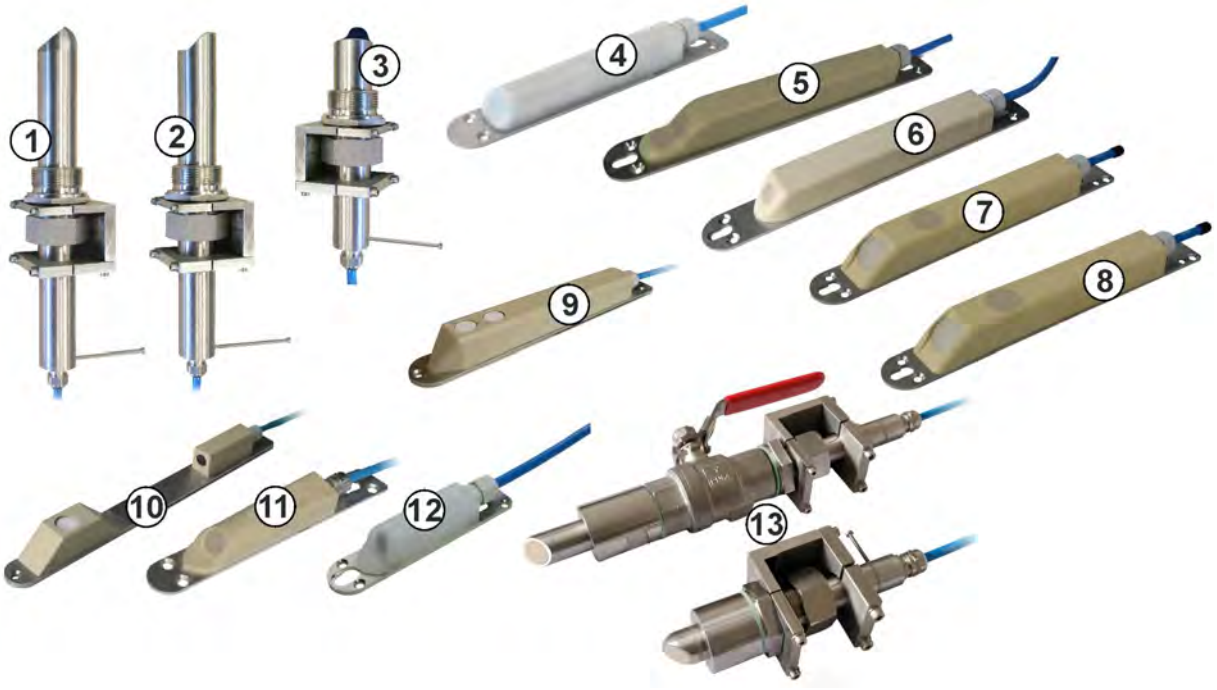
Keep the Instruction Manual for future Reference

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 sensors, this instruction manual must be handed over with them. The manual is part of the standard delivery.

3 Sensor Overview



	Sensor	Design	v-Measure-ment	h-Measurement	Installation
1	CS2-….R	Pipe sensor	Cross Correlation	-	With nozzle in pipe from outside **or** Installation in float
2	POA-….R	Pipe sensor	Cross Correlation		With nozzle in pipe from outside **or** Installation in float
3	KDA-R / KDO-R	Pipe sensor	Doppler	-	With nozzle in pipe from outside
4	KDA-K / KDO-K	Wedge Sensor	Doppler	Optional: Pressure Measurement	Screwing to channel/channel wall or channel/channel bottom **or** Bracing with RMS pipe mounting system *
5	POA-VxH1K / POA-VxU1K	Wedge Sensor	Cross Correlation	Water-Ultrasound **or** Pressure Measurement + Water-Ultrasound	Screwing to channel/channel wall or channel/channel bottom **or** Bracing with RMS pipe mounting system *
6	POA-Vx00K / POA-VxD0K	Wedge Sensor	Cross Correlation	None **or** Pressure Measurement	Screwing to channel/channel wall or channel/channel bottom **or** Bracing with RMS pipe mounting system *

7	CS2-….K	Wedge Sensor	Cross Correlation	Without **or** Pressure Measurement **or** Water-Ultrasound **or** Pressure Measurement + Water-Ultrasound	Screwing to channel/channel wall or channel/channel bottom **or** Bracing with RMS pipe mounting system *
8	CSP	Wedge Sensor	Cross Correlation	Without **or** Pressure Measurement **or** Water-Ultrasound **or** Pressure Measurement + Water-Ultrasound	Screwing to channel/channel wall or channel/channel bottom **or** Bracing with RMS pipe mounting system *
9	OCL	Wedge Sensor	-	Air-Ultrasound	Fasten at the top (e.g. in the pipe crown) **or** Bracing with RMS pipe mounting system *
10	DSM	Mini Wedge Sensor	-	Air-Ultrasound	Fasten at the top (e.g. in the pipe crown) **or** Bracing with RMS pipe mounting system *
11	CSM-V1D0K	Mini Wedge Sensor	Cross Correlation	Pressure Measurement	Screwing to channel/channel wall or channel/channel bottom **or** Bracing with RMS pipe mounting system *
12	CSM-V100K	Mini Wedge Sensor	Cross Correlation	-	Screwing to channel/channel wall or channel/channel bottom **or** Bracing with RMS pipe mounting system *
13	CSM-V100M / CSM-V100S	Pipe sensor	Cross Correlation	-	With nozzle in pipe from outside

**) To clamp the sensors with the RMS pipe mounting system, be sure to follow the installation instructions for RMS pipe mounting systems!*

Fig. 3-1 Overview and details of the sensors

4 Sensor Positioning in the Measurement Section

4.1 Selecting the Measurement Section

The mounting of the sensors at the measurement place is extremely dependent on the local conditions.

Therefore, care must be taken to ensure good hydraulic conditions and a sufficient calming section upstream of the installation location.

Conditions for Calming Sections

- Falls, bed jumps, fixtures and channel profile changes **upstream** of the measurement must be avoided.
- Avoid lateral supply lines directly **upstream** or **downstream** of the measurement!
- **Sedimentation:** Select the measuring section in such a way that no deposits (sand, rubble, mud) are present in the measuring section or can be deposited subsequently. Sedimentation is caused by insufficient drag forces within the flow profile and indicate insufficient slope or structural defects (negative partial slope) within the measuring section. Observe required minimum flow velocity (DWA-A 110).
- **Part Filled Pipes:** Do not exceed a filling level of 80 % in the pipe. From a filling level of about 80 % of the nominal diameter, pipes can temporarily block. In order to avoid pulsation in the measurement section, the diameter must be selected so that a filling level of 80 % is not exceeded (independent of Q_{min} or Q_{max} for standard discharges; 2 Q_{TW}).
- Avoid **changes in slope** within the measurement section.
- **Inlet and outlet section**: The straight inlet section must be at least 5x DN. The outlet section must be at least 2x DN.
  In case of changes or disturbances of the hydraulics and disturbance of the flow profile, longer calming sections are required.
- **Level measurements:** Select an installation site with as few waves as possible and with a water level line parallel to the channel bottom.
  The level measurement must be in the **same area** as the flow velocity measurement.
  If the water level is low, make sure that the flow velocity sensor may have an influence on the level measurement.

Support in the selection/assessment of the measurement place

If in doubt when selecting or assessing the planned measurement place, contact your local NIVUS representative or the internal sales department at NIVUS GmbH in Eppingen:

E-Mail sales@nivus.com, Phone + 49 7262 9191-794

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

- Sketches or drawings
- Photos of the planned measurement place

These must show the structural situation at, before and after the planned installation location.

4.2 Sensor Positioning Examples

The illustrations in Chapters "*4.2.1 In partially filled channels*" to "*4.2.3 In full pipelines*" show examples of different applications to demonstrate

- well-suited measurement sections
- less suitable measurement sections
- the correct sensor position in the measurement section
- problem applications and also critical hydraulic conditions

The numerical values given in the examples are guidelines and recommendations based on many years of experience. Depending on the hydraulic conditions (roughness, additional hydraulic disturbances, high flow velocities, etc.), much larger distances may also be required.

Illustrations of the sensors as examples only

*The following examples apply to **wedge** sensors and **pipe** sensors.*

4.2.1 In partially filled channels

Use of a separate air ultrasonic sensor (fill level)

*If you are using a separate air ultrasonic sensor to measure the level, it must be installed **upstream of the flow velocity sensor** in order to avoid any turbulence caused by the flow velocity sensor (see also* Fig. 4-11*). Coordinate variations with NIVUS.*

To capture the maximum flow velocity in the flow pattern, observe the following:

- If possible, mount the flow velocity sensor in the centre of the channel.
  Exception: Sensors in measuring sections tending to sedimentation with a curved bottom.
- For asymmetrical mounting: When programming, be sure to specify the sensor position in relation to the centre of the channel.

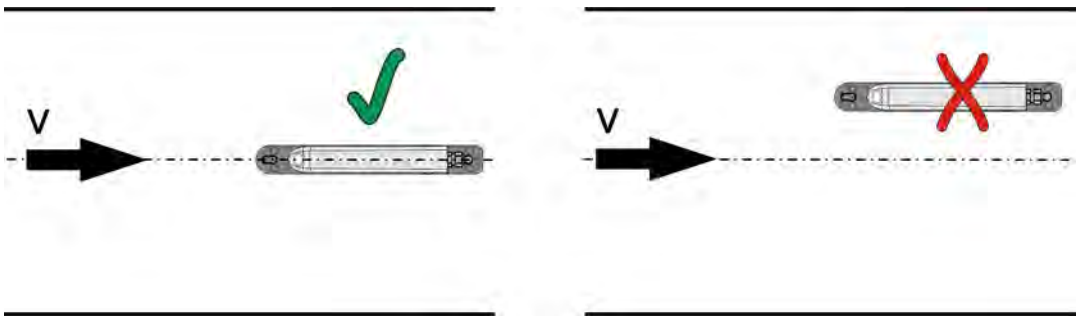


Fig. 4-1 Sensor positioning in the channel centre (principle)

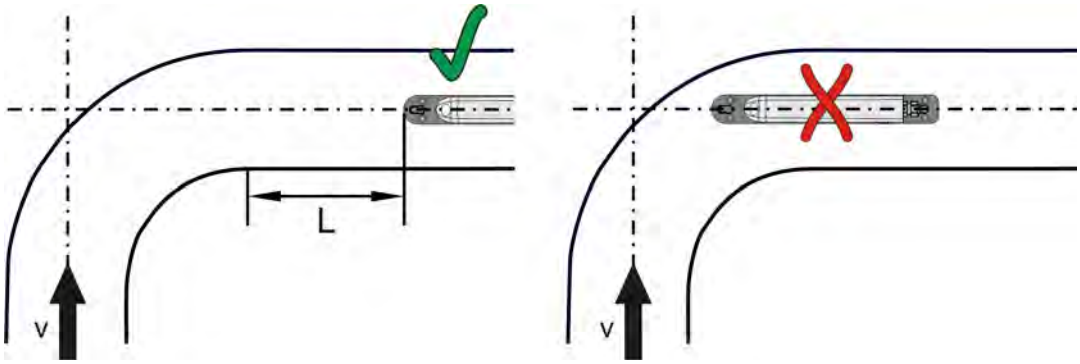
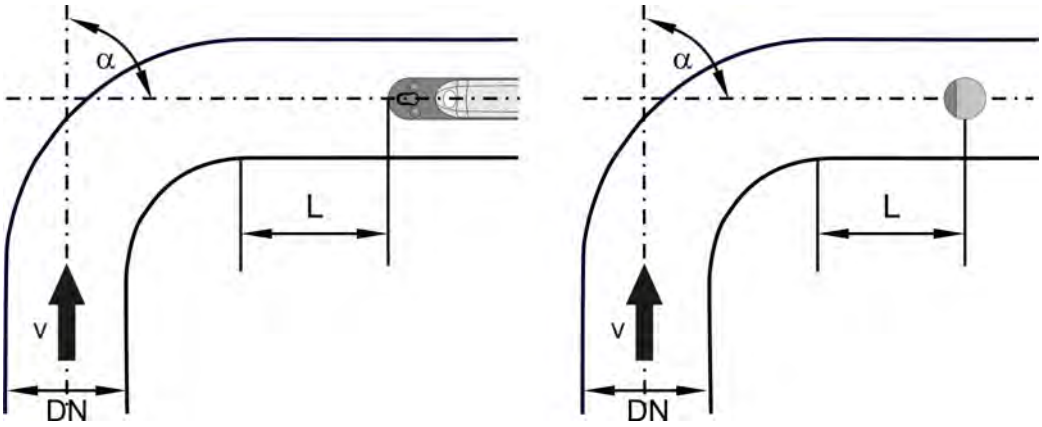


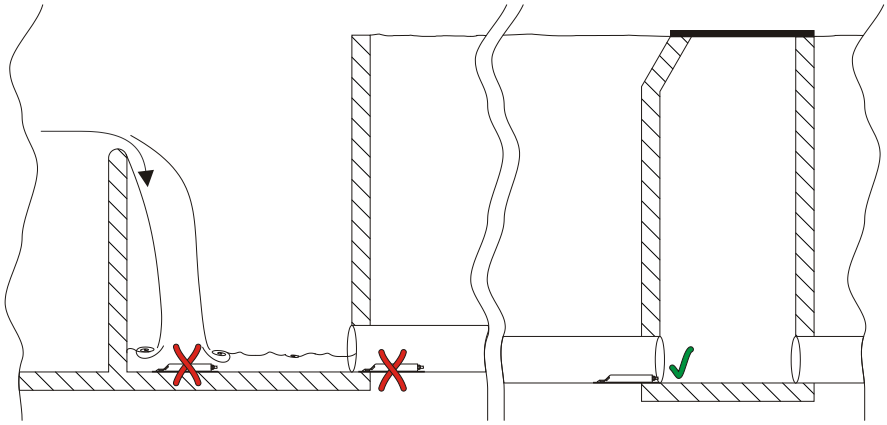
Fig. 4-2 Sensor position behind curves or bends (principle)



α = Change of the flow direction

Sensor Type	Change of flow direction α	v ≤ 1 m/s	v > 1 m/s
POA, CS2, CSP, KDA, KDO	α = 0°…15° α = 15°…45° α = 45°…90°	L ≥ min. 3x DN L ≥ min. 5x DN L ≥ min. 10x DN	L ≥ min. 5x DN L ≥ min. 10x DN L ≥ min. 15…20x DN
CSM-V100	α = 0°…15° α = 15°…45° α = 45°...90°	L ≥ min. 5x DN L ≥ min. 8x DN L ≥ min. 15x DN	L ≥ min. 10x DN L ≥ min. 20x DN L ≥ min. 30…40x DN
CSM-V1D0	α = 0°…15° α = 15°…45° α = 45°…90°	L ≥ min. 4x DN L ≥ min. 6x DN L ≥ min. 12x DN	L ≥ min. 7x DN L ≥ min. 15x DN L ≥ min. 25…30x DN

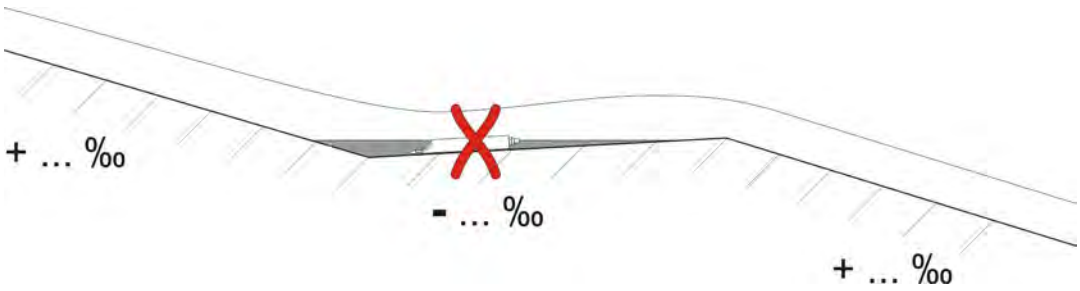
Fig. 4-3 Sensor position behind curves or bends (principle)



× Error! Undefined flow conditions

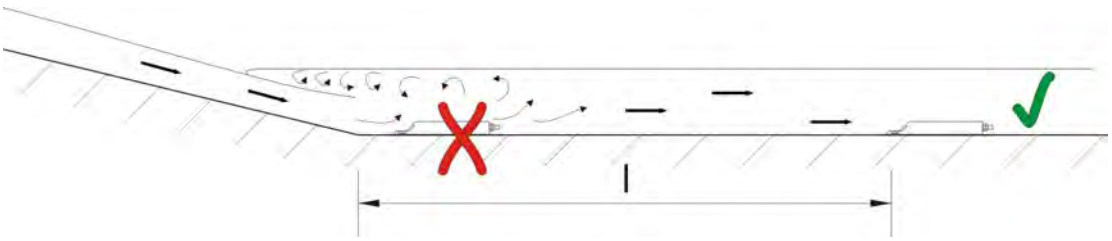
✓ Distance sufficient for even flow
(depending on application a distance of 10...50x DN)

Fig. 4-4 Discharge canal or fall – eddying (principle)



× Error!
Risk of silting due to negative slope

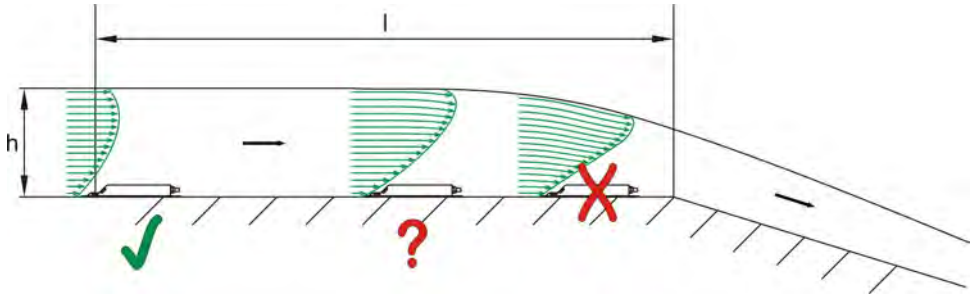
Fig. 4-5 Negative slope - risk of silting (principle)



× Error! Change in slope = change of flow profile

✓ Distance; depending on slope and flow velocity value
l = min. 20x DN

Fig. 4-6 Error due to change in slope (principle)

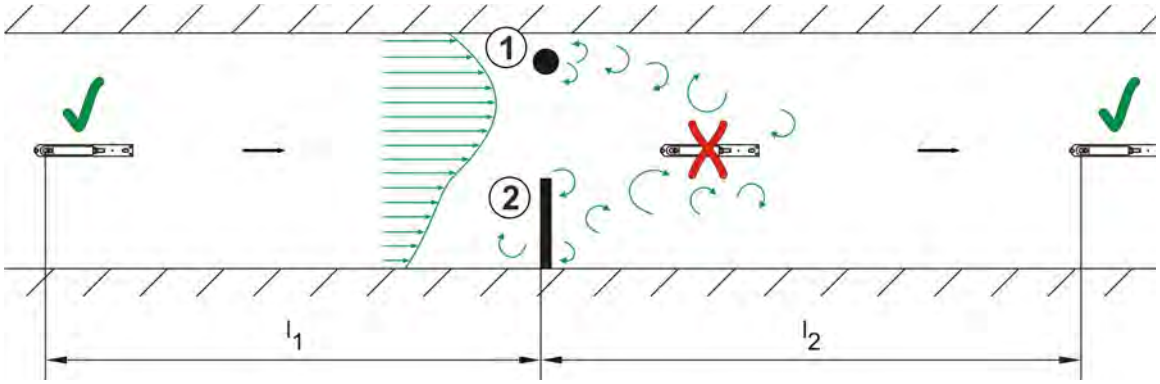


× Error! Transition from flowing to shooting
Incorrect level and flow velocity measurement

? Critical measurement point, not recommended! Beginning of the jet lowering

✓ Distance l = min. 5x h_{max} at installation place

Fig. 4-7 Error due to changing flow profile upstream of change in slope or fall (principle)



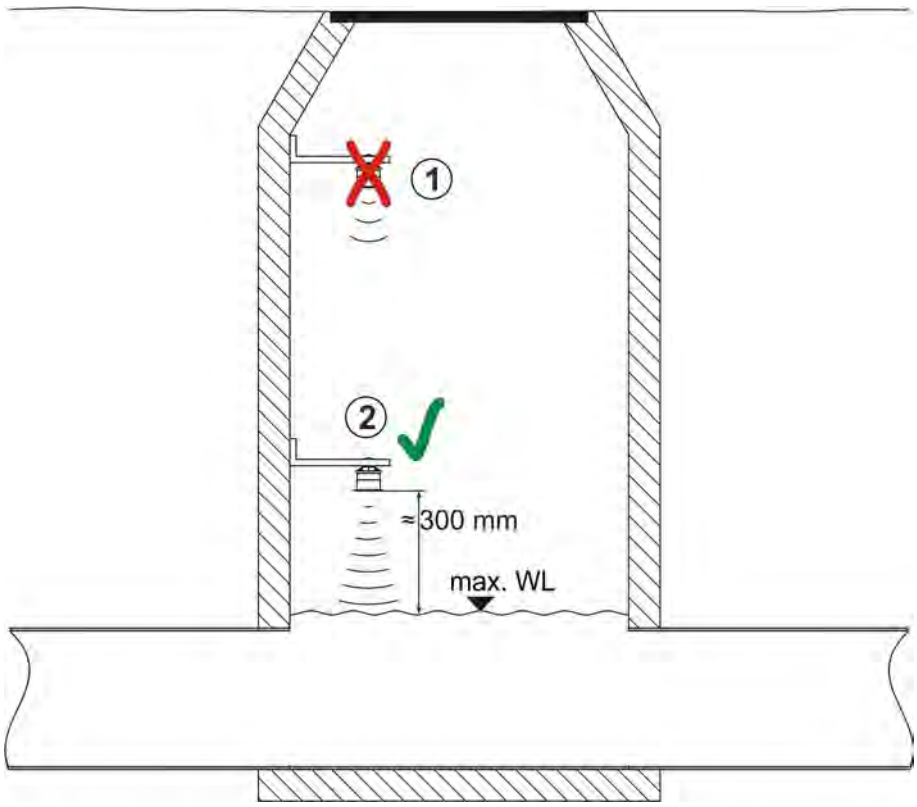
1 Fixtures e.g. Sampler or similar

2 Obstruction

× Error due to eddying!

