Instruction manual for the Measurement System NivuLog SunFlow

(Original Instruction Manual – German)

As from Firmware-Revision 03v001
Modem Version: 03v001

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Translation

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

Names

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

1 Contents

1.1 Table of Contents

2 General

Important

READ CAREFULLY BEFORE USE

KEEP IN A SAFE PLACE FOR LATER REFERENCE

This Instruction manual for the NivuLog SunFlow is intended for the initial start-up of the unit depicted on the title page.
Read the instructions carefully prior to use.

This Instruction manual is part of the NivuLog SunFlow delivery and shall be available to users at any time. The safety instructions contained therein must be followed.
In case of selling the NivuLog SunFlow this Instruction manual must be provided to the purchaser.
The Sensor installation is described in the separate “Installation Instruction for Correlation and Doppler Sensors”. This Installation Instruction is part of the Sensor delivery. Read the instructions carefully prior to sensor installation.

The operation of the complete system is described in the separate manual "Device to Web Data logging system (D2W)" as well as to the „Technical Description for Doppler Sensors“.

3 General Notes on Safety and Danger

3.1 General Danger Notes

Cautions

are framed and labelled with a warning triangle.

This indicates an immediate high risk threatening life and limb.

Danger by electric voltage

is framed and labelled with the Symbol on the left.

Warnings

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

This indicates a possible risk to persons as well as possible damage to facilities and material.

Notes

are framed and labelled with a "hand"

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

3.1.1 Special Danger Notes

DANGER

Risk of fire and burns

The NivuLog SunFlow measurement system contains Lithium-Ion-Batteries.

Damaged Lithium cells may ignite or explode due to their extremely high energy density.

WARNING

Toxic substances

The included, rechargeable Lithium-Ion-Batteries contain toxic substances and therefore must not be disposed of as normal household waste. Always dispose of such batteries in accordance with statutory regulations.

WARNING

Germ contamination

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

3.2 Safety Guidelines and Precautions in Handling GSM/GPRS-Modems

Important Note

The GSM/GPRS-Modem must be switched on and should be operated in an area where signal strength is well.

The following safety measures and guidelines have to be respected in all phases of installation, operation or due to maintenance or repair of the GSM/GPRS modem. The manufacturer accepts no liability for any damages resulting from disregarding the guidelines.

3.2.1 Safety Guidelines Protection Class

Please ensure proper function of the safety features of this unit. Use or install the measurement system exclusively as described in this instruction manual.

3.3 Precautions for GSM/GPRS-Modem Installation

DANGER

Risk due to radio waves

The effects of radio waves on medical equipment and persons with pacemakers or similar have not yet been investigated sufficiently. There is a risk of malfunctions or unit failures. The measurement system under no circumstances must be operated in close proximity to highly flammable areas such as service stations or flammable gases, vapours or dust.

- This instrument shall be installed only by trained expert personnel familiar with approved methods for the installation of radio frequency transmitters including the correct grounding of external antennas.
- It is not allowed to operate the device in Hospitals and/or near medical equipment such as cardiac pacemakers or hearing aids.
- It is not allowed to operate the device in close proximity to highly flammable areas such as service stations. The same applies for operation in close proximity to fuel depots, chemical plants and blasting sites.
- It is not allowed to operate the device in close proximity to flammable gases, vapours or dust.
- Keep the device away from heavy shocks or vibrations.
- The use of a GSM/GPRS-Modem near to the televisions, radios or computer may cause interference.
- Do not open the GSM/GPRS-Modem due to reasons of safety and guarantee.
- The use of GSM services (SMS, Data communication, GPRS or similar) may induce additional expenses. The user bears sole responsibility for resulting costs or damage.
- Do not install the unit in any other way than specified in this manual. Every instance of misuse will invalidate the warranty.