✓ Distance l1 (upstream of obstruction) = min. 5x h_{max}
Distance l2 (downstream of obstruction) = min. 10x h_{max}
with flow velocities >1 m/s

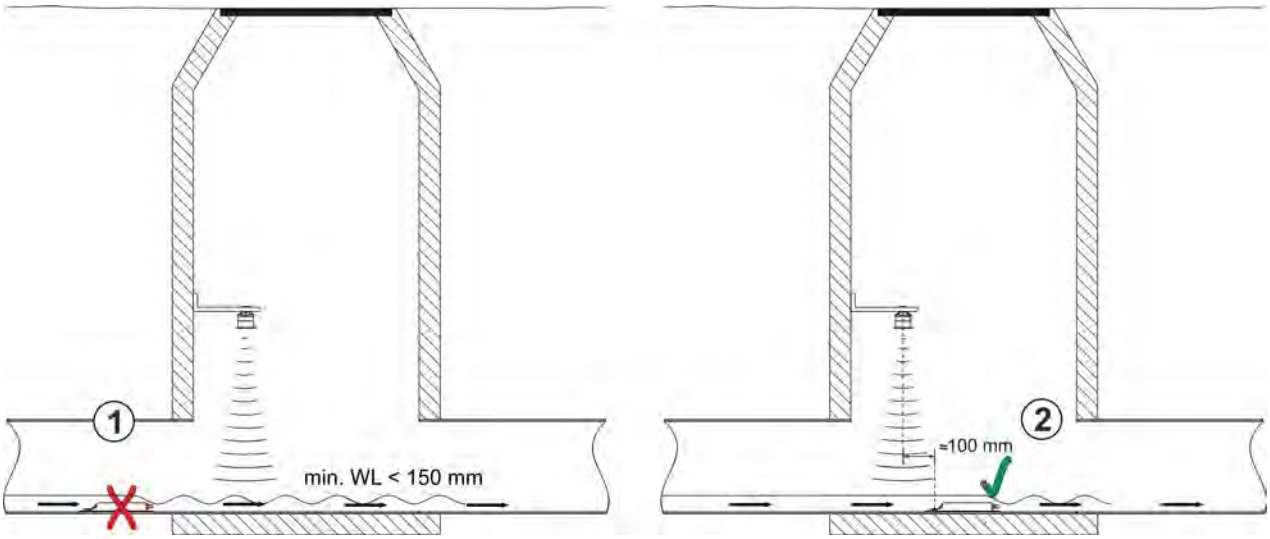
Fig. 4-8 Error due to fixtures or obstructions (top view) (principles)



1 Distance from bottom edge of sensor to max. water level too great

2 OK: optimum sensor position at maximum water level (may be lower depending on sensor type)

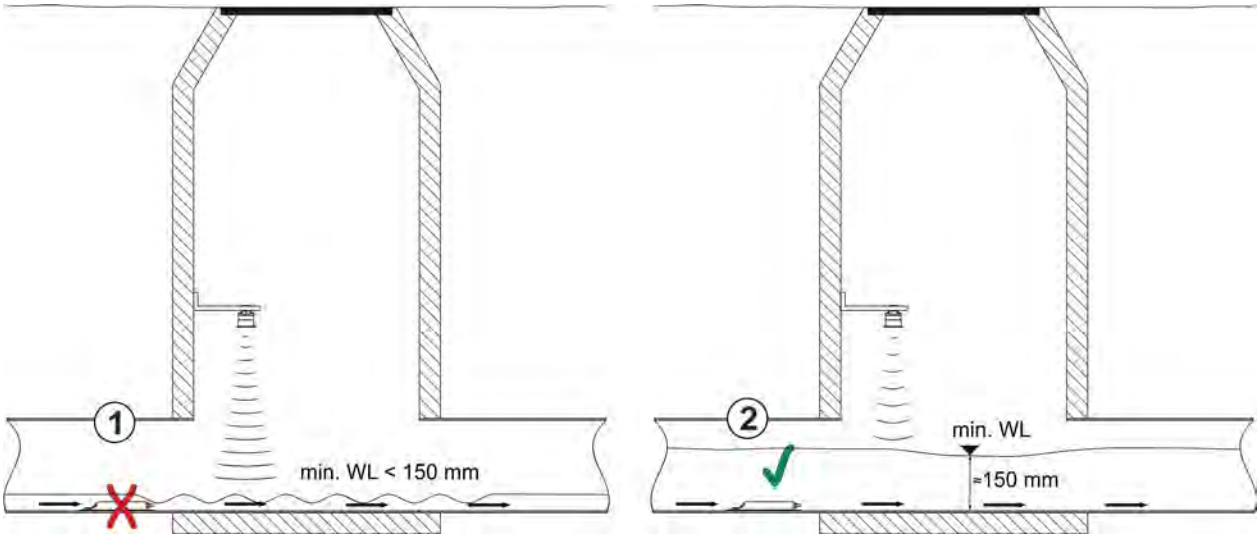
Fig. 4-9 Installation of air-ultrasonic sensors (principle)



1 Wave formation on the water surface downstream of sensor
→ Faulty measurement with air ultrasonic sensor mounted behind it

2 Installation OK (for low flow levels, possibly lower by 10 mm)

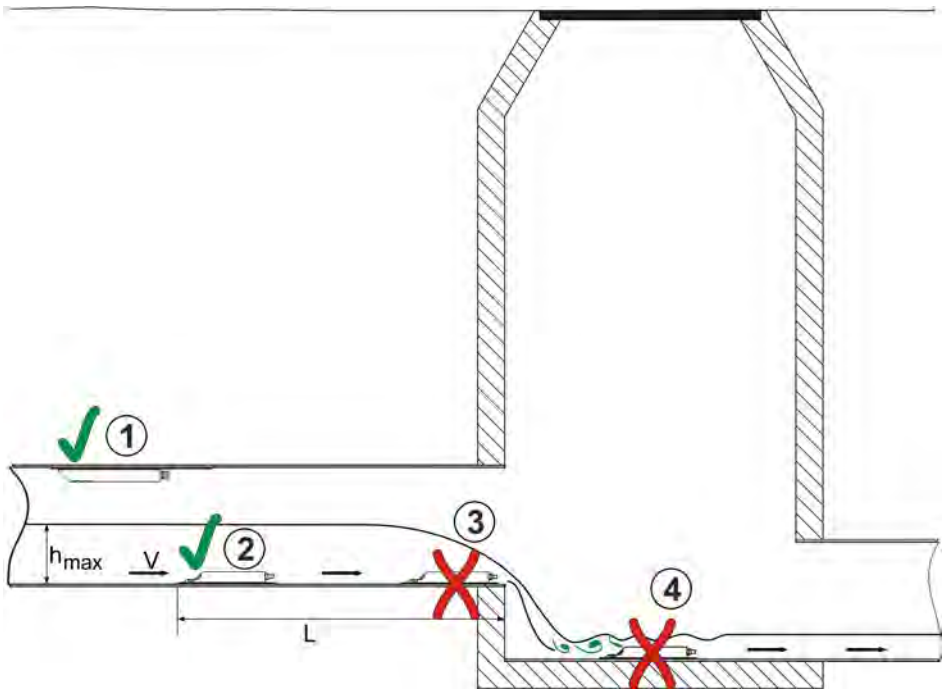
Fig. 4-10 Installation in shafts with fill levels < 150 mm (principle)



1 Wave formation on the water surface downstream of sensor
→ Faulty measurement with air ultrasonic sensor mounted behind it

2 Installation OK with minimum water level > 150 mm

Fig. 4-11 Installation in shafts with fill levels > 150 mm (principle)



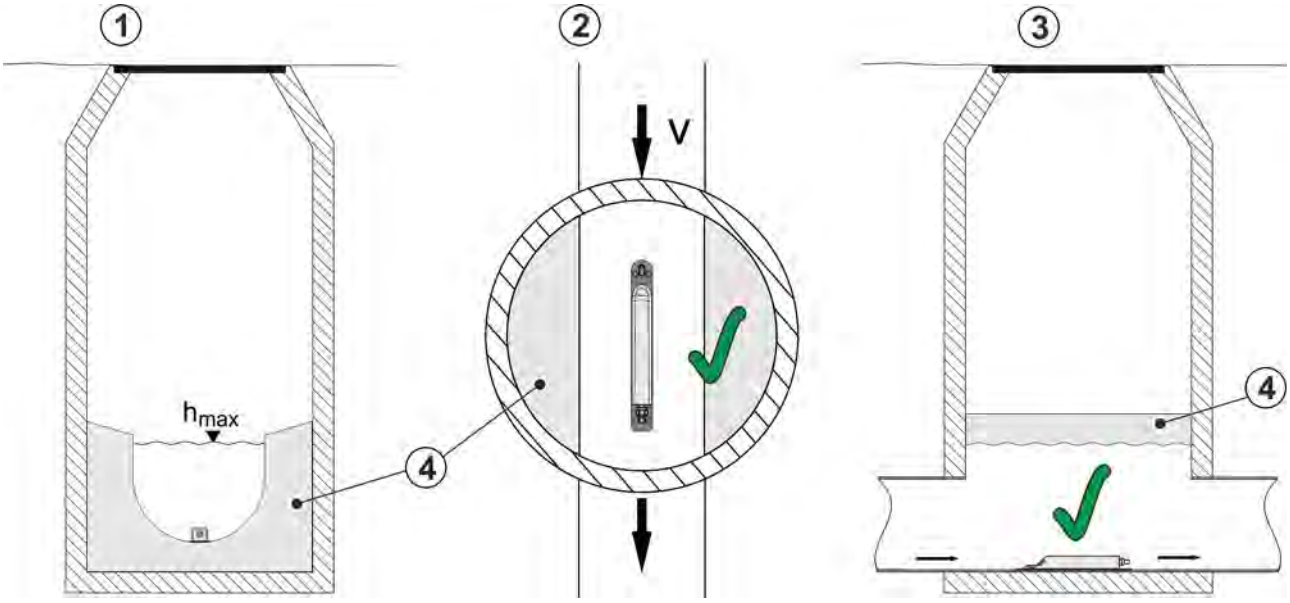
1 Installation OK: Air-ultrasonic sensor before flow velocity sensor

2 **or** sensor with pressure measurement cell
$L \geq 3x\ h_{max}$
h_{max} = maximum water level in intake

3 Error! Transition from flowing to shooting
Faulty flow velocities and levels

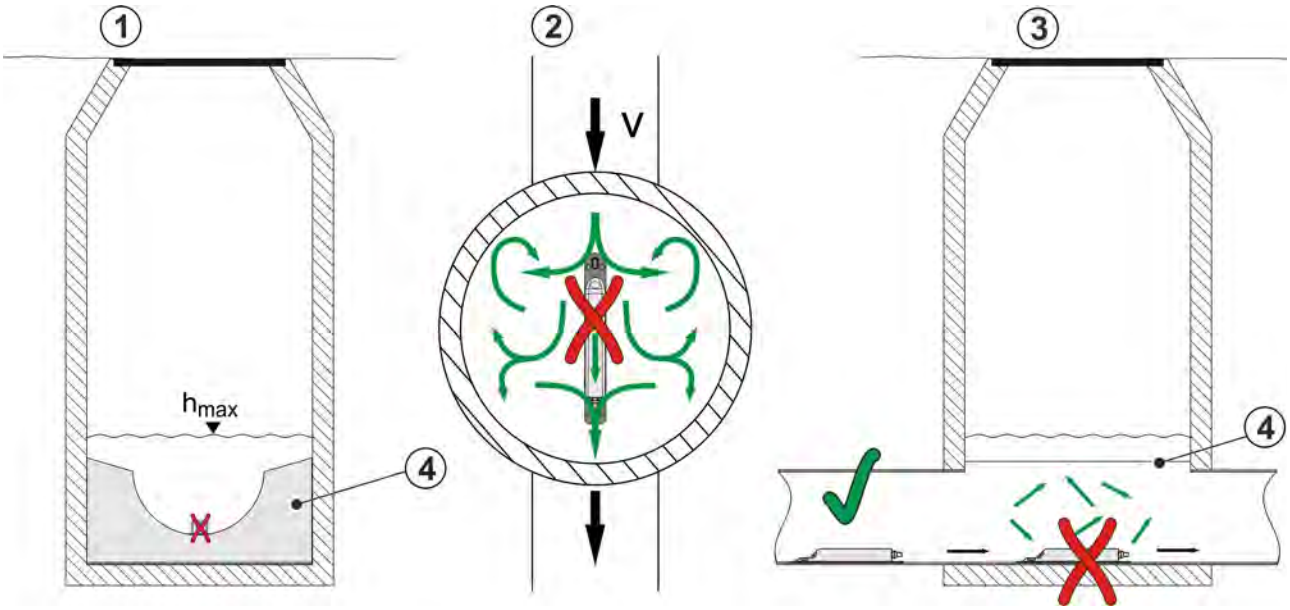
4 Error! Eddying and wave formation after fall
→ Find another measuring point or adapt the shaft

Fig. 4-12 Installation with fall or change of slope (principle)



1 Front view of shaft
2 Top view of shaft
3 Lateral view of shaft
4 Berm: $h_{Berm} > h_{max}$

Fig. 4-13 Sensor position in shafts with high berm (principle)



1 Front view of shaft
2 Top view of shaft
3 Lateral view of shaft
4 Berm: $h_{Berm} < h_{max}$

Fig. 4-14 Sensor position in shafts with low berm (principle)

4.2.2 In structured, partially filled channels

Observe when mounting the sensor:

- Position the mounting plates of the sensors as horizontally as possible

In **rectangular** and **rectangular-like** geometries, arrange flow velocity sensors according to the Gaussian distribution:

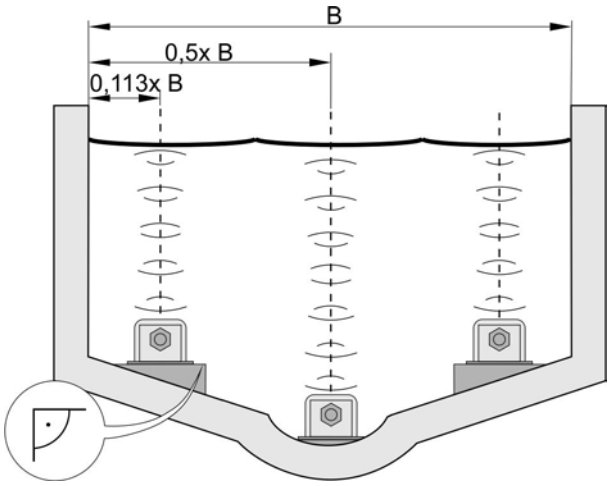


Fig. 4-15 Arrangement of several sensors according to the Gaussian distribution (principle)

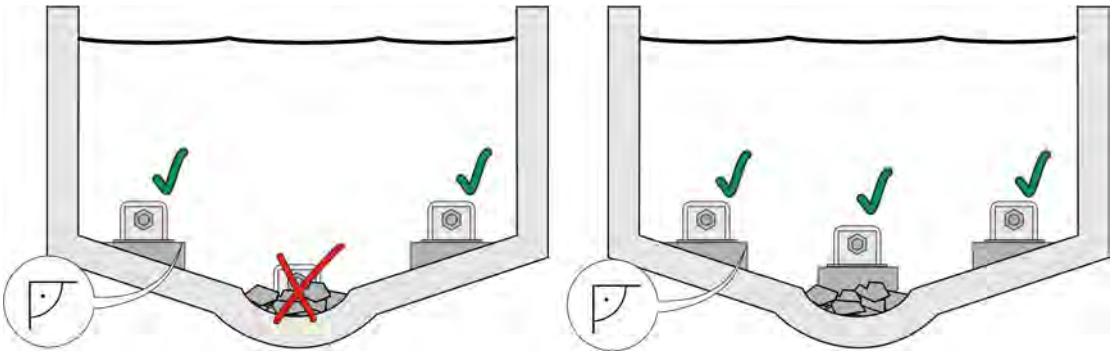


Fig. 4-16 Positioning with sediments in the dry weather flume (principle)

Arrange flow velocity sensors in **pipes** as follows:

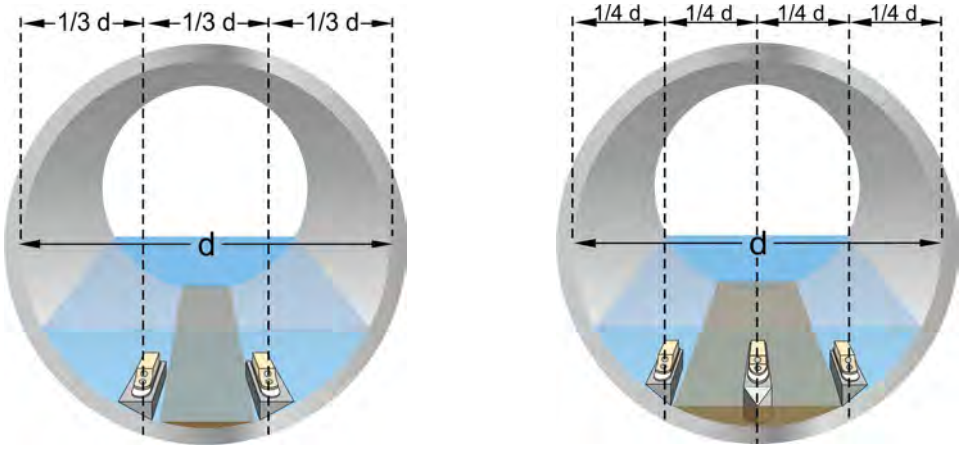


Fig. 4-17 Arrangement of several wedge sensors in pipes (principle)

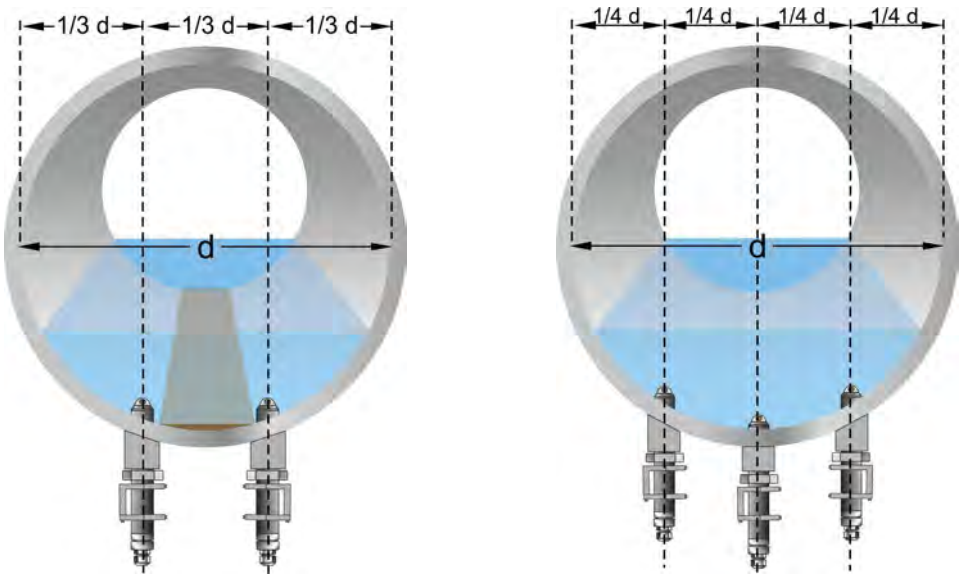


Fig. 4-18 Arrangement of several pipe sensors (principle)

For all other profiles, please enquire about the correct positioning of the sensors at NIVUS.

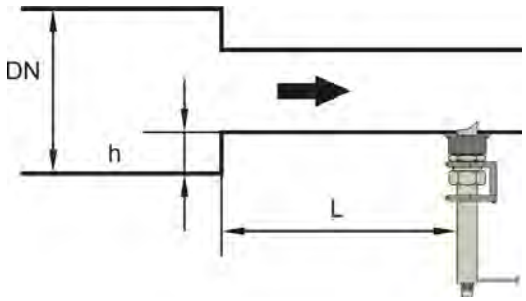
Enclose dimensioned drawings.

Contact:

your local NIVUS representative or the internal sales department at NIVUS GmbH in Eppingen:

E-Mail sales@nivus.com, Phone + 49 7262 9191-794

4.2.3 In full pipelines



Sensor Type	h	L
POA, CS2, KDA, KDO, CSM-V100M	h ≤ 5 % of DN h > 5 % of DN h ≥ 30 % of DN	L ≥ min. 3x DN L ≥ min. 5x DN L ≥ min. 10x DN
CSM-V100S	h ≤ 5 % of DN h > 5 % of DN h ≥ 30 % of DN	L ≥ min. 5x DN L ≥ min. 10x DN L ≥ min. 30x DN

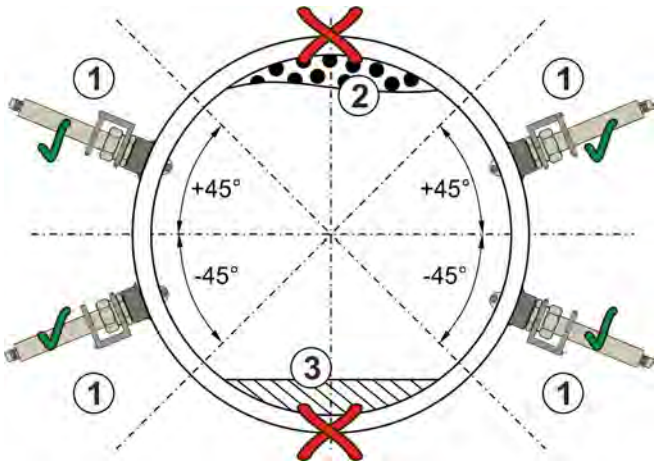
Fig. 4-19 Sensor position behind profile changes (principles)

In horizontal pipelines depending on the measured medium deposits (sediments) may occur at the pipe bottom.

Avoid pipe crown and pipe bottom as installation locations.

There is a risk of silting or air bubbles.

NIVUS recommends a mounting angle of -45°...+45° to the horizontal.

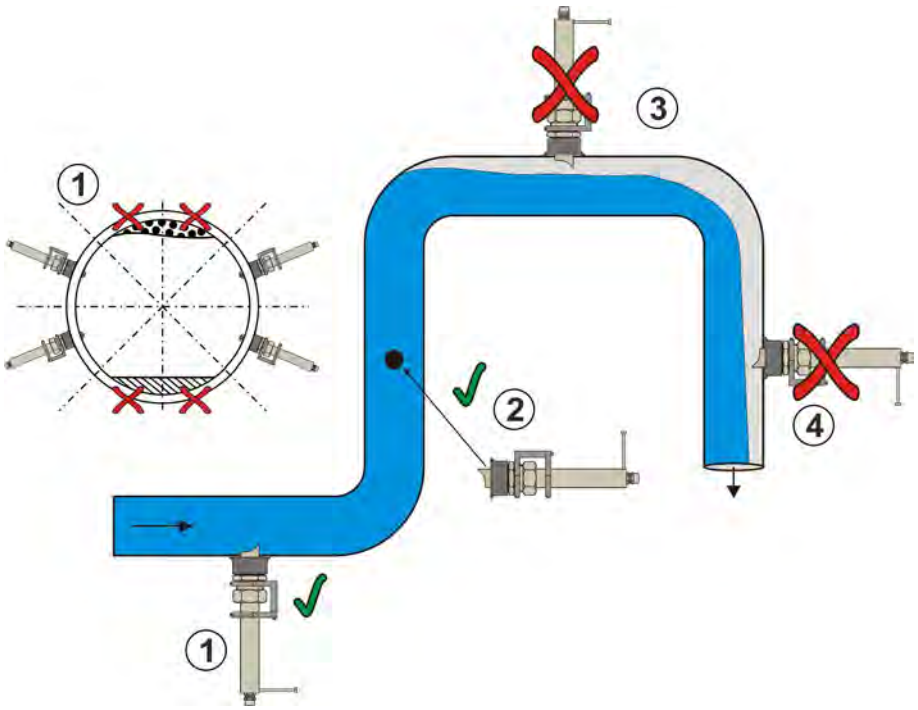


1 Recommended sensor mounting area
2 Risk of air bubbles
3 Risk of silting/sludge

Fig. 4-20 Recommended installation angles (principle)

If the pipework runs vertically upwards, there is no risk of silting or air bubbles forming on the sensor. The installation location can be chosen as required.

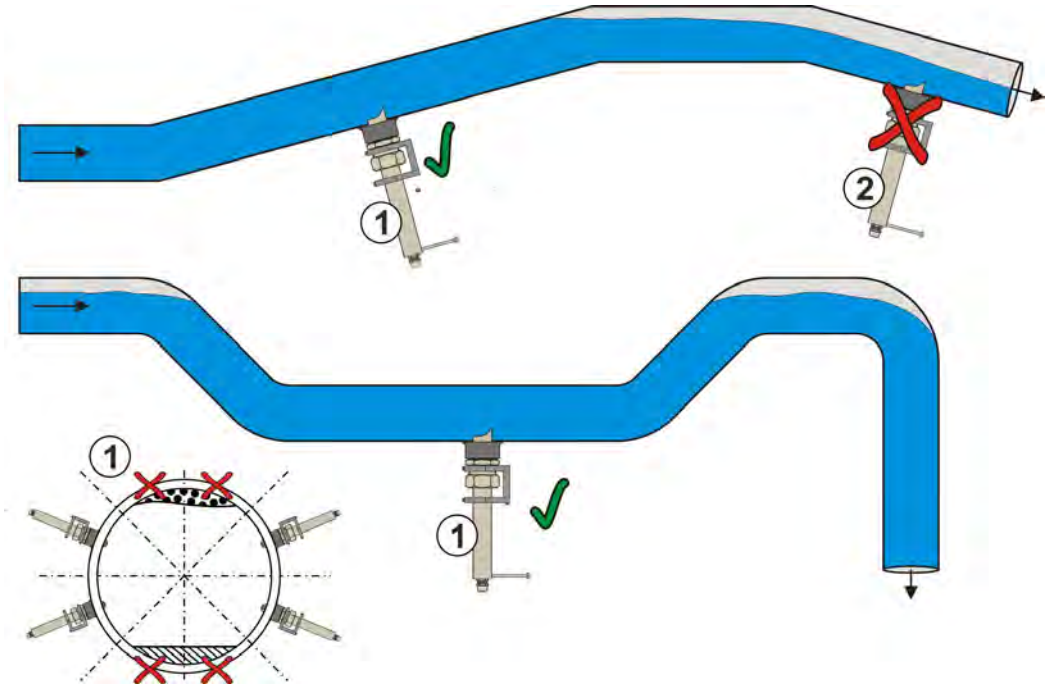
A correct and reliably functioning measurement is only possible with full filled pipelines. Therefore, installations in downpipes or at the highest point of the pipe are not suitable (see *Fig. 4-21*).



1 Recommended range in the horizontal (installation angle of -45°...+45° to the horizontal)
2 Recommended range in the vertical
3 Not recommended, as partial filling/empty run
4 No measurement possible due to empty run

Fig. 4-21 Comparison of different installation locations (principle)

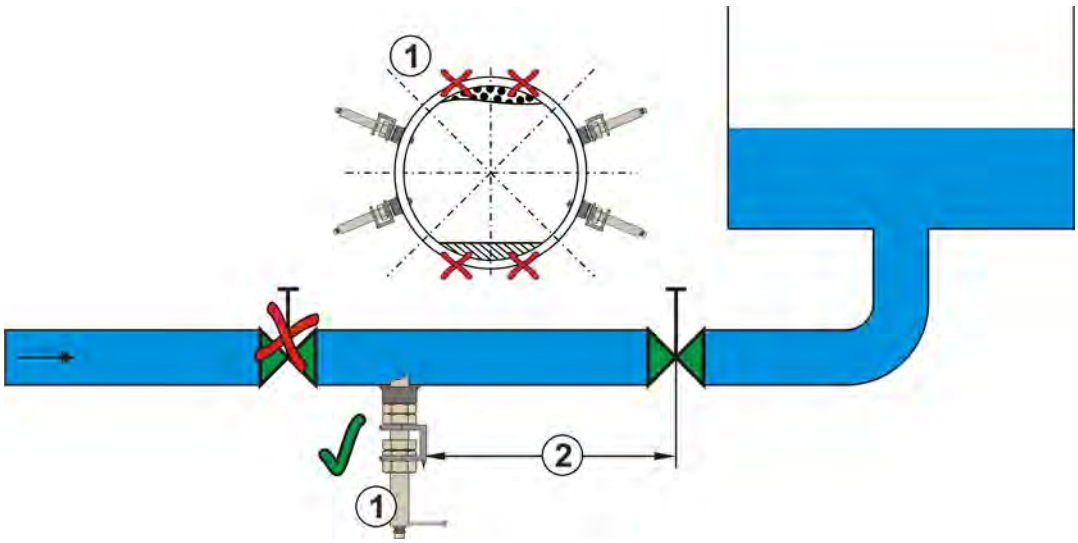
When planning new measurements in horizontal pipelines, a slight rise or a culvert is recommended (installation of the sensors as in *Fig. 4-22*).



1 Recommended installation areas (installation angle of -45°...+45° to the horizontal)
2 Installation not recommended

Fig. 4-22 Horizontal line with siphon (principle)

Always install control and shut-off valves **downstream** of the flow velocity sensor.



1 Recommended installation area (installation angle of -45°...+45° to the horizontal)

2 Min. 3x DN

Fig. 4-23 Use of stop and control valves (principle)

5 Sensor Mounting

5.1 Principles of Sensor Mounting

WARNING

Explosion hazard due to explosive gases in the environment

Persons may be injured.

- *Before starting installation work, check for possible danger from explosive gases with a gas warning device.*
- *Observe occupational safety regulations.*
- *During installation, make sure that no electrostatic charge can occur.*
- *If necessary, take the necessary measures to avert danger.*

WARNING

Danger due to electric shock!

When drilling in wet rooms or in filled pipes, dangerous fault currents can occur and lead to personal injury.

- *Use an electronic personal protection adapter.*

CAUTION

Risk of damage to the unit and malfunctions

- *Check sensor suitability for the application with regard to pressure, temperature and measurement method.*
  The specifications for the sensors can be found in the Technical Description for Correlation Sensors and external Electronic Box or in the Technical Description for Doppler Sensors.

Sensor Mounting in dirty Media

In channels and flumes with too low a slope or where backwater occurs, sedimentation can quickly occur at the bottom of the flume in the case of dirty media. This easily leads to silting and silting up of the sensor, which is mounted on the channel bottom. As a result, measurement failure or unstable measurement reading may occur.

Possible countermeasures:

- Set the sensor higher with the help of a wedge support (see Chap "*8.7 Wedge support*")
- Installing the sensor on the side of the channel wall
- Installing the pipe sensor using a float (see Chap. "*8.9 Float*")

5.2 Wedge Sensors

5.2.1 Information on Wedge Sensor Mounting

5.2.1.1 Basics

- Do not remove any parts of the wedge sensor.
  If the base plate or the cable glands of the sensor are loosened or removed, then the sensor is leaking. Penetrating water destroys the electronics. This leads to measurement failure in the long run.
- Do not widen the mounting holes on the base plate.
- Do not bend the base plate of the wedge sensor.
- Attach mounting parts for wedge sensors flat with the mounting plate.
  If screws or other fastening parts protrude into the measuring medium, then there is a risk of sensor build-up in the wastewater area. Sensor build-up leads to malfunctions or measurement failure.
- Mount the wedge sensor on an exactly flat surface. Uneven ground leads to sensor body breakage.

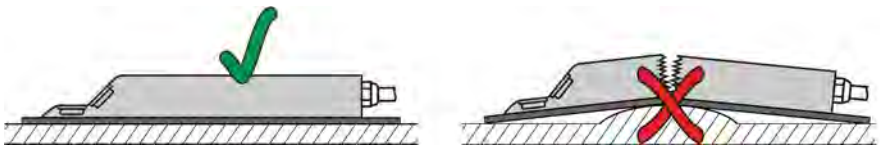


Fig. 5-1 Wedge sensor mounting on flat ground

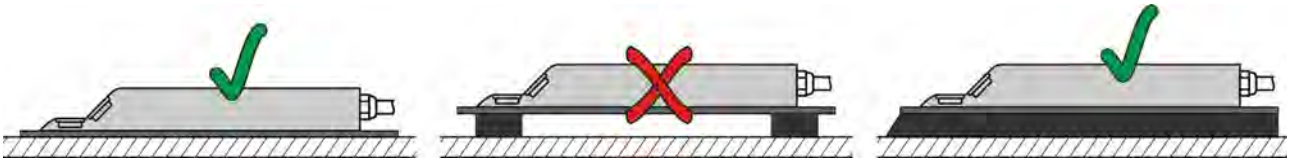
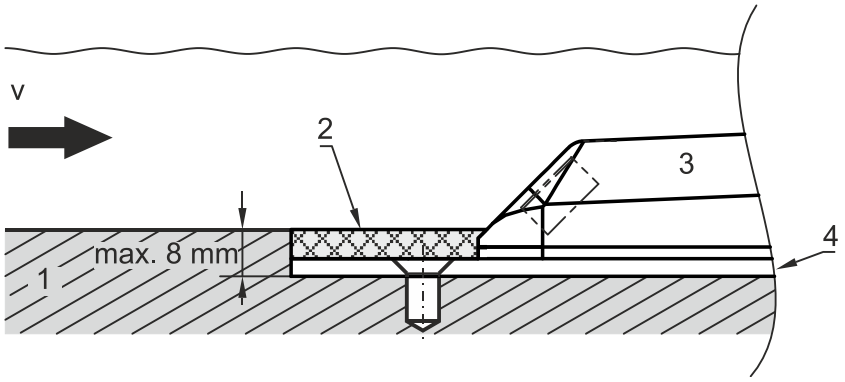


Fig. 5-2 Elevated wedge sensor

5.2.1.2 Wedge sensor without integrated pressure measurement cell

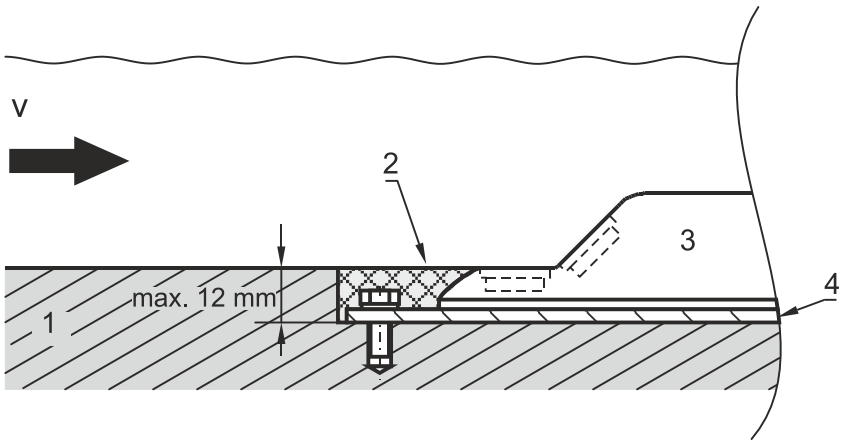
Observe when mounting the sensor:

- Mount wedge sensors **without integrated pressure measurement cell**, if possible, in a recess. You must create this recess beforehand.
- Recess for KDA, KDO and CS2 sensors: max. 8 mm (see *Fig. 5-3*)
- Recess POA sensor: max. 12 mm (see *Fig. 5-4*).
- After completing the installation work, seal the remaining gaps with permanently elastic material (silicone or similar).



1 Channel bottom
2 Silicone or similar
3 Sensor body
4 Base Plate/Mounting Plate

Fig. 5-3 Lowered wedge sensor (KDA, KDO or CS2)



1 Channel bottom
2 Silicone or similar
3 Sensor body
4 Base Plate/Mounting Plate

Fig. 5-4 Lowered wedge sensor (POA)

5.2.1.3 Wedge sensor with integrated pressure measurement cell

Observe when mounting and operating the sensors:

- **Do not countersink** combination sensors with **integrated pressure measurement cell** into the mounting location. Sealing or soiling lead to measurement distortions of the level measurement. The measurement is inaccurate or fails completely.
- Do not remove the cover above the pressure measurement cell. This protects the pressure measurement cell from external influences. Removal of the cover will void the warranty.
- Do not touch the pressure measurement cell. Do not use a water jet for cleaning. Contact with fingers, brushes, water jets, etc. will damage the pressure measurement cell and lead to measurement failures.
- Always operate sensors with integrated pressure measurement cell with pressure compensation element. Penetrating moisture can destroy the sensor electronics of sensors with integrated pressure measurement cells.

Possible Measurement Deviations

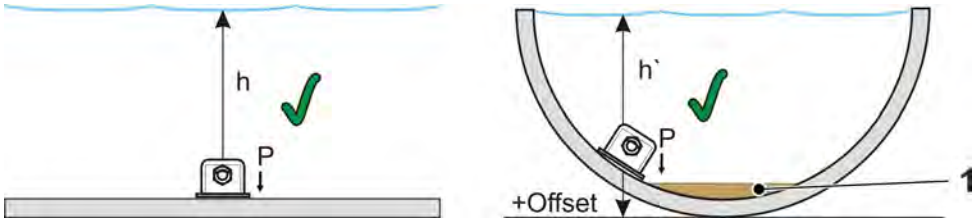
When using a sensor with a pressure measurement cell, note that physically induced measurement deviations can occur at high flow velocities and low levels (Bernoulli effect).

If there is a risk of silting or sludge:

- Mount sensors with integrated pressure measurement cell off-centre.
  The pressure measurement cell detects the level above the sensor.

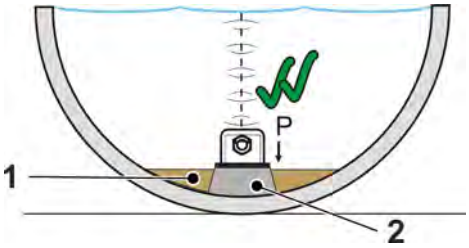
OR

- Set the sensor higher with the help of a wedge support.



1 Sedimentation (sand/sludge)

Fig. 5-5 Sensor with integrated pressure measurement cell: Mounting off-centre



1 Sedimentation (sludge/sand)

2 Wedge support

Fig. 5-6 Sensor with integrated pressure measurement cell: Mounting with wedge support

Capillary tube integrated into the cable

For wedge sensors with integrated pressure measurement cell, there is a transparent capillary tube in the sensor cable. This capillary tube is used to compensate for the fluctuating atmospheric air pressure.

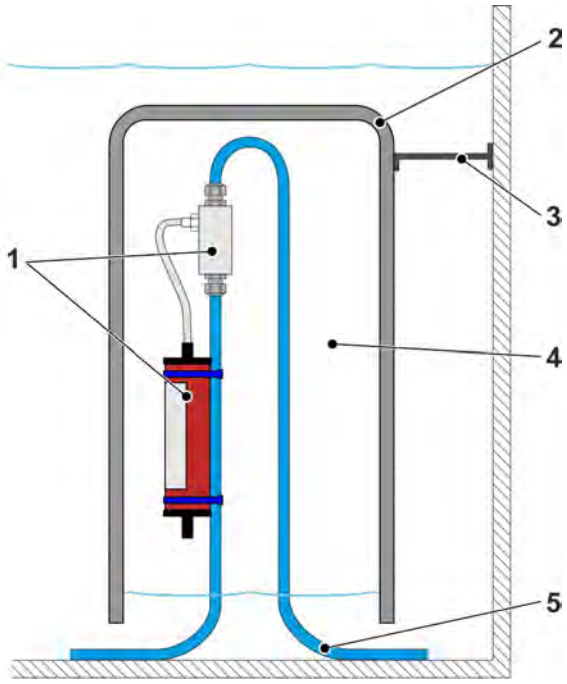
Observe when handling the capillary tube:

- Do not kink the cable with the capillary tube.
- Seal the transparent capillary tube before laying the cable (see Chap. "*5.2.5 Cable routing*").
- Do not extend the cable end by means of a hermetically sealed junction box.
- Do not use air filters of other types.

If this is not observed, the level cannot be measured correctly by means of the pressure measurement cell.

Mounting of the required/associated pressure compensation element

- Select the mounting location so that the pressure compensation element is easily accessible for maintenance and checks.
- Install in **non**-flooded/floodable area; attach flood protection if necessary.
  Please observe: Flood protection prevents water from entering the air filter of the pressure compensation element and the pressure sensor, **but distorts the measurement result in the event of overflow**.



1 Pressure Compensation Element
2 Airtight flood protection, the only opening must point downwards
3 Fastening against buoyancy
4 Air cushion
5 Sensor cable

Fig. 5-7 Proposal for flood protection

Any further information on the pressure compensation element (description, installation, maintenance) can be found in the Technical Description for Correlation Sensors and external Electronic Box.

5.2.1.4 Wedge sensor with integrated water-ultrasound

Observe when mounting the sensor:

- Install sensors with integrated water ultrasound so that the ultrasound hits the contact surface between the medium and air at a right angle.
  An oblique measuring angle leads to a loss of echo. The level measurement may fail as a result.

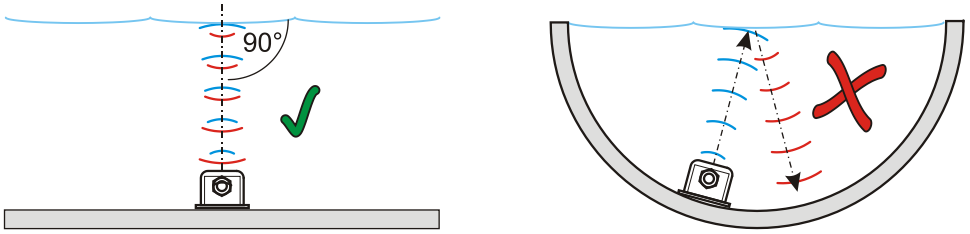


Fig. 5-8 Installation a sensor with integrated ultrasonic water measurement

5.2.2 Required Tools and Material

For the installation of wedge sensors you need:

- (Impact) drill with (stone) drill bit
- 4 stainless steel screws with countersunk head (size M5, length 30-70 mm)
- 4 suitable dowels
- Screwdriver (suitable for the screws)
- Cable cover sheets or similar

Do not use: Stud bolts or similar fastening material.

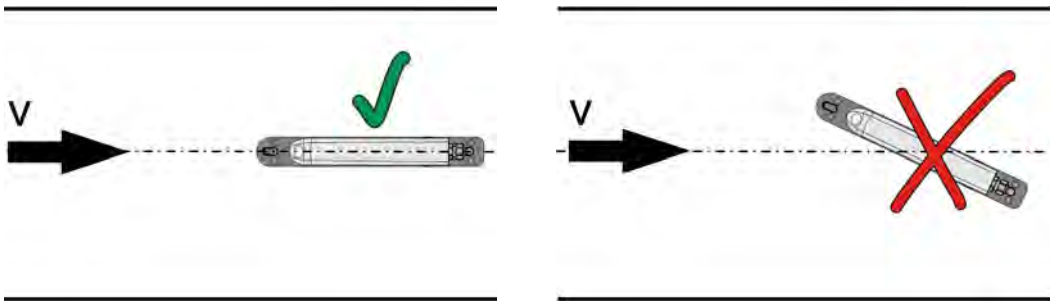
Other special tools and materials may be required for special applications.

Tools and materials are not included in the scope of delivery!

⇨ Tools and mounting accessories see Chap. "*8 Mounting Accessories and Tools*" and *"9 Accessories and Spare Parts".*

5.2.3 Alignment of Wedge Sensors

As standard, the wedge sensor is installed exactly in the centre on the channel bottom. The bevelled side of the sensor points against the flow direction.



Mounting: Normally in the centre | Error: Measurement value distortion

Fig. 5-9 Sensor Alignment

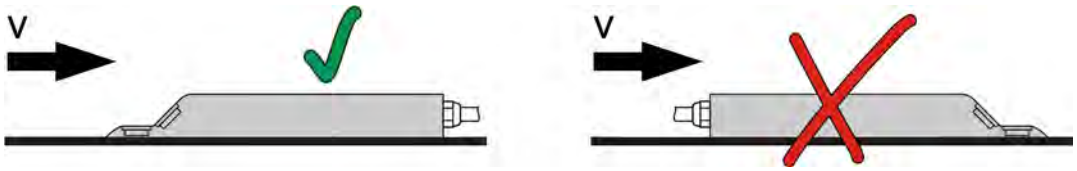


Fig. 5-10 Sensor alignment against the flow direction

5.2.4 Fastening the Sensor

Procedure:

1. Provide screws and suitable dowels: Select the length of the screws so that a secure and permanent sensor fastening is ensured.
2. Drill holes at the desired mounting location according to the dowel size.
3. Insert the dowels into the drill holes.
4. Screw on the sensor so that the countersunk head screws are completely countersunk into the base plate/mounting plate. This reduces eddying and build-up.
5. Seal any gap on the base plate/mounting plate with silicone or similar suitable material.
   There must be no gap between the base plate/mounting plate of the sensor and the ground!

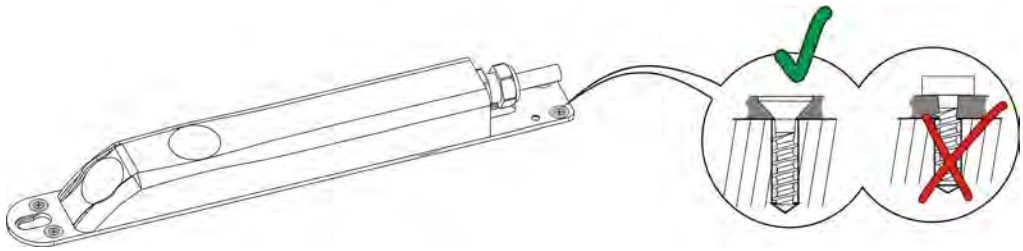


Fig. 5-11 Mounting the wedge sensor

5.2.5 Cable routing

Observe BEFORE laying the cable:

- For sensors with an integrated **pressure measurement cell** , temporarily seal the transparent capillary tube at the end of the cable with insulating tape or another suitable material to protect it from air and moisture.
  If the capillary tube is not properly sealed before the cable is laid, moisture may enter the sensor via the tube whilst the cable is being laid. This may cause damage to the internal electronics and result in the sensor failing.
  Note: The insulating tape, or any alternative material used, is removed once the cable has been laid (see Page 39).

Observe WHEN laying the cable:

- Do **not** lay the sensor cable loosely, unprotected or across the medium. Dirt carried in the medium can build up on the cable.
  Result: Sensor damage or cable breakage.
- To avoid disturbance due to electrical interference, do not lay sensor cables close to motor supply lines and power lines.
- Do not go below the minimum bending radius of the cable of 10 cm (cable with FEP cable sheath 15 cm).
- Route the sensor cable out to the same side as the sensor.
  Do not run the cable over the bottom of the canal or through the medium (see *Fig. 5-12*).

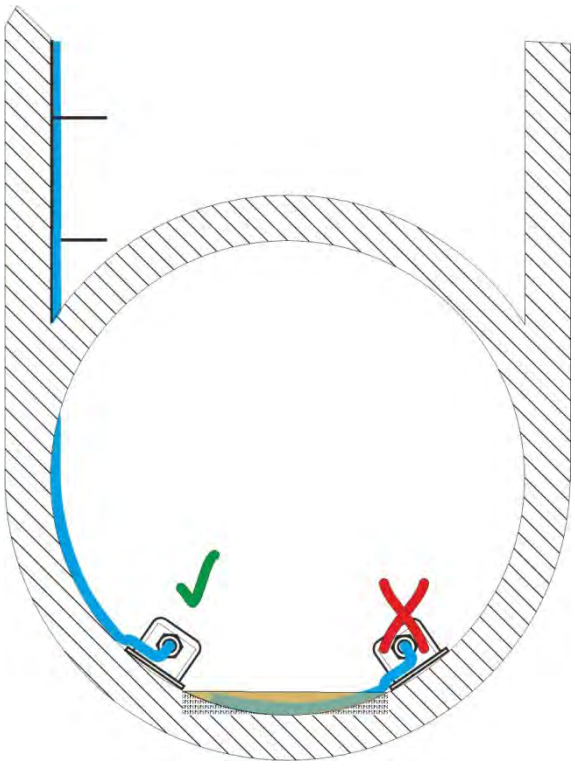


Fig. 5-12 Cable routing wedge sensor

Cable with FEP cable sheath:

The connection cables of highly resistant wedge sensors are coated with an additional, transparent FEP cable sheath. This FEP cable sheath ensures resistance to organic solvents, acids and alkalis.

Observe when handling FEP-coated cables:

- Handle highly resistant sensors with an additional FEP cable sheath with particular care. The FEP cable sheath must not be damaged or removed under any circumstances.
- **The minimum bending radius for connection cables with an FEP cable sheath is 15 cm. Failure to observe the bending radius will result in damage to the FEP cable sheath.**
- The FEP cable protection sheath is not suitable for frequent bending or moving cable installation.

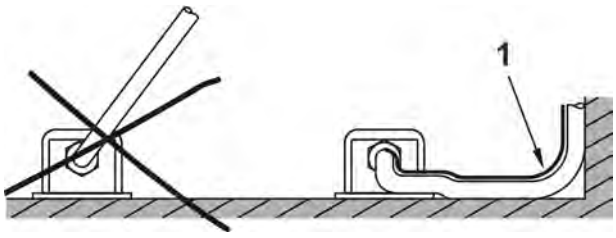
Laying Cables:

- Run the cable **downstream** of the wedge sensor on the channel bottom to the channel wall. Do not go below the minimum bending radius of the cable of 10 cm (for cables with FEP cable sheath 15 cm).
- For sensors with an **integrated pressure measurement cell** , remove the insulating tape (or similar) that was previously stuck to the cable end of the transparent capillary tube once the cable has been laid.
  If the insulating tape is not removed, the pressure measurement cell will not be able to measure the level correctly, as this prevents the necessary pressure compensation via the capillary tube.

Avoiding entanglement with debris:

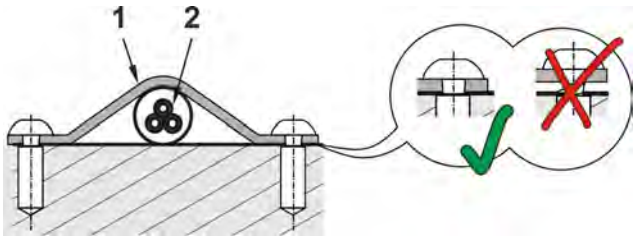
- Cable:
  - cover the cable with a thin, medium-resistant stainless steel sheet
    or
  - lay the cable in a slot and then seal it with permanently elastic material.
- At curves/junctions, additionally fasten the cable to the ground with a clamp.

⇨ Cable cover sheets see Chap. "*8.8 Cable Protection Sheets*".



1 Protective cover/cable protection sheet

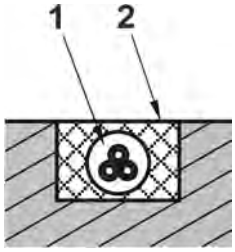
Fig. 5-13 Cable laying in the medium



Cable with Cable Protection Sheet

1 Stainless Steel Sheet/Cable Cover, Types ZMS 140, ZMS 141 or ZMS 142

2 Cable

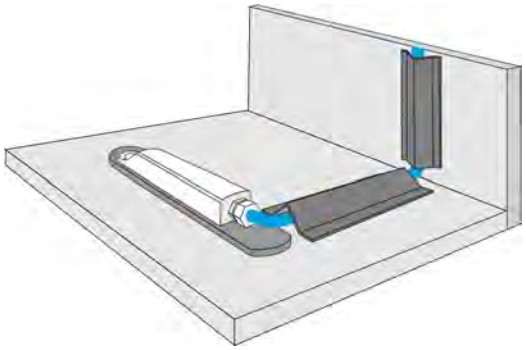


Cable laid in slot

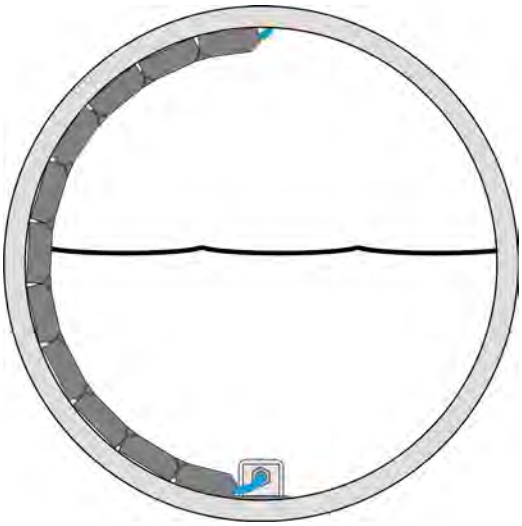
1 Cable

2 Permanently Elastic Material

Fig. 5-14 Mounting examples for cable laying

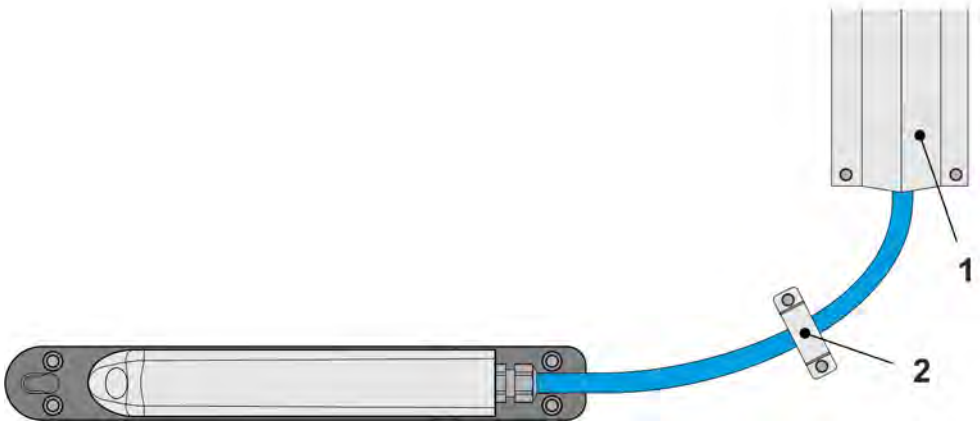


Cable protection sheet Type ZMS 140



Cable protection sheet Types ZMS 141 or ZMS 142

Fig. 5-15 Cable laying with cable cover sheet



1 Cable protection sheet Type ZMS 140

2 Clamp

Fig. 5-16 Cable laying with cable cover sheet and clamp

5.3 OCL and DSM Air-Ultrasonic Sensors

5.3.1 Information on Mounting Air-Ultrasonic Sensors

Observe when mounting the sensor:

- Do not remove any parts of the sensor (for exceptions, see chapter "*5.3.2 Mounting plate construction*").
  If the base plate or the cable glands of the sensor are loosened or removed, then the sensor is leaking. This leads to measurement failure in the long run. Penetrating water destroys the electronics.
- Do not widen the mounting holes on the mounting plate.
- Do not bend the sensor mounting plate.
- Mount the sensor on an exactly flat surface. Uneven ground leads to sensor body breakage.
- Attach mounting parts for sensors flat with the mounting plate.

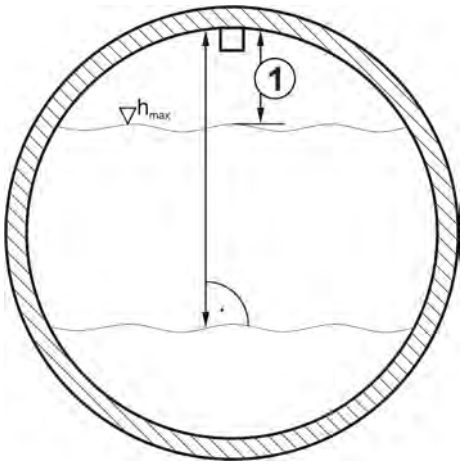
Notes on flooding the OCL or DSM sensors:

No level can be measured within the so-called >Dead Zone<.

In the event of flooding or in the area of the dead zone of the air ultrasonic sensor, the ultrasound is coupled into the measuring medium.

- The dead zone of the OCL sensor is 14 cm
- The dead zone of the DSM sensor is 4 cm

Coupling of the ultrasound leads to incorrect level measurement in the event of flooding.



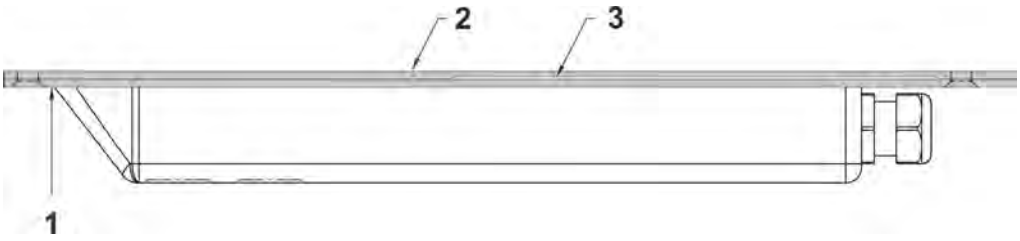
1 Dead Zone

Fig. 5-17 Dead zone of the OCL or DSM sensors

Adjust the dead zone in the transmitter:

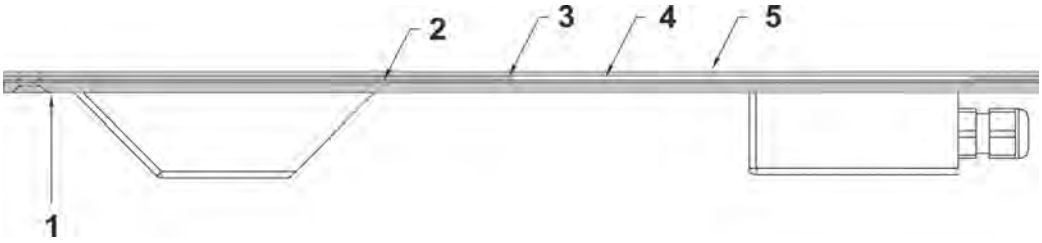
1. When parameterising the transmitter, hide the flooding area.
2. Deactivate the sensor in this area.

5.3.2 Mounting plate construction



1 Base plate - **never remove!**
2 Cover sheet - may be dismantled (optionally available for OCL-L3)
3 Insertion area for the RMS pipe mounting system

Fig. 5-18 OCL sensor: mounting plate construction



1 Base plate - **never remove!**
2 Intermediate plate - may be dismantled
3 Spacer plate long and short - may be dismantled
4 Insertion area for the RMS pipe mounting system
5 Cover sheet - may be dismantled

Fig. 5-19 DSM sensor: mounting plate construction

5.3.3 Sensor Positioning

The OCL or DSM sensor must be installed at least 10 cm **upstream** of the wedge sensor when viewed in the direction of flow (see *Fig. 5-20*). Otherwise, there is a risk of detecting too high a fill level, especially at low fill levels.

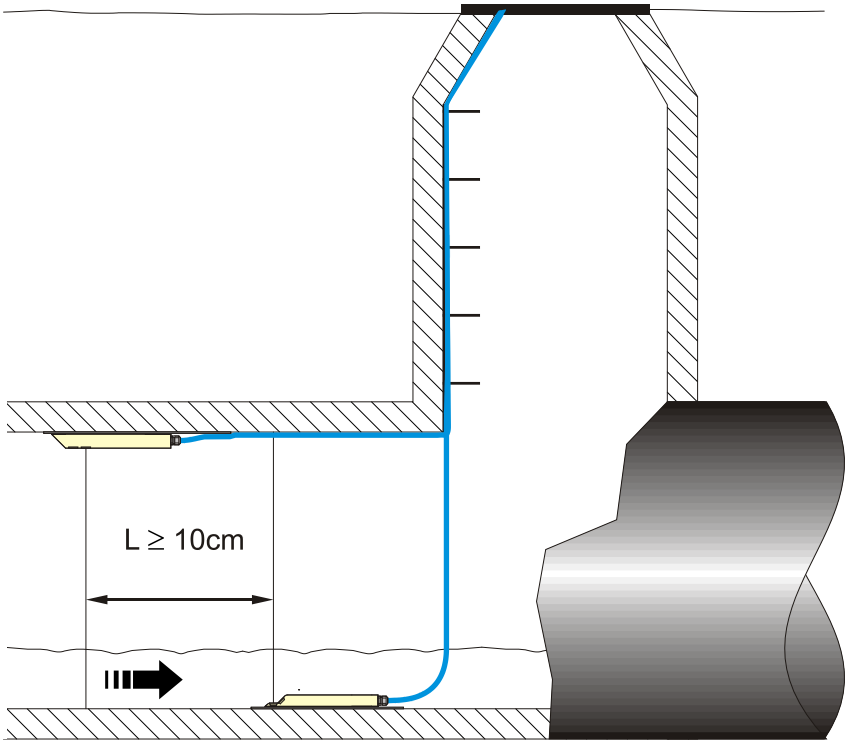


Fig. 5-20 Mounting example for OCL and DSM sensors

5.3.4 Required Tools and Material

To permanently attach the OCL and DSM air-ultrasonic sensors to the pipe crown, you need:

- (Impact) drill with (stone) drill bit
- 3 stainless steel screws with countersunk head (size M5, length 30-70 mm)
- 3 suitable dowels
- Screwdriver (suitable for the screws)
- Cable cover sheets or similar if required

For the DSM air-ultrasonic sensor you also need:

- NIVUS Mounting Shoe *(E-GES-LUSBFSCH)*

Tools and materials are not included in the scope of delivery!

⇨ Tools and mounting accessories see Chap. "*9 Accessories and Spare Parts".*

5.3.5 Permanent fastening in the pipe

Observe the correct sensor position (see *Fig. 5-20*).

WARNING

Danger due to electric shock!

When drilling in wet rooms or in filled pipes, dangerous fault currents can occur and lead to personal injury.

- *Use an electronic personal protection adapter.*

Installing the air-ultrasonic sensor in the pipe crown:

1. Provide screws and suitable dowels.
2. Drill holes at the desired mounting location according to the dowel size.
3. Insert the dowels into the drill holes.
4. Screw on the sensor so that the countersunk head screws are completely countersunk into the mounting plate.

5.3.6 Temporary fastening in the pipe

For temporary sensor mounting, use an RMS pipe mounting system from NIVUS.

Use the Mounting Instructions for RMS Pipe Mounting Systems.
The assembly instructions are enclosed with each delivery or can be downloaded from our homepage.

5.4 Pipe Sensors

5.4.1 Notes on pipe sensor installation

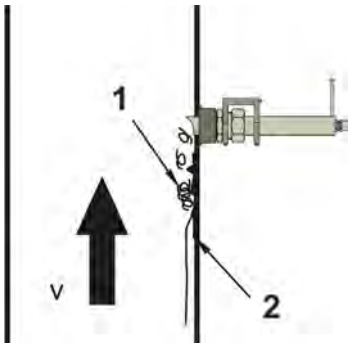
The sensor can be installed in

- empty pipelines/flumes/channels

Do **not** mount the sensors on vibrating pipelines!

Observe when mounting the sensor:

- Pipe sensors must be permanently fixed in the pipe (exception: sensor installation using a float, see Chap. "*8.9 Float*").
- A hole must be drilled into the pipe wall to install the pipe sensor. Do not burn the pipe with a welding torch. Deposited welding pearls can cause turbulence in front of the sensor (see *Fig 5-21*).
  Turbulence affects the measurement values.
- Use only non-corrosive fastening material.



1 Eddying

2 Welding pearls burn-off

Fig 5-21 Disturbances due to burning of the pipeline

NIVUS recommendation: Commission a specialist company to drill into the pipework and install the sensor nozzles.

5.4.2 Required Tools and Material

For the installation of all pipe sensors you need:

- Drill with slip clutch
- Cutting paste
- Teflon tape if required
- Suitable drill bit with extension if required
- Pipe spanner or suitable open-end spanner

Other special tools and materials may be required for special applications.

Tools and materials are not included in the scope of delivery!

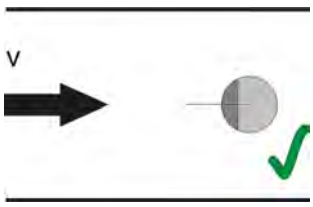
⇨ Tools and mounting accessories see Chap. "*8 Mounting Accessories and Tools*" and *"9 Accessories and Spare Parts".*

5.4.3 Aligning Pipe Sensors

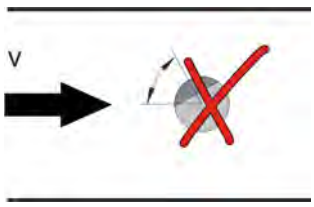
Note the following when mounting the sensors in pipes:

Position the pipe sensor so that the bevelled side of the sensor (= emitting surface) points exactly against the direction of flow.

- **Pipe sensors:** The alignment aid (see *Fig. 5-26*) shall point in the direction of flow.



Correct Installation



Error: Measurement value distortion

Fig. 5-22 Sensor face against flow direction

Attach the welding nozzle at an angle of 90° to the pipe.

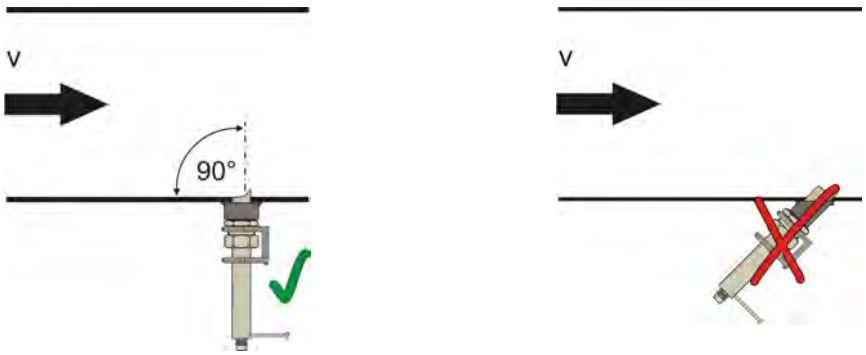
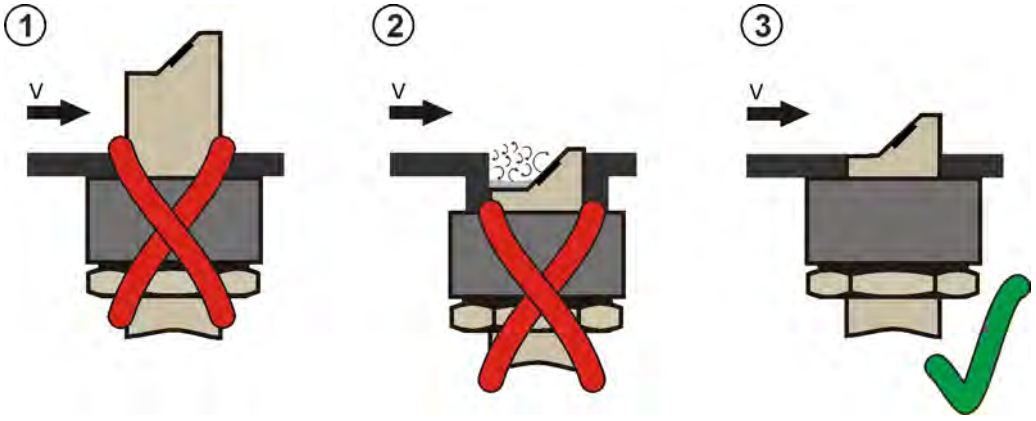


Fig. 5-23 Pipe sensor 90° to pipe wall

Pipe sensors with three surfaces (horizontal, angled, horizontal) at the front:

Position the pipe sensor so that the lower horizontal part of the sensor head is exactly flush with the pipe wall.



1 Sensor protrudes too far into the medium: measurement value distortion

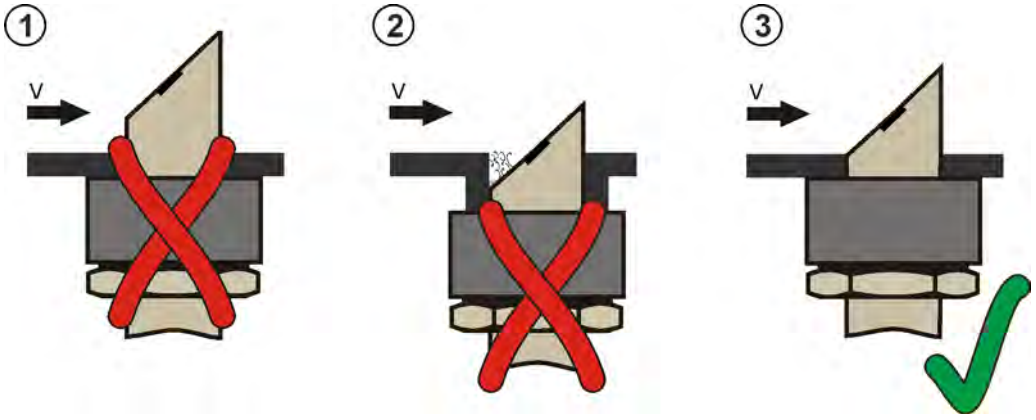
2 Sensor is too deep: Sediment build-up and eddy formation lead to distortion of measurement values

3 Correct sensor position

Fig. 5-24 Sensor position on the pipe wall

Pipe sensors with only one surface (angled) at the front:

Position the pipe sensor so that the start of the bevel on the sensor head is flush with the pipe wall.



1 Sensor protrudes too far into the medium: measurement value distortion

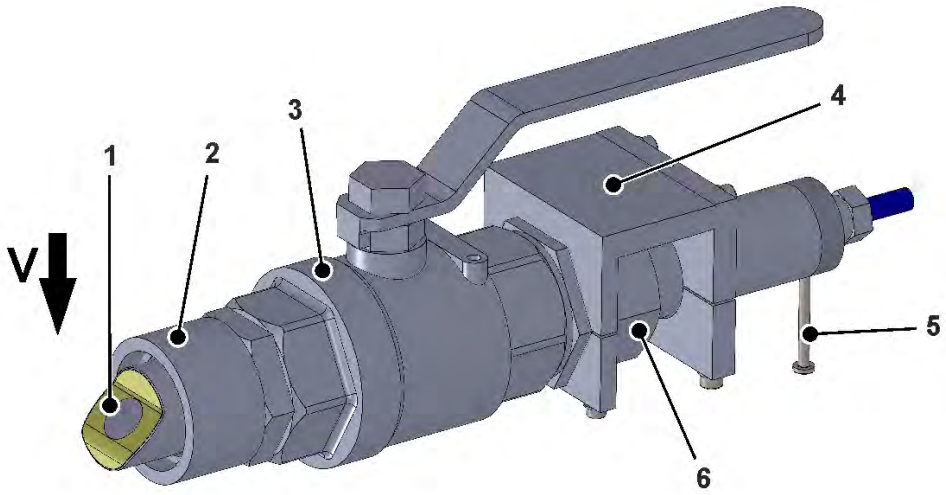
2 Sensor is too deep: Sediment build-up and eddy formation lead to distortion of measurement values

3 Correct sensor position

Fig. 5-25 Sensor position on the pipe wall

5.4.4 Pipe Sensors: Drilling in pipeline and installation

5.4.4.1 Overview of Components



1 Pipe sensor

2 Double Nipple

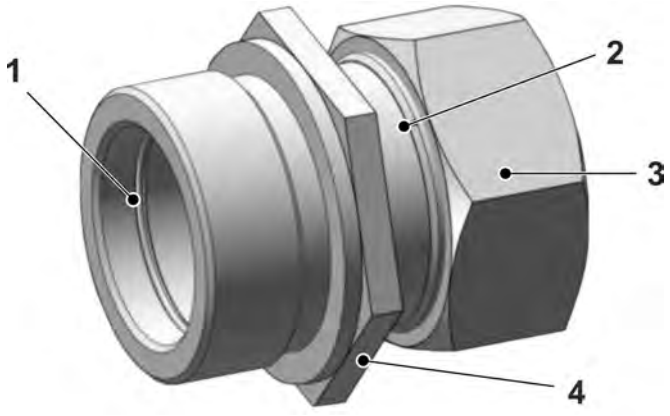
3 Ball Valve (optional)

4 Fastening element

5 Screw; alignment aid 180° to flow direction

6 Sensor screw connection 1½", for details see *Fig. 5-27*

Fig. 5-26 Pipe sensors POA, CS2 and KDA/KDO



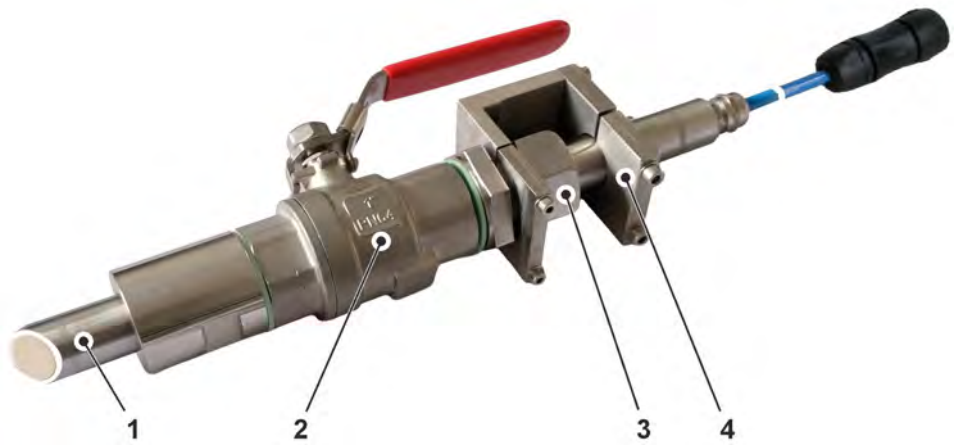
1 Groove with O-ring

2 Extended threaded outlet

3 Sleeve nut SW50

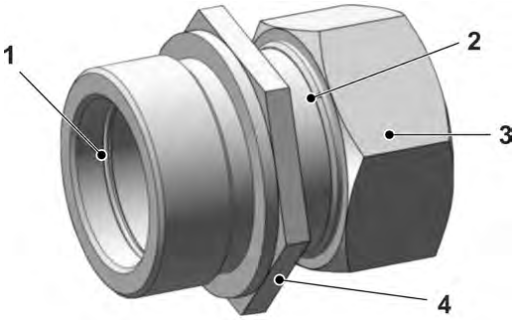
4 Hexagon

Fig. 5-27 Sensor screw connection 1½"



1 Pipe sensor
2 Ball Valve (for CSM-V100 M3/S3)
3 Sensor screw connection 1", for details see *Fig. 5-29*
4 Fastening element
Screw (not depicted); alignment aid; 180° to flow direction

Fig. 5-28 Pipe sensors CSM-V100 M/S



1 Groove with O-ring
2 Extended threaded outlet
3 Sleeve nut SW36
4 Hexagon

Fig. 5-29 Sensor screw connection 1"

5.4.4.2 Notes on drilling in pipelines

WARNING

Danger due to electric shock!

When drilling in wet rooms or in filled pipes, dangerous fault currents can occur and lead to personal injury.

- *Use an electronic personal protection adapter.*

CAUTION

Risk of personal injury!

If you drill with too much contact pressure, the drill may jam. This may lead to personal injury.

- *Observe contact pressure. The contact pressure depends on the pipe material and wall thickness.*
- *Do not exceed the drilling speed specified by the drill bit manufacturer.*

The following information applies to pipes made of

- Steel
- Stainless steel
- Plastic

For pipelines made of other materials (e.g. concrete or cast iron), consult a pipework contractor or contact NIVUS.

An empty pipe is a prerequisite for the installation of a pipe sensor.
Before installation, ensure that the pipe or pipeline is empty.

NIVUS recommend: Use a slow-running drill with a slip clutch.

⇨ Tools and mounting accessories for pipe sensor mounting see Chap. "*8 Mounting Accessories and Tools*".

5.4.4.3 Drill into drained pipeline and attach nozzle

Prepare drilling:

1. Plug in a personal protection adapter.
2. Mark the mounting point for the sensor on the pipe.
3. Clamp the Ø 38 mm or Ø 25 mm drill bit into the drill.
4. Set the drilling speed.
   The drilling speed depends on the drill bit used and the pipe material. Refer to the drill bit manufacturer's specifications for the drilling speed.

Drilling:

1. Drill and observe
   a) the contact pressure for the drill,
   b) ensure unimpeded chip removal and
   c) and use cutting paste to cool the drill bit.
2. If necessary, interrupt the drilling process and remove any chips.

Attach nozzle:

1. Remove chips that may have formed.
2. Deburr the hole with a file.
3. Attach nozzle. The fastening type of the nozzle depends on the pipe material, e.g.:
   a) Welding (steel, stainless steel)
   b) Use tapping saddle
   c) Gluing (PVC)
   d) Plastic welding (HDPE)
   e) Laminating

Next Step:

- Prepare sensor mounting (see Chap. "*5.4.4.5 Prepare sensor mounting*")

5.4.4.4 Notes on Sensor Mounting

CAUTION

Risk of personal injury!

If the pipe sensors are mounted without a fastening element, they can come loose from the screw connection and be thrown out. As a result, medium can escape uncontrolled. This can lead to personal injury or damage to the system.

- *Do not use pipe sensors without a fastening element!*

Observe the following during installation:

- Fasten the pipe sensor with a fastening element (see Chap. "*5.4.4.7 Fastening Element: Overview of Components*"). The fastening element is part of the delivery and must be used in any case.
- Optionally, use a ball valve (see Chap. "*8.3 Ball Valve"*) for unpressurised removal (not for CSM-V100 M2/S2).

5.4.4.5 Prepare sensor mounting

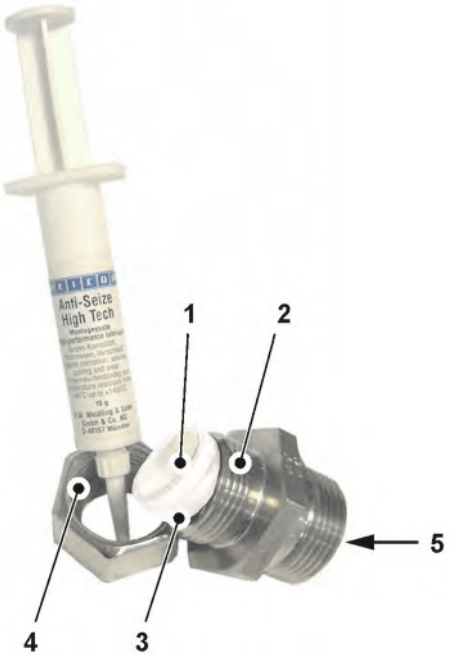
When installing pipe sensors, a special grease paste for stainless steel screw connections according to DIN 2353 must be used (e.g. Volz GmbH Grease Paste 325-250).

Screw connections are pre-greased at the factory.

Any grease paste required can be obtained from NIVUS.

Lightly grease the following parts of the sensor screw connection before installing the sensor (identical for 1½" and 1" sensor screw connections):

- Sensor screw connection thread (*Fig. 5-30*, Pos. 2)
- Inner cone sensor screw connection (*Fig. 5-30*, Pos. 3)
- Inside thread of sleeve nut (*Fig. 5-30*, Pos. 4)



1 Gasket ring
2 Sensor screw connection thread
3 Inner cone sensor screw connection
4 Inside thread of sleeve nut
5 O-ring inside of sensor screw connection

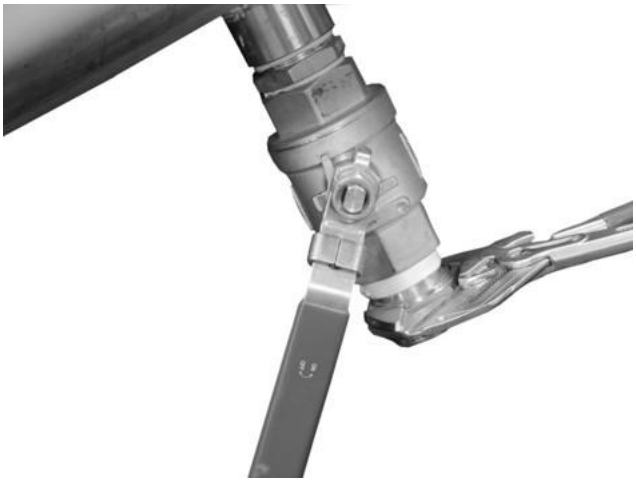
Fig. 5-30 Grease the sensor screw connection

Attach the sensor screw connection

1. Lightly grease the O-ring inside the sensor screw connection.

2. Screw the sensor screw connection into the welding nozzle or the ball valve.

3. Tighten with pipe spanner or SW55 (for 1½" sensor) or SW41 (for 1" sensor) open-end spanner.



Next Step:

- Install pipe sensor (see Chap. "*5.4.4.6 Install pipe sensor"*)

5.4.4.6 Install pipe sensor

Important Notice

Carry out the mounting of the pipe sensor according to DIN 3859-2.

Prerequisite:

- Nozzle or tapping saddle is fitted and a hole is drilled in the pipeline (see Chap. "*5.4.4.3 Drill into drained pipeline and attach nozzle*").

Procedure:

1. Slide the sleeve nut and the gasket ring over the pipe sensor.
2. Optional: open ball valve.
3. Push the pipe sensor with sealing ring into the sensor screw connection.
4. Insert the pipe sensor into the sensor screw connection so far that only the sensor head protrudes into the medium (see Chap. "*5.4.3 Aligning Pipe Sensors*").
5. Align the pipe sensor (see Chap. "*5.4.3 Aligning Pipe Sensors"*).

6. Only tighten the sleeve nut by hand.
7. Then tighten the sleeve nut using an open-end spanner SW50 (for 1½" sensor) or SW36 (for 1" sensor) max. ½ turn.

Next Steps:

- Prepare the mounting of the fastening element (see Chap. "*5.4.4.8 Prepare the mounting of the fastening element*").
- Mount the fastening element (see Chap. "*5.4.4.9 Mount the fastening element*").

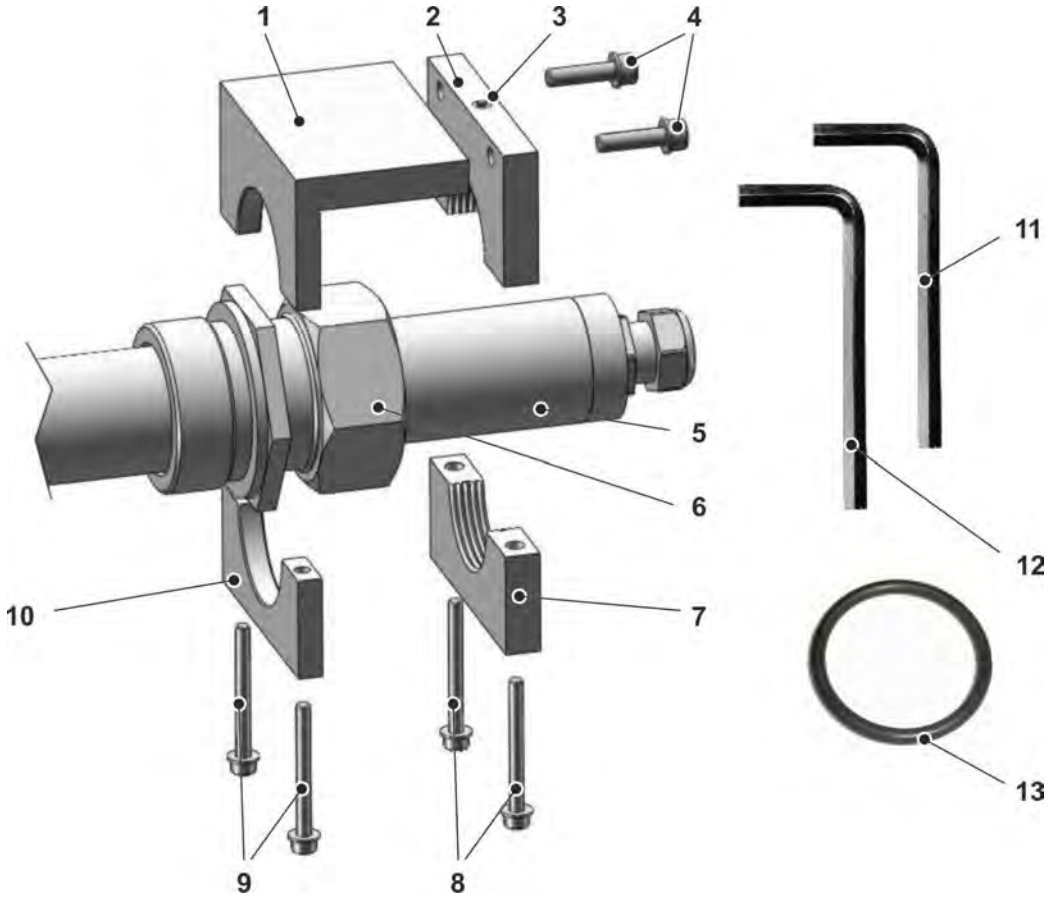
5.4.4.7 Fastening Element: Overview of Components

The respective fastening element is part of the sensor delivery and must be used in conjunction with the appropriate 1½" or 1" sensor screw connection.

Note: The design of the fastening elements for the 1½" or 1" sensor screw connections is essentially the same, although the dimensions differ in some cases.

The appropriate fastening element

- holds the pipe sensor securely in position and, when mounted correctly, prevents the sensor from being thrown out and
- facilitates the exact reinstallation of the sensor after cleaning or inspection processes.



1 Front upper clamping element (1x)
2 Rear upper clamping element (1x)
3 Welded threaded pin as additional clamping protection (prevents rotation)
4 Hexagon socket screw (Allen®) M5 (2x) or M4 (2x)
5 Pipe sensor
6 Sensor Screw Connection
7 Rear lower clamping element (1x)
8 Hexagon socket screw (Allen®) M5 (2x)
9 Hexagon socket screw (Allen®) M4 (2x)
10 Front lower clamping element (1x)
11 Hexagon socket spanner 1x 4 mm (Allen® key)
12 Hexagon socket spanner 1x 3 mm (Allen® key)
13 Spare O-ring for sensor screw connection, see *Fig. 5-27* or *Fig. 5-29*

Fig. 5-31 Fastening Element for Pipe Sensors (1½" or 1")

Note

The fastening elements have been tested by an independent testing body:

- *The 1½" pipe sensors are rated for a continuous pressure of 4 bar and a peak pressure (30 seconds) of 8.0 bar.*
- *The 1" pipe sensors (CSM-V100 M/S only) are rated for a continuous pressure of 16 bar.*

*Higher pressure ranges **cannot** be safely absorbed!*

5.4.4.8 Prepare the mounting of the fastening element

Procedure:

1. To ensure secure clamping, degrease the rear area of the pipe sensor and the rear clamp elements of the fastening element (*Fig. 5-31*, Pos. 2 and 7).
2. Ensure that the sensor shaft and clamping area of the clamp elements are dry.

5.4.4.9 Mount the fastening element

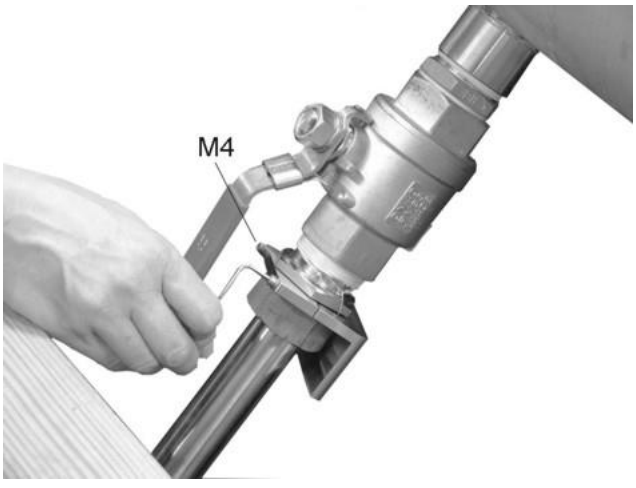
Important Notice

To ensure the tested safety:

- *Check the tightness of the entire screw connection.*

Procedure:

1. Connect the front upper clamp element (see *Fig. 5-31*, Pos. 1) to the front lower clamp element (Pos. 10) on the sensor screw connection using the two hexagon socket screws (Allen®) M4 (Pos. 9).



2. Screw the rear upper clamp element (Pos. 2) to the front upper clamp element (Pos. 1) using the two hexagon socket screws (Allen®) M5 or M4 (see *Fig. 5-31*, Pos. 4).

3. Screw the rear lower clamp element (Pos. 7) to the rear upper clamp element (Pos. 2) using the two hexagon socket screws (Allen®) M5 (see *Fig. 5-31*, Pos. 8).

4. Check the tightness of the entire screw connection.
5. If liquid leaks under operating conditions:
   a) Tighten the corresponding screws.
   b) If necessary, put the entire plant out of operation again and replace damaged seals, Teflon tapes, etc.

6 Maintenance and Cleaning

All information on maintenance and cleaning of the sensors can be found in the Technical Description for Cross Correlation Sensors and external Electronic Box or in the Technical Description for Doppler Sensors.

7 Sensors in the Control Section

7.1 Basic Technical Control Information

Preconditions:

- The distance between the flow velocity sensor and the downstream control valve should be at least 4x DN, but preferably 5x DN.
- Flow velocities in the control section should not fall below 30 cm/s in order to achieve sufficient selectivity of the system in accordance with DWA.
- The pipe measuring section and control valve must have the same internal diameter as the incoming and outgoing pipeline.
- Control slide valves must have a full passage. Control valves with an integrated gate valve to improve the Kvs value at low control flow rates lead to silting of the measuring section in wastewater containing sediment and are therefore not permitted.

Avoid upstream and downstream of the control section:

- Bed jumps
- Steps
- Weld seams
- Protruding flange gaskets

7.2 Construction of the Control Section

7.2.1 With Pipe Measuring Section

NIVUS offers the following pipe measuring sections for nominal pipe diameters DN200 to DN1000:

	Short Pipe Measuring Section	**Long Pipe Measuring Section**
Description	Fitting piece with dome, dimensions adapted to the most common magnetic flowmeters (EMF)	
Available for nominal pipe diameter	DN200 to DN1000	DN200 to DN400
Mounting the Flow Velocity Sensor (Pipe Sensor)	With welding nozzle or tapping saddle in front of the pipe measuring section; If there is a risk of silting or sludge accumulation: mount the pipe sensor slightly off-centre	Direct installation in integrated nozzle

➪ Pipe Measuring Sections can be found in Chap. "*9 Accessories and Spare Parts*".

Contrary to the usual control engineering principles, the measurement is installed **upstream and not downstream** of the control valve. Due to the non-compressibility of the

measurement medium, there is no time delay between the change in slide valve position and the change in speed (= change in flow rate) when the valve is fully blocked, which means that no dead times need to be taken into account.

However, this design reduces or completely avoids hydraulic problems caused by external turbulence downstream of the control valve.

*The **level sensor** must be screwed **absolutely gas-tight** into the dome flange cover (plastic) (Fig. 7-2 Pos. 5). Use Teflon sealing tape for secure sealing!*

*The **dome flange cover** (Fig. 7-2 Pos. 5) must be screwed **absolutely gas-tight** to the dome flange (Fig. 7-2 Pos. 7) (welded to the dome (Fig. 7-2 Pos. 8) of the pipe measuring section (short / long)).*

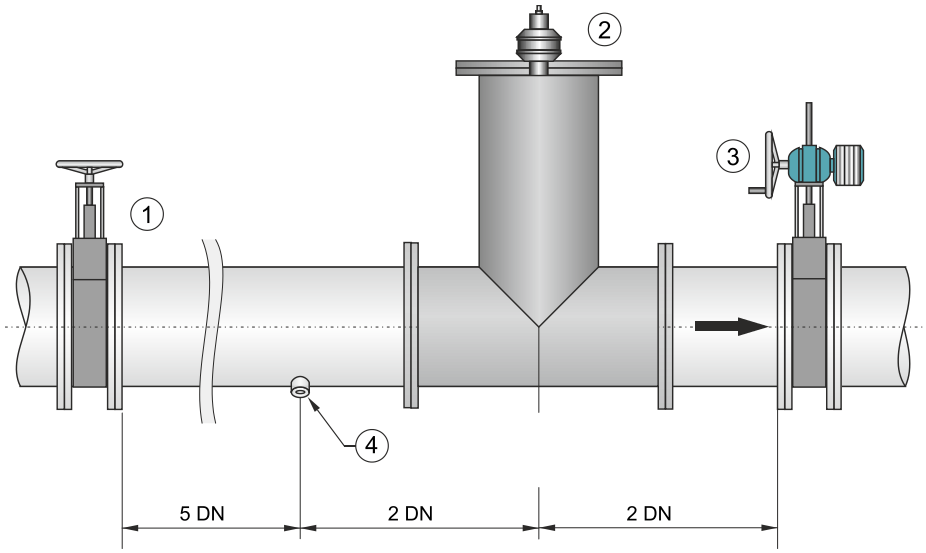
*Ensure that the **flange gasket** (Fig. 7-2 Pos. 6) between the dome flange cover and the dome flange is clean and free of defects. If necessary, apply suitable grease between the dome flange cover, flange gasket and dome flange.*

*Also ensure that all **fastening screws** on the dome flange cover, dome flange and pipe measuring section are present and firmly screwed in.*

*If the installation is not carried out correctly or if there is a leak, the **gas buffer** in the dome required for a functioning measurement can escape and the measurement result of the level measurement can be falsified by the immersion of the ultrasonic sensor in the medium.*

Short Pipe Measuring Section

Example: Installation of a discharge control system with nozzle/tapping clamp for the flow velocity sensor **upstream** of the pipe measuring section.



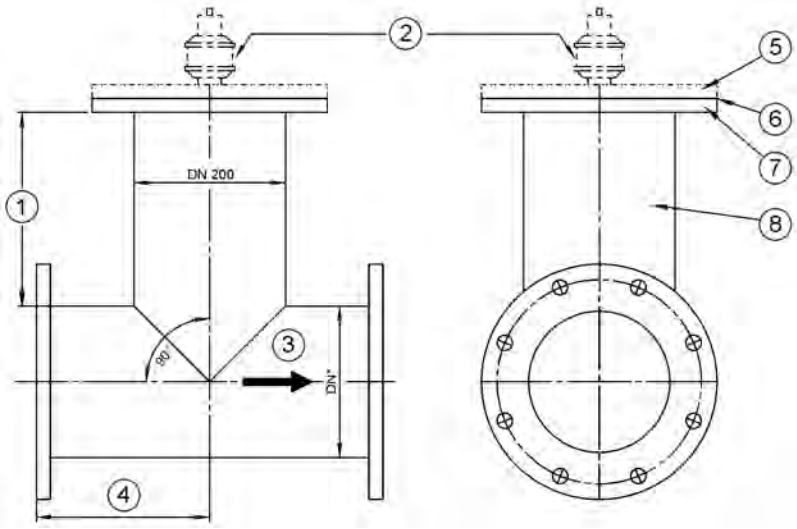
1 Manual slide valve (must be fully open)

2 Ultrasonic sensor

3 Electric control slide valve

4 Install pipe sensor using nozzle/tapping saddle

Fig. 7-1 Construction of a control section: discharge control with adapter (short pipe measuring section) and nozzle/tapping saddle

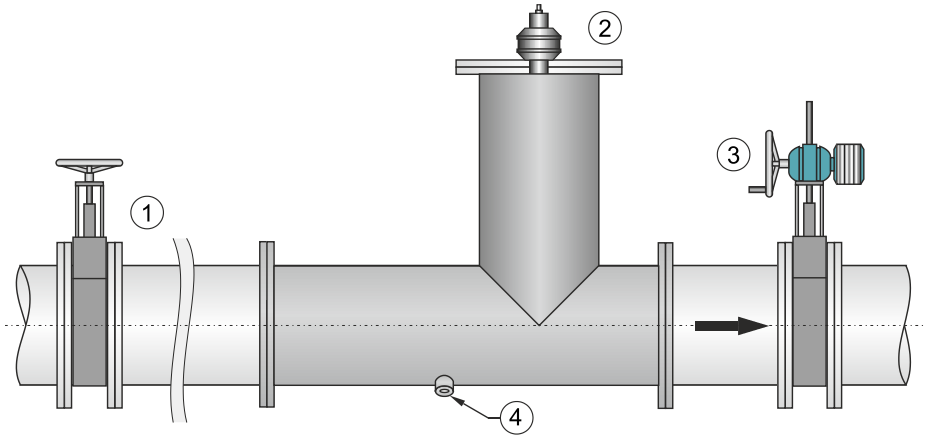


1 Min. 300 mm (dome is raised by 30 mm / meter WC upstream of the slide valve)
2 Ultrasonic Sensor
3 Flow direction
4 Distance/position for dome: centre (see also Pos. 8)
5 Dome flange cover (plastic)
6 Flange gasket
7 Dome flange, welded on dome (Pos. 8)
8 Dome (DN200) (see also Pos. 4)

Fig. 7-2 Short Pipe Measuring Section

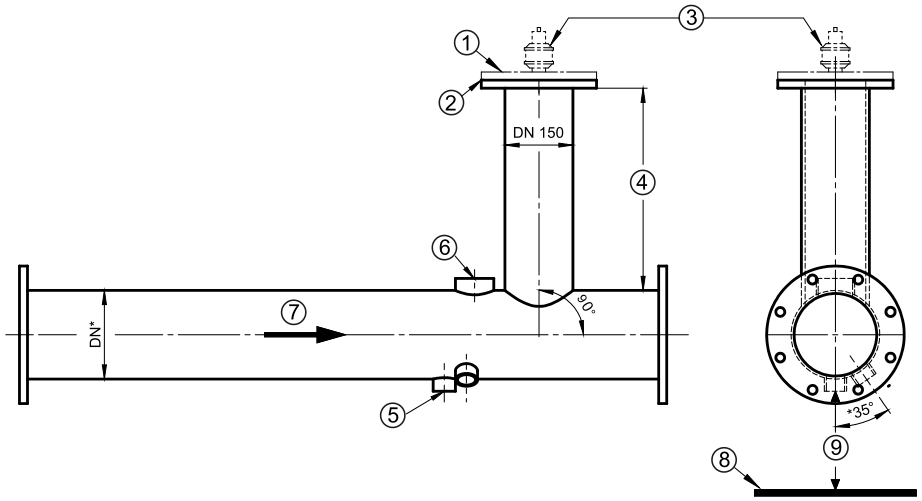
Long Pipe Measuring Section

Example: Installation of a discharge control system with nozzle for the flow velocity sensor in the pipe measuring section.



1 Manual slide valve (must be fully open)
2 Ultrasonic Sensor
3 Electric control slide valve
4 Mounting position for pipe sensor

Fig. 7-3 Construction of a control section: discharge control with long pipe measuring section



1 Flange DN150 with R1" inside thread
2 Flange gasket
3 Ultrasonic Sensor
4 Dome (500 up to 700 mm available, depending on impoundage pressure)
5 Nozzle with G1½″ inside thread for 1½″ screw-in pipe sensor
6 Cleaning opening Rp3″
7 Flow direction
8 Base
9 Distance to the base:
min. 550 mm with ball valve /
min. 350 mm without ball valve

Fig. 7-4 Long Pipe Measuring Section

7.2.2 In the Channel

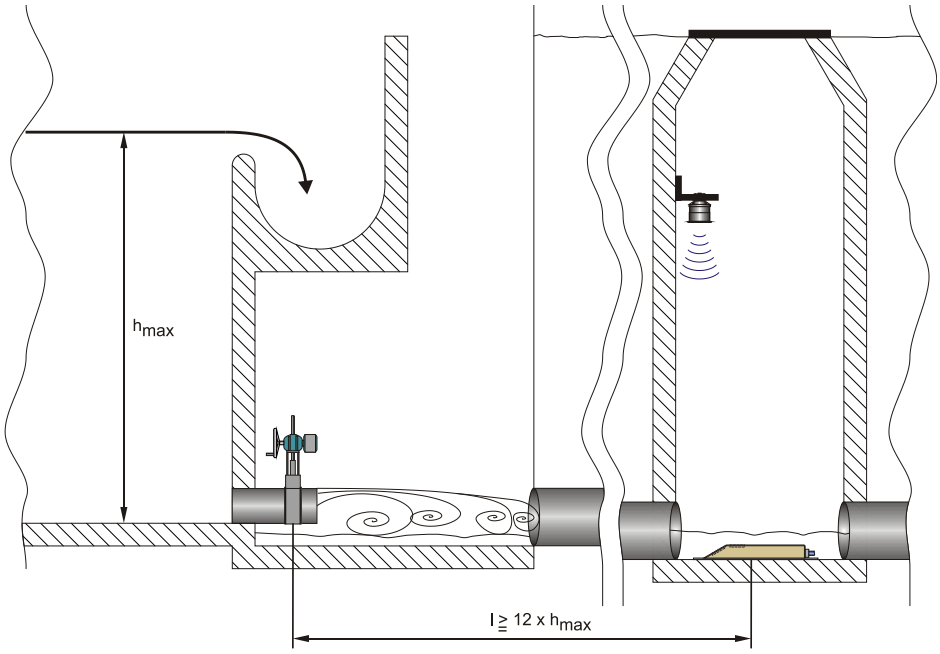


Fig. 7-5 Arrangement of the measurement downstream of the slider

If no pipe measuring section can be installed, the measurement must be installed downstream of the control valve. The distance to the control valve must then be at least 12x h_{max} (maximum water level).

First check the hydraulic conditions of the measurement place.

Please note when installing the sensor downstream of the control slide:

- Due to the extended running times, the measurement and thus also the control react with a significant delay. Programme the control to suit the application with a correspondingly large time delay.
- If the required minimum distances of 12x h_{max} (maximum water level) cannot be maintained, install energy-breaking elements such as baffle walls, deflectors or similar. These elements must be designed depending on the application. In such a case contact NIVUS.

Contact:
your local NIVUS representative or the internal sales department at NIVUS GmbH in Eppingen:

E-Mail sales@nivus.com, Phone + 49 7262 9191-794

8 Mounting Accessories and Tools

8.1 Welding Nozzle

8.1.1 Description

For mounting 1½″ pipe sensors, welding nozzles made of steel or stainless steel (1.4571) are available.

Variants:

- Straight
- 20°
- 30°
- For special applications (very little space at the installation place):
  welding nozzle with external thread. A ball valve can be screwed directly onto this welding nozzle.

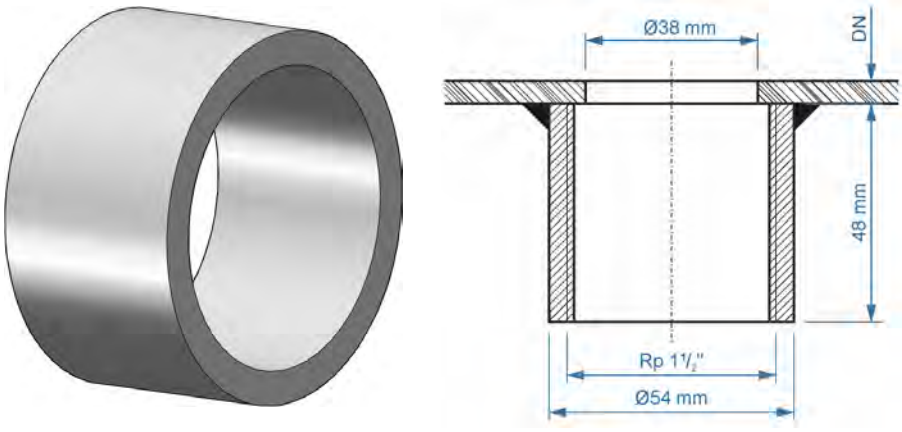
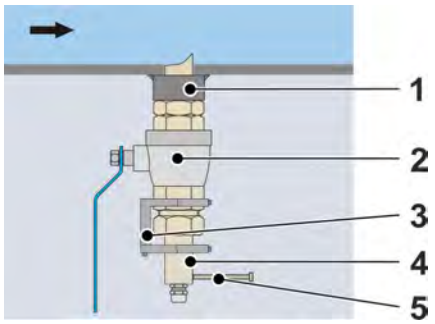


Fig. 8-1 View and dimensions straight welding nozzle

8.1.2 Installation Examples

The straight welding socket is intended for measurements with only one flow velocity sensor. This is usually welded in the pipe bottom or slightly off-centre if there is a risk of sedimentation.



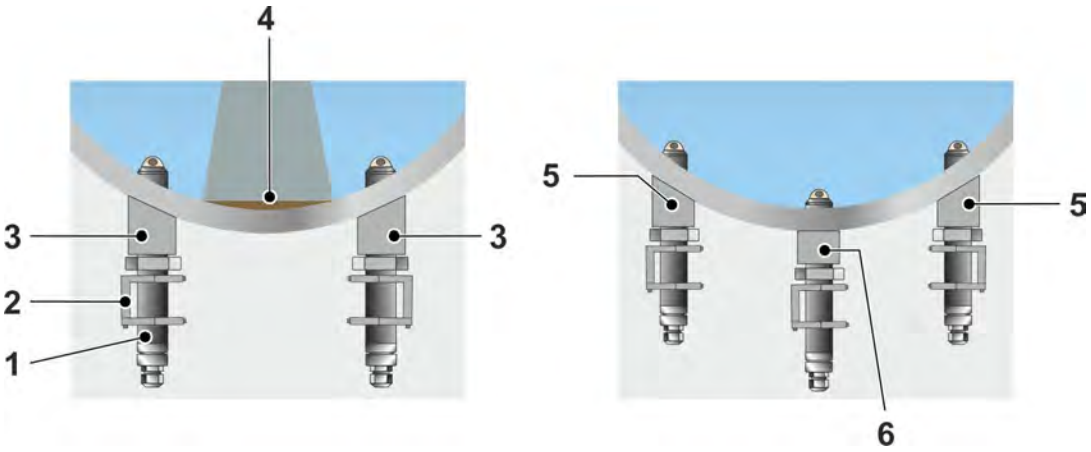
1 Welding nozzle straight construction
2 Ball Valve
3 Fastening element
4 Pipe sensor
5 Screw M4; alignment aid; 180° to flow direction

Fig. 8-2 Installation example: 1x pipe sensor with straight welding nozzle

For very large pipe diameters or hydraulically highly distorted flow profiles, 2 or 3 flow velocity sensors are often used (for distribution see *Fig. 4-18*). The installed pipe sensors must measure vertically upwards. To ensure this, insert the welding nozzles as follows:

Number of pipe sensors with flow velocity measurement at one measurement place	Number of Welding Nozzles	Installation Angle
2	2	20°
3	2	30°
3	1	Straight

Tab. 8-1 Use of welding nozzles



1 Pipe sensor for flow velocity measurement
2 Fastening element
3 Welding Nozzle 20°
4 Sediment
5 Welding Nozzle 30°
6 Welding nozzle straight construction

Fig. 8-3 Installation Examples: 2 or 3 pipe sensors with welding nozzles

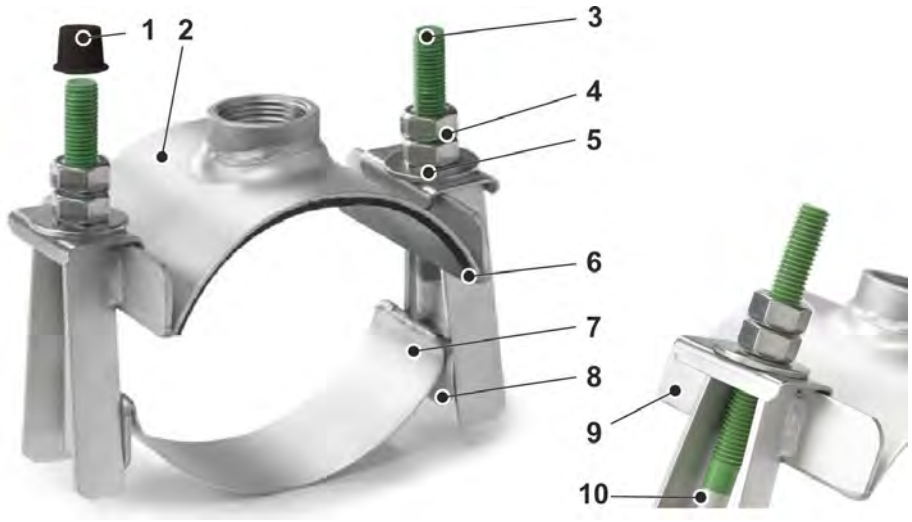
8.2 Tapping Saddle

8.2.1 Description

A tapping saddle is available from NIVUS for retrofitting a pipe sensor. This is available for pipe outside diameters from 100 mm to 2000 mm and is manufactured in two variants (see *Fig. 8-4* and *Fig. 8-5*).

Versions for pipe outside diameters from **100 mm to 400 mm** consisting of the following materials:

- All metal parts of the tapping saddle are made of stainless steel (1.4301/V2A).
- The saddle piece is fully etched and passivated to prevent corrosion of the base material.
- The threaded bolts are coated with Teflon to prevent cold welded joints.
- The rubber gasket is treated with antioxidant/antiozonant to increase its life. The rubber gasket ensures a perfect seal.



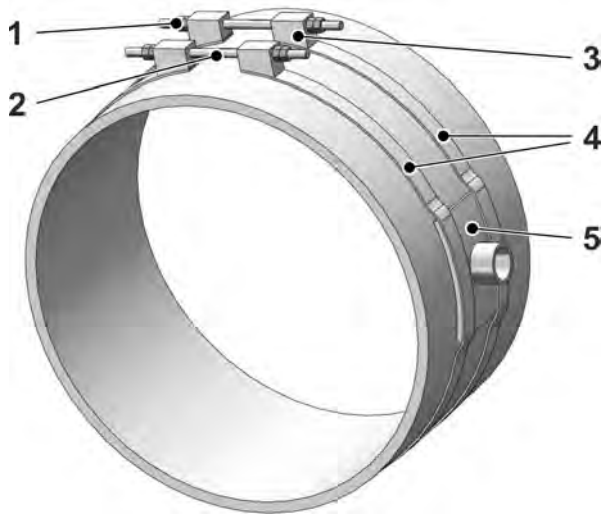
1 Thread protection cap
2 Saddle piece with 1½" internal thread for sensor screw connection
3 Threaded bolt M12, (M14, M16) Teflon-coated
4 Nut and lock nut
5 Washer
6 Rubber gasket
7 Saddle piece with threaded bolt
8 Side bar
9 Retaining bracket
10 Screw yoke

Fig. 8-4 Overview tapping saddle for outside diameters 100 mm to 400 mm

Versions for pipe outside diameters between **400 mm and 2000 mm** consisting of the following components:

- For outside diameters 400...600 mm: 2 clamping straps with clamping bolts and nuts
  For outside diameters 625...1300 mm: 4 half-round clamping straps with clamping bolts and nuts
  For outside diameters from 1300 mm: 6 third-round clamping straps with clamping bolts and nuts
- 1 mounting plate with weld-on sensor mounting nozzle with 1½" internal thread. This also contains an O-ring to seal the mounting plate to the pipe wall.

All metal parts of this system are made of stainless steel (1.4301/V2A).



1 Nut and lock nut
2 Clamping bolt
3 Guide block for the clamping bolt
4 Clamping straps
5 Mounting plate with nozzle for sensor mounting and internal O-ring

Fig. 8-5 Overview tapping saddle for outside diameters 400 mm to 600 mm

8.2.2 Installation Examples

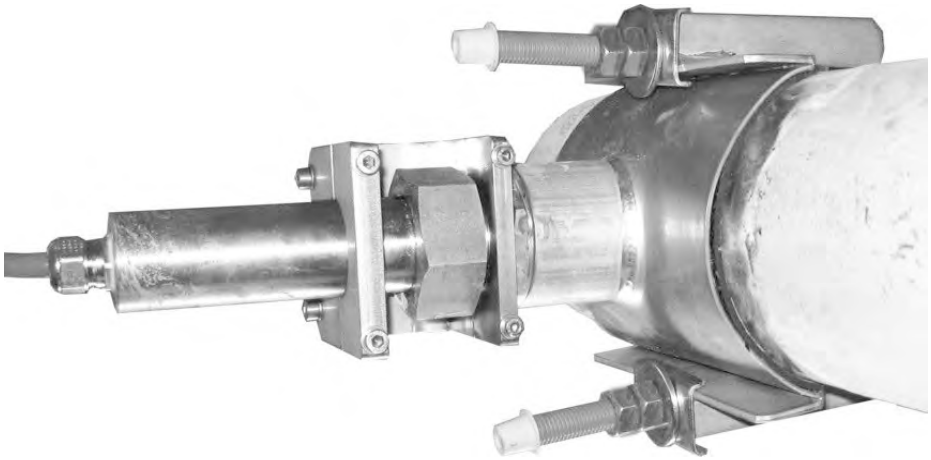


Fig. 8-6 Installation example with tapping saddle for outside diameters 100 mm to 400 mm

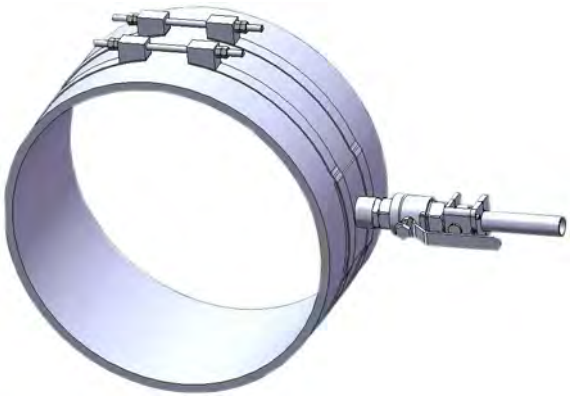


Fig. 8-7 Installation example with tapping saddle for outside diameters 400 mm to 600 mm

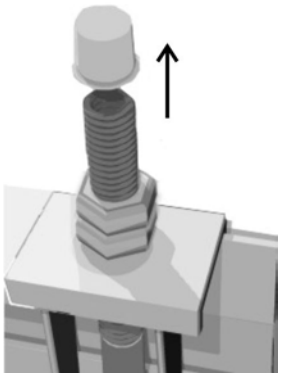
8.2.3 Installation

Prepare installation:

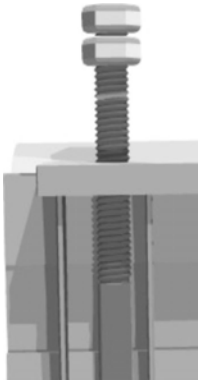
- Check the pipe/mounting point for possible damage.
- Clean the pipe from dirt, grease, etc.
- Check pipe diameter and dimension of the tapping saddle.
- Grease the thread of the nozzle with suitable grease paste for stainless steel screw connections.
- For the tapping saddle for outer diameters up to 400 mm, use soft soap as a lubricant for the rubber seal if necessary (no oil or grease!).

Installation pipe sensor with tapping saddle for outside diameters up to 400 mm:

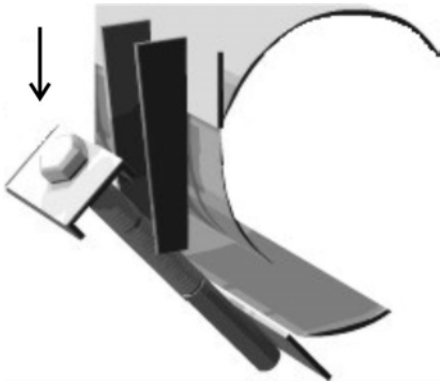
1. Drill a hole of at least Ø 38 mm into the pipe.
   In case of metal pipes cool the drill bit (see Chapter "*8.4 Drill Bit*") with cutting paste.
2. Deburr the hole with a file and remove chips.
3. Remove the thread protection cap from the threaded bolts of the tapping saddle (if available).



4. Back off the nuts and lock nuts to the end of the threaded bolts, but do not remove them completely.



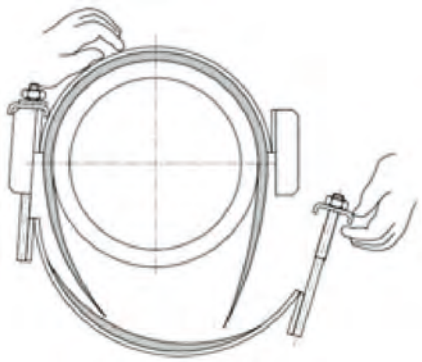
5. Unfold the saddle pieces.



6. Screw the sensor screw connection into the greased nozzle of the tapping saddle hand-tight.
7. Insert the sensor and hand-tighten the sensor screw connection.

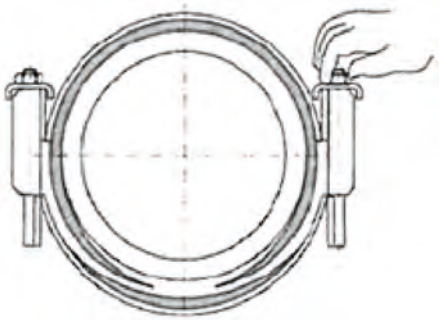
8. Place the saddle piece with the sensor on the pipe and insert the sensor through the hole in the pipe. Place the lower saddle piece around the pipe.

9. Place the retaining bracket over the bolt yokes on one side and tighten the nuts by hand.



→ The retaining bracket is hooked into the side bracket by tightening the nuts.

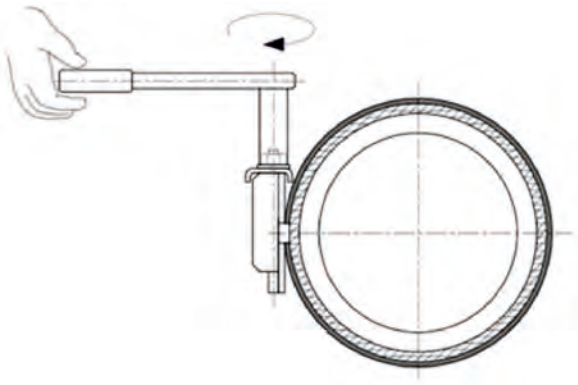
10. Tighten the bolts.



11. Before tightening the tapping saddle, make sure that the pipe sensor is not tilted and can be pushed further into the pipe!
    Tighten all nuts using a spanner with a length of approx. 300 mm.
    If you use a torque spanner, the following torques apply for metal and concrete pipes:

Bolts M12	Spanner width 19 mm	Torque 65 Nm
Bolts M14	Spanner width 22 mm	Torque 85 Nm
Bolts M16	Spanner width 24 mm	Torque 110 Nm

    Use a lower torque for plastic pipes (ask the pipe manufacturer for the permissible load).



    → When the nuts are tightened, the retaining bracket is automatically pressed into the side bar.

12. Tighten lock nuts.

CAUTION

Risk of damage to property

Vibrating system parts such as pump pipework can cause the nuts to come loose.

- *Always secure the nuts on the threaded bolts with a lock nut.*

13. If the tapping saddle is tight, align the pipe sensor and tighten the sensor screw connection (see Chapters "*5.4.4.6 Install pipe sensor*").

Assistant required

At least two persons are required to install tapping saddles larger than 400 mm.

Installation pipe sensor with tapping saddle for outside diameters between 400 mm and 600 mm:

1. Drill a hole of at least Ø 38 mm into the pipe.
   In case of metal pipes cool the drill bit (see Chapter "*8.4 Drill Bit*") with cutting paste.
2. If necessary, deburr the hole with a file and remove the chips (depending on the pipe material).
3. Loosen the nuts and lock nuts on the clamping bolts (*Fig. 8-5*, Pos. 1) and remove one side at a time.
   → The clamping straps can be opened.
4. Check whether the O-ring on the inside of the mounting plate (*Fig. 8-5*, Pos. 2) is correctly positioned in the groove and correct if necessary.
5. Person 1: Place the mounting plate on the drill hole in the pipework and hold it firmly.
6. Other person(s): Place the two clamping straps (*Fig. 8-5*, Pos. 4) around the mounting plate and the pipe.
7. Guide the clamping bolts (*Fig. 8-5*, Pos. 1) back through the guide blocks (*Fig. 8-5*, Pos. 3) on the clamping straps, loosely screw on the nuts and lock nuts.
8. Screw the sensor screw connection into the greased nozzle of the tapping saddle hand-tight.
9. Insert the sensor and hand-tighten the sensor screw connection.
10. Tighten all nuts and lock nuts (*Fig. 8-5*, Pos. 1) on the clamping straps.
11. If the tapping saddle is tight, align the pipe sensor and tighten the screw connection (see Chapter "*5.4.4.6 Install pipe sensor*").

Installation pipe sensor with tapping saddle for outside diameters larger than 600 mm:

The clamping straps for pipework with an external diameter greater than 600 mm are in 2 or 3 parts. When fitting the tapping saddle, proceed as for the tapping saddle for outside diameters between 400 mm and 600 mm, but note the following:

- Place clamping straps around the mounting plate and the pipe and loosely screw all connection points.
- Insert the sensor and hand-tighten the sensor screw connection. Then tighten the nuts and lock nuts evenly at all connection points of the clamping straps.

8.3 Ball Valve

The additional use of a corrosion-resistant ball valve with a straight passage enables quick and uncomplicated shut-off of the sensor installation location after removing a pipe sensor from depressurised pipes.

Available are

- Ball valve for 1½″ pipe sensors: *ZUB0 HAHN R15*
- Ball valve for 1″ pipe sensors: *ZUB0 HAHN R1*

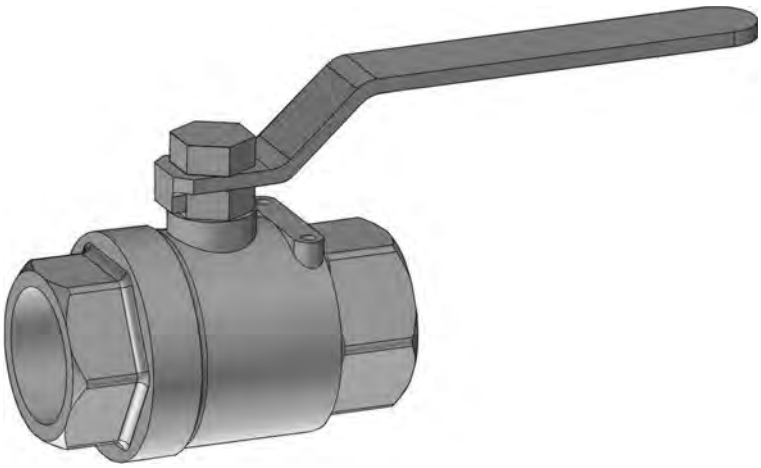
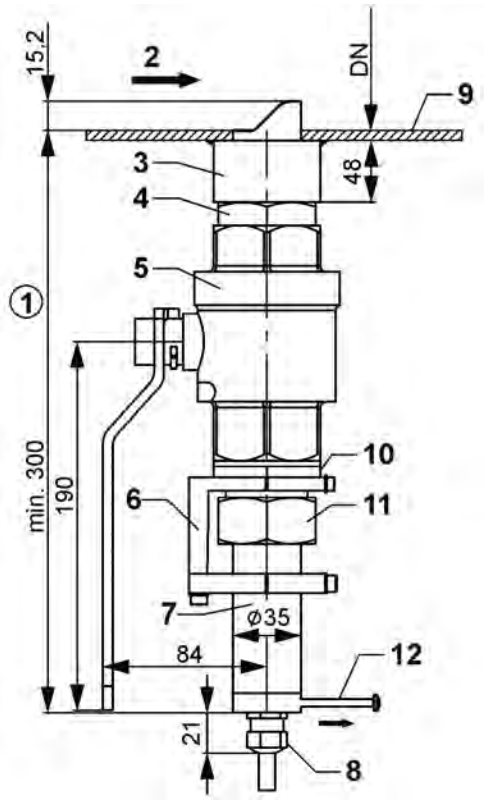


Fig. 8-8 Ball Valve



1 Min. 300 mm
2 Flow direction
3 Welding Nozzle
4 Hexagon double nipple SW50
5 Ball valve DN40 / PN63
6 Fastening element
7 Pipe sensor 1½"
8 Cable gland M16x1.5
9 Pipe wall
10 Screw thread SW55
11 Sleeve nut SW50
12 Screw; alignment aid; in flow direction

Fig. 8-9 Dimensional drawing of pipe sensor 1½″ with fastening element, ball valve and welding nozzle

8.4 Drill Bit

Drill bits in Ø 38 mm and Ø 25 mm are available for installing pipe sensors in steel, stainless steel and plastic pipes.

1 Drill Bit

Fig. 8-10 Drill bit

8.5 Cutting paste

Recommendation from NIVUS: When drilling in steel and stainless steel, use cutting paste to

- prevent premature wear of the drill bit and
- to reduce friction during drilling.

Fig. 8-11 Cutting paste

8.6 Sensor Protection Sheet

There is a risk of mechanical damage to the sensor body in media containing large amounts of gravel and stones with a high flow velocity. A sensor protection sheet is available for the POA, CS2, CSP, KDA and KDO wedge sensors. This prevents the impact of larger bodies and reduces the mechanical load on the sensor body.

The risk of sensor damage is thus reduced.

Do not use the sensor protection plate in media containing large amounts of waste water (risk of entangeling with debris).

Fig. 8-12 Sensor Protection Sheet

8.7 Wedge support

8.7.1 Description

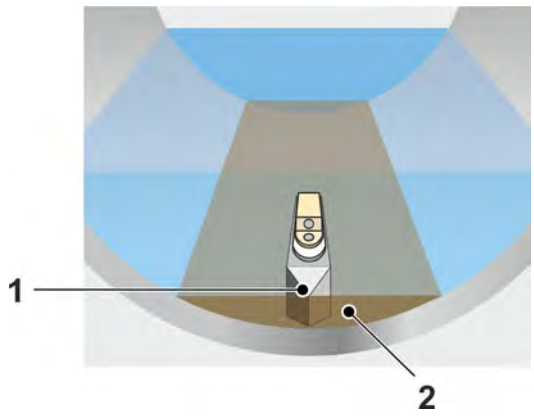
Wedge supports are intended for the installation of the wedge sensors POA, CS2, CSP, KDA and KDO in case of heavy sedimentation. Wedge supports raise the mounting position of the wedge sensors so that they protrude from the sediment and can measure the flow velocity.

Variants:

- Straight, height: 30 mm, 50 mm, 100 mm, 150 mm or 200 mm.
  The height of the wedge support depends on the expected height of the sediment.
- Left or right 20°
- Left or right 30°

8.7.2 Installation Examples

Straight wedge supports are intended for raising wedge sensors in horizontal channel bottoms and at the lowest point of pipes.



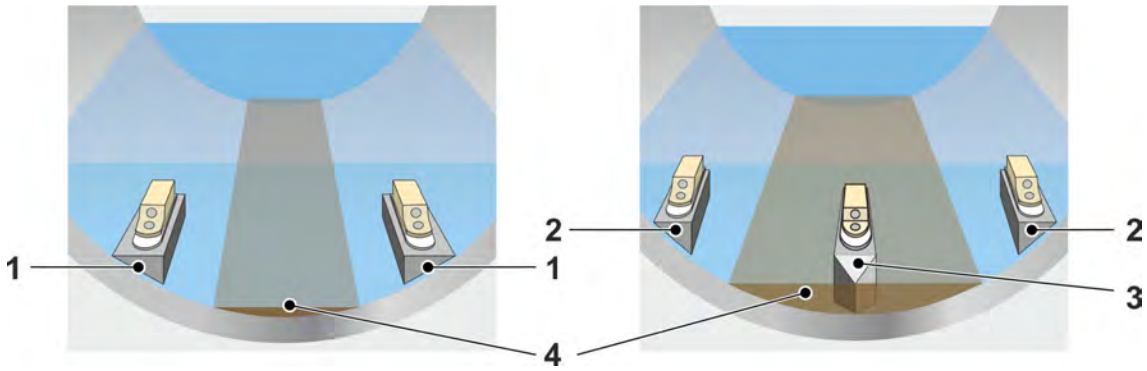
1 Wedge support straight
2 Sediment

Fig. 8-13 Installation example: 1x wedge sensor with straight wedge support

For very large pipe diameters two or three flow velocity sensors are often used (for distribution see *Fig. 4-17*). The wedge sensors must be installed vertically. To ensure this, insert the wedge supports as follows:

Number of wedge sensors with flow velocity measurement at one measurement place	Number Wedge support	Installation angle
2	1	Left 20°
	1	Right 20°
3	1	Left 30°
	1	Right 30°
	1	Straight

Tab. 8-2 Use of wedge supports



1 Wedge Supports 20°
2 Wedge Supports 30°
3 Wedge support straight
4 Sediment

Fig. 8-14 Installation examples: 2 or 3 wedge sensors with wedge supports

8.8 Cable Protection Sheets

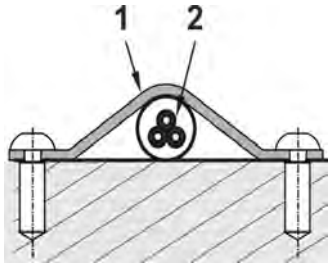
Cable cover sheets are for preventing build-up on sensor cables. You can obtain cable cover sheets made of 1.4571 (each 1 m long) from NIVUS.

Variants:

Type	Description	Use
ZMS 140	rigid	To cover one sensor cable. For even surfaces and straight cable runs.
ZMS 141	bendable	To cover up to three sensor cables. For straight and slightly curved surfaces such as the inside of concrete pipes and masonry, curved canals. Suitable for laying larger cable radii.
ZMS 142	bendable	To cover one sensor cable with max. Ø 12 mm or two sensor cables with max. Ø 8.5 mm. For slightly curved surfaces such as the inside of concrete pipes and masonry, curved canals. Suitable for laying larger cable radii.

Tab. 8-3 Overview cable cover sheets

Cable cover sheets are supplied with the appropriate corrosion-proof fastening material.



1 Cable Protection Sheet
2 Cable

Fig. 8-15 Cable laying with cable cover sheet

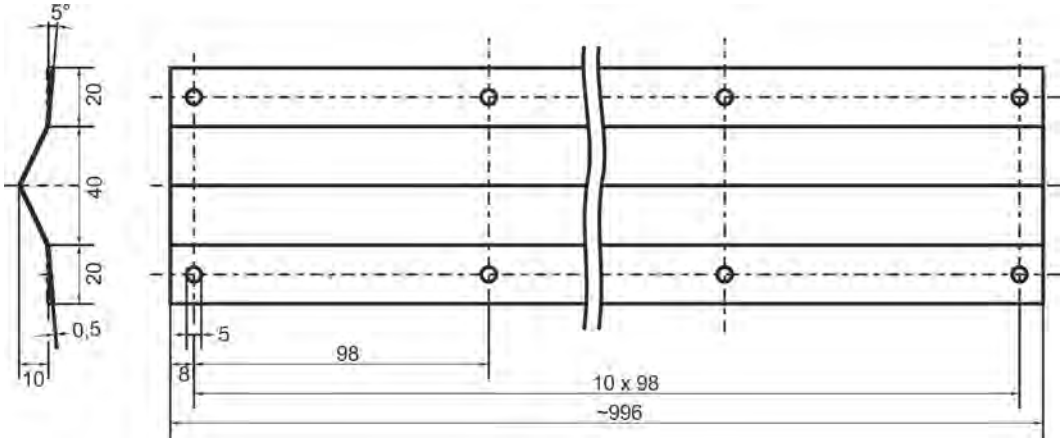
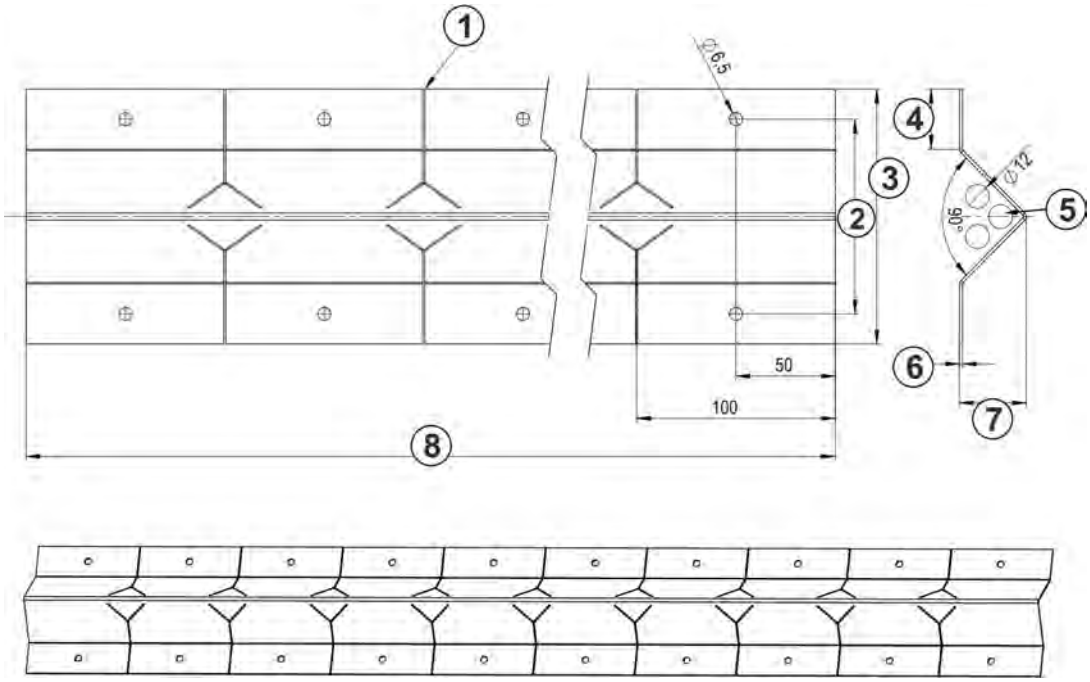


Fig. 8-16 Dimensional drawing cable protection sheet Type ZMS 140



	ZMS 141	ZMS 142
1	Y-bending edges every 100 mm	Y-bending edges every 100 mm
2	97 mm	47 mm
3	127 mm	62 mm
4	30 mm	15 mm
5	For max. 3 sensor cables	For max. 2 sensor cables
6	1.5 mm	1 mm
7	34 mm	16 mm
8	1000 mm	996 mm

Fig. 8-17 Dimensional drawing cable protection sheet Types ZMS 141 and ZMS 142

8.9 Float

Low flow velocities and the resulting sedimentation lead to siltation and silting of the sensor on the channel floor after a very short time. As a result, measurement failure or unstable measurement reading may occur. Sensors should then be mounted on a wedge base on the channel wall or from above using a float.

The installation of a float is particularly suitable if

- channels and flumes are to be cleaned at regular intervals (with a float installation, the sensor system can be removed from the channel/flume quickly and without tools),
- the fill level fluctuates greatly, and the sensor cannot be optimally installed in a lateral mounting position (optimum sensor position in relation to the average fill level: sensor protrudes from the medium at minimum fill level) and/or
- the sediment level is unknown or fluctuates greatly and therefore no suitable wedge base can be selected.

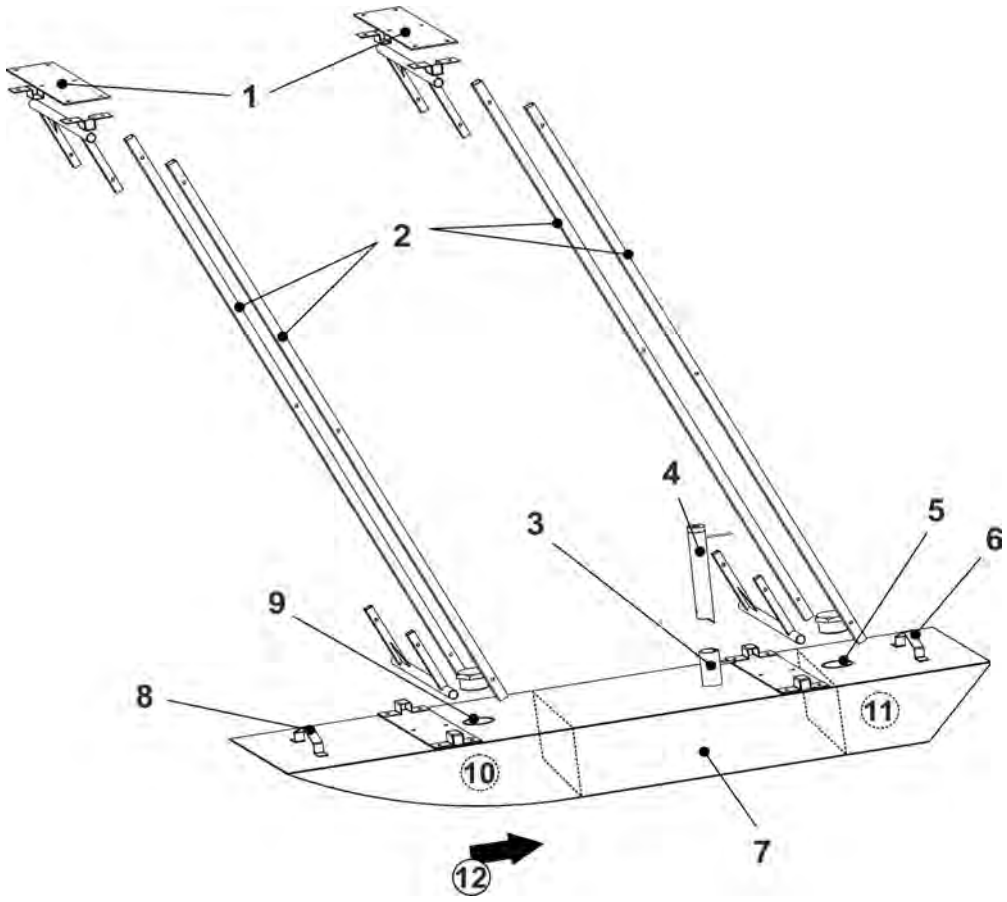
The use of floats is unsuitable

- if large objects such as branches, tree trunks etc. or large floating islands of matted materials such as grass, fibres etc. are floating on the surface of the channel or flume,
- in fast-flowing applications (v > approx. 1 m/s),
- in very wavy applications,
- if the flow depth is too shallow:
  Sensor POA: Minimum water level without sediment 20 cm
  Sensor CS2: Minimum water level without sediment 30 cm

Various types of floats can be ordered as customised designs from NIVUS.

8.9.1 Description

In practice, flat floats with parallel rods and a pipe sensor inserted from above have proven their worth (see *Fig. 8-18*).



1 Ceiling bracket for fastening to channel ridge, pipe crown or two traverses
2 Parallel rods
3 Pipe sensor holder
4 Pipe sensor (not included in the float delivery)
5 Rear filler neck
6 Rear carrying handle
7 Float body
8 Front carrying handle
9 Front filler neck
10 Front ballast tank
11 Rear ballast tank
12 Flow direction

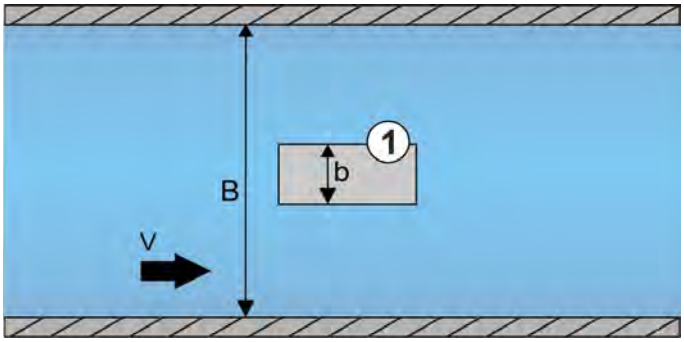
Fig. 8-18 Overview float

The design ensures reliable and stable sensor contact with the medium to be measured up to average flow velocities of approx. 100 cm/s and a minimum level of the medium to be measured of approx. 15 cm.

The float is designed for use with POA and CS2 pipe sensors.
Only sensors with a pipe length of 20 cm fit directly into the pipe sensor holder integrated in the float body.

As the pipe sensor is mounted from above, it can be removed, checked/cleaned and replaced in exactly the same position in just a few minutes without the need for any installation tools.

If possible, the width of the float should not exceed 40 % of the channel width in order to avoid hydraulic effects (lateral turbulence and cross flows, unstable immersion, etc.)(see *Fig. 8-19*).



b ≤ 0.4x B

1 Float

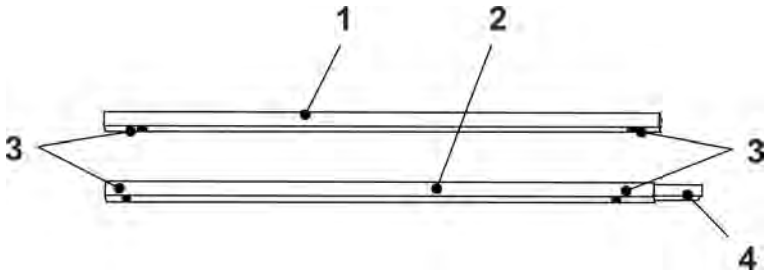
Fig. 8-19 Float width, top view on channel

8.9.2 Parallel rods

8.9.2.1 Description

In the standard delivery state, the parallel rods consist of eight square rods + connecting elements (see *Fig. 8-20*). Four rods serve as basic rods (Pos. 1). The other four rods (Pos. 2) can be used to extend the rodding in deep channels or when the fill level fluctuates greatly.

If required, you can purchase an additional extension set with four 1-metre rods from NIVUS. Only use this extension for floats with a width of 40 cm.



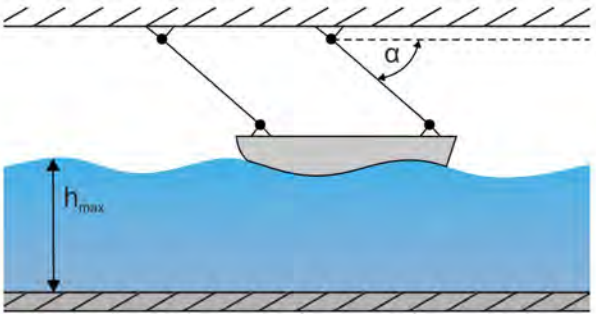
1 Basic rods (4x)
2 Extension rods (4x)
3 Fastening holes
4 Welded square steel for adaptation

Fig. 8-20 Individual parts of the parallel rod system

8.9.2.2 Determining the correct length

The length of the parallel rods depends on the maximum and minimum water levels that can occur in the application. Therefore, you must first determine a mounting location and then determine these two limit levels.

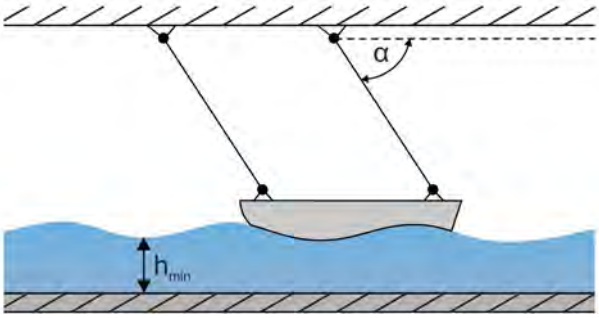
At maximum water level, the parallel rods must not be at an angle of less than 18° to the horizontal (see *Fig. 8-21*).



α > 18°

Fig. 8-21 Length of the parallel rods at maximum water level

At minimum water level, the float should still rest securely on the medium. This requires an angle of 80° or less (see *Fig. 8-22*).



α ≤ 80°
h_{min} > 15 cm

Fig. 8-22 Length of the parallel rods at minimum water level

8.9.2.3 Adjust length

Shortening the parallel rods:

1. Omit the extension rods.
2. Shorten a set of rods (basic rods) to the same length and drill the removed fastening holes again using a drill bit suitable for stainless steel with a diameter of at least 6.5 mm.

Important Notice

If you want to shorten the rods, shorten the rods of the basic system (see Fig. 8-20*, Pos. 1) to avoid removing the adapter plug connection.*

Extending the parallel rods:

- Extend using an extension set (see Chap. "*8.9.2.1 Description*").

Important Notice

Parallel rods that are too long lead to instability.

- *Extend parallel rods to max. 3 m.*

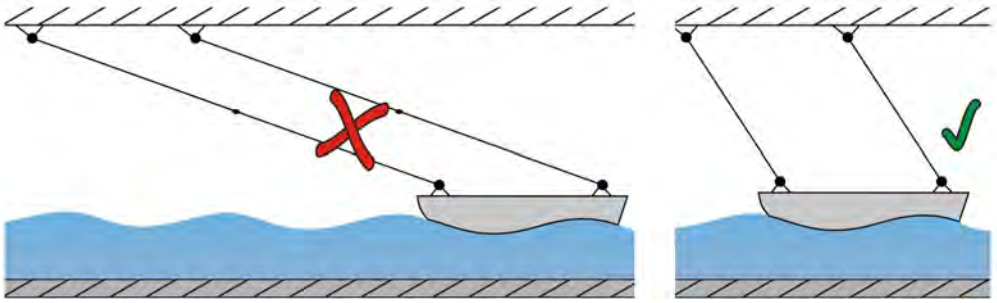


Fig. 8-23 Optimum length of the parallel rods

8.9.3 Notes on float installation in turbulent media

Strong surface waves lead to oscillation of the float body and to air entrainment underneath the float surface. This can cause the measurement to fail sporadically.

Countermeasures:

- Calm the water surface in front of the float.
- Weigh down the float to stabilise it: Pour small quantities of a dry, free-flowing filler (sand, grit or similar) into the front or rear ballast tank via the front and rear filler necks (*Fig. 8-18*, Pos. 10/11).

Important Notice

The filling quantity in the ballast tanks must not be so large that the tip of the float body is immersed in the medium or is washed over by waves.

After filling, close the filler neck again so that it is watertight.

If surface waves partially wash over the float body, measurement failure may also occur.

Countermeasures:

- Calm the water surface in front of the float.
- Find another installation location with a calm surface.

8.9.4 Installing the pipe sensor

Procedure:

CAUTION

Risk of damage to property

If the float with the pipe sensor installed is placed on the ground, the sensor head will be damaged.

- *Only fit the pipe sensor when the float is in the medium.*

1. Fit the pipe sensor with the enclosed M4 alignment screw. Screw it hand-tight into the thread at the end of the pipe sensor.

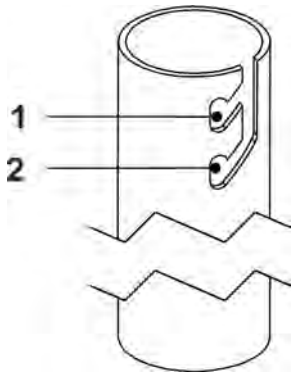
Important Notice

If the positions of the POA and CS2 pipe sensors are swapped, the POA pipe sensor will not protrude into the medium or the CS2 pipe sensor will get clogged very quickly.

- *Observe the sensor position.*

2. Hook the pipe sensor into the pipe sensor holder using the screw.

Pipe sensor CS2: Position 1
Pipe sensor POA: Position 2



Important Notice

If the water surface is very turbulent and the float body 'dances' on the water surface, air bubbles can form under the sensor body and push the pipe sensor out of the sensor holder.

- *Secure the pipe sensor (elastic wedge, taping or similar).*

3. Secure the pipe sensor if required.

8.9.5 Maintenance and Cleaning

Important Notice

Deposits on the surface of the float body, the handles, the sensor mount and the hinge mounts of the rods lead to an uncontrolled increase in weight of the float body and to deeper immersion or submersion and the associated failure of the system.

- *Clean the float body and sensors regularly.*
  The cleaning interval depends on the floating substances in the medium and the design of the float body.

Carry out the following maintenance and cleaning work regularly:

- The float rods are movably mounted via sliding connections. Check these connections regularly and lubricate or oil them.
- Check the float and its rods for wear, bending, loose connections, tight-fitting filler plugs, damage to the float body and wear on the movable sliding connections.
- Remove dirt and fouling from the float body and rods.

An increased amount of grease, oil or substances that tend to deposit can lead to increased soiling on the underside of the float body and the protruding sensor nose. These dirt and deposits can lead to a malfunction or interruption of the measurement. In this case, the operator must provide for cyclical cleaning cycles of the sensor body and flow velocity sensor. The cleaning interval depends on the degree of soiling and must be determined on the basis of operating experience. If it turns out that cyclical cleaning intervals are necessary, then the installation of a winch should be considered.

When lifting the float body out of the medium, observe the following instructions:

- At least two persons are required to lift out the float body.
- Use the carrying handles attached to the float body (*Fig. 8-18*, Pos. 6/8).

Important Notice

Risk of deformation.

- *Do not lift the float out of the medium by the parallel rods.*

9 Accessories and Spare Parts

More accessories for sensor mounting can be found in our current price list/parts list.

Pipe Sensor Mounting	
ZUB0SCHNEID15PT	Sensor gasket made of PTFE for screw-in pipe sensor connection
E-PMA-ORING35	*See Technical Description for Correlation Sensors and external Electronic Box*
E-VGM-ANTISEIZE	Anti seize grease paste, 10 ml in syringe for screw-in pipe sensor connection
Pipe Measuring Section	
OCM0ZDN0…	Pipe measuring sections in various nominal diameters (up to DN800), galvanised steel or stainless steel 1.4571
OCM0ZCRDN..	Pipe measuring sections in various nominal diameters (up to DN400), galvanised steel or stainless steel 1.4571, dome height 500 mm
ZUB0DN150STD	Gasket ring with steel insert DN150 for flange of the long pipe measuring section
ZUB0DN200STD	Gasket ring with steel insert DN200 for flange of the short pipe measuring section (adapter)
Drill Bit	
ZUB0BOHRK38	Drill bit Ø 38 mm for steel and stainless steel
ZUB0BOHRK25	Drill bit Ø 25 mm for steel and stainless steel
Cutting paste *ZUB0SCHNEID*	High-performance cutting paste for stainless steel and titanium, 125 g
Welding Nozzle *ZUB0STU15…*	For the installation of 1½" pipe sensors in steel or stainless steel pipes
Ball Valve	
ZUB0HAHNR15	To remove 1½" pipe sensors from pipes without pressure
ZUB0HAHNR1	To remove 1" pipe sensors from pipes without pressure
Tapping Saddle *ZUB0ABS01…/* to*...03*	For installation of 1½" pipe sensors in pipelines
Mounting Plates *ZUB0ABP15…*	For the installation of 1½" pipe sensors on GRP and concrete pipes
Pipe Mounting System	For the temporary, non-permanent installation of wedge sensors in pipes from DN150 to a maximum of DN2000 Material: 1.4571
ZUB0RMS2…	
ZUB0RMS3…	
ZUB0RMS4…	
ZUB0RMS5…	
Wedge Supports	Wedge support left 30° / wedge support right 30° For POA, CSP, CS2, KDA and KDO wedge sensors, for horizontal sensor installation in pipe. Material: stainless steel 1.4571
ZUB0KS00L30V4A	
ZUB0KS00R30V4A	

Cable cover	
ZMS0140	Cable cover sheet for a sensor plate, length 1000 mm
ZMS0141	Bendable cable cover sheet approx. 1000 mm long, for covering up to three sensor cables
ZMS0142	Bendable cable cover sheet approx. 1000 mm long, for covering one sensor cable with max. Ø 12 mm or two sensor cables with max. Ø 8.5 mm
Sensor Protection Sheet	
ZUB0SENSCHU1	Sensor protection sheet for CSP, CS2, KDA and KDO wedge sensors, material 1.4571
ZUB0SENSCHU2	Sensor protection sheet for POA wedge sensor, material 1.4571

Tab. 9-1 Accessories and spare parts

10 Dismantling/Disposal

10.1 Dismantling

Preparing Dismantling:

- If possible, drain the measurement place.

Dismantling Sensors:

1. Disconnect the measurement system from the mains.
2. Use a suitable tool to disconnect the connected cables from the transmitter.
3. Remove the sensors from the canal or the pipeline.
4. For pipeline: Close the sensor opening.

Observe the following note when dismantling wedge sensors with and without pressure measurement cell.

Important Notice

Incorrect handling will damage the wedge sensor.

- *Use a suitable screwdriver for dismantling.*
- ***Never** use chisels, hammers, crowbars, levers, hammer drills and similar tools.*

10.2 Disposal

Dispose of the sensors, accessories and mounting parts in accordance with the applicable local environmental regulations for electrical products.

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

Index

A

Accessories 87
Ball Valve 74
Cable Protection Sheet 78
Cutting Paste 75
Drill Bit.... 75
Sensor Protection Sheet 76
Tapping Saddle 67
Wedge Support 76
Welding Nozzle 65
Air-Ultrasonic Sensor
Mounting 41
Permanent Fastening.... 44
Positioning 43
Temporary Fastening 44
Alignment
Pipe Sensors.... 46
Wedge Sensors 37
Article Names 9
Avoiding Tressing....39

B

Ball Valve
Pipe Sensors CSM-V100 M/S.... 87
Pipe sensors POA, CS2, KDA/KDO.... 87
Pipe sensors POA, CS2, KDA/KDO, CSM-V100 M/S 74

C

Cable
With Capillary Tube.... 35
With FEP Cable Sheath 39
Cable Protection Sheet 78, 88
Cleaning 59
Conditions Calming Sections 18
Control Section....60
Basic Information 60
Construction.... 60
In the Channel.... 63
With Pipe Measuring Section 60
Copyright 3
Copyrights 3
Cutting paste 75, 87

D

Dead Zone....41
Dismantling....89
Drill Bit 75

E

Ex Protection 13

F

Fastening element....56
Float....80
Description.... 81
Installation in turbulent Media 84
Installing the Pipe Sensor 85
Maintenance and Cleaning 86
Parallel Rods.... 82
Flood Protection 35

G

Germs....11
Grease paste 52, 87

I

Installation 31
Intended Use 14

M

maintenance 59
Mounting
Air-Ultrasonic Sensor 41, 44
Basics 31
In dirty Media 31
Pipe Sensor 45
Pipe Sensor CS2 48
Pipe Sensor KDA/KDO 48
Pipe Sensor POA.... 48
Pressure Compensation Element 35
Wedge Sensor 32
Wedge Sensor with Pressure Measurement Cell.... 34
Wedge sensor with Water-Ultrasound 36
Wedge Sensor without Pressure Measurement Cell.... 33
Mounting Accessories 65

N

Names 3
NIVUS Addresses....2

O

Operator's Duties....14

P

Parallel rods....82
Pipe Measuring Section 87
Long.... 62
Short 61
Pipe Sensors
Alignment.... 46

Attach Nozzle 51
Drilling in Pipeline 50
Pipe sensors CSM-V100 M/S
Components 49
Sensor Screw Connection 49
Pipe Sensors CSM-V100 M/S
Alignment Aid 49
Pipe sensors POA, CS2, KDA/KDO
Components 48
Sensor Screw Connection 48
Pipe Sensors POA, CS2, KDA/KDO
Alignment Aid 48
Mount Fastening Element 57
Pipe sensors POA, CS2, KDA/KDO, CSM-V100 M/S
Installing 54
Pipe Sensors POA, CS2, KDA/KDO, CSM-V100 M/S
Drilling into drained pipeline 51
Prepare Installation 52
Positioning 18
Precautions 11
Property Rights 3

Q

Qualified Personnel 13

R

Requirements for the Personnel 13
RMS Pipe Mounting System 44, 87

S

Safety Information
Pipe Sensors 12
Safety Instructions 10
Safety Measures 11
Selecting the Measurement Section 18
Sensor
With Pressure Measurement Cell 38, 39
Sensor Overview 16
Sensor Positioning 19
After Bend 20
Air-Ultrasonic Sensor 19, 23, 43
Change in Slope 21
Fall 21, 22, 24
Fixtures 22
In partially filled channels 19
In structured Channels 26
Negative Slope 21
Profile Change 28
Shaft 23, 24
Shaft with Berm 25
Sensor Protection Sheet 76, 88
Spare Parts 87
Subsidiaries 2

T

Tapping Saddle
Description 67
Installation 69
Installation Examples 69
Translation 3

W

Wedge Sensor
Alignment 37
Cable Routing 37
Fastening 37
Wedge support 87
Wedge Support
Description 76
Installation Examples 77
Welding Nozzle
Description 65
Installation Examples 66