3.4 Device Identification

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

- Name and address of manufacturer
- CE label
- Type and serial number
- Year of manufacture (coded in the serial number)

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

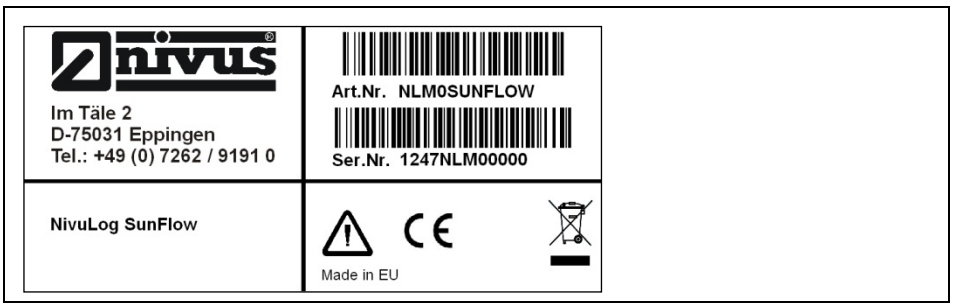


Fig. 3-1 NivuLog SunFlow - nameplate

This symbol indicates that the NivuLog SunFlow is equipped with a fixed on-board SIM chip.

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

The safety instructions contained within must be followed.

To operate the complete system it is necessary to additionally refer to the "Device to Web Data logging system D2W", the "Technical Instruction for Doppler Sensors" instruction manuals as well as to the "Installation instructions for correlation and Doppler sensors" manuals.

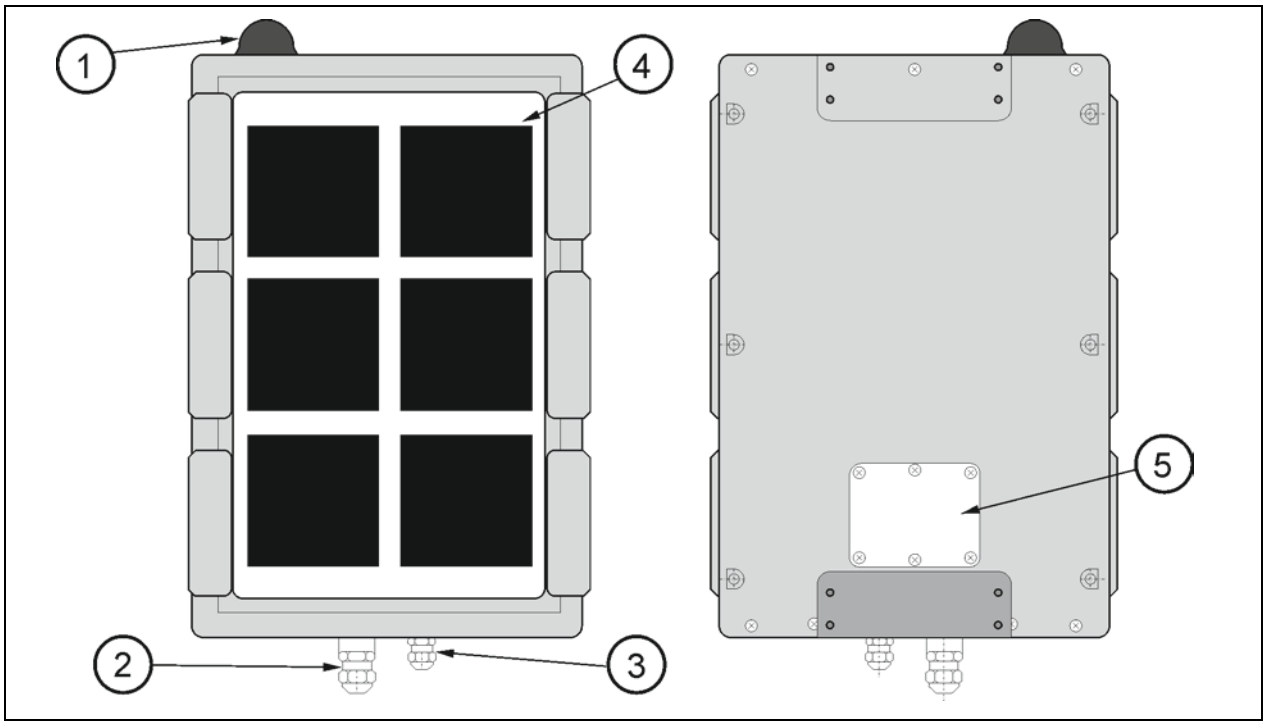
WARNING

Do not disable safety devices!

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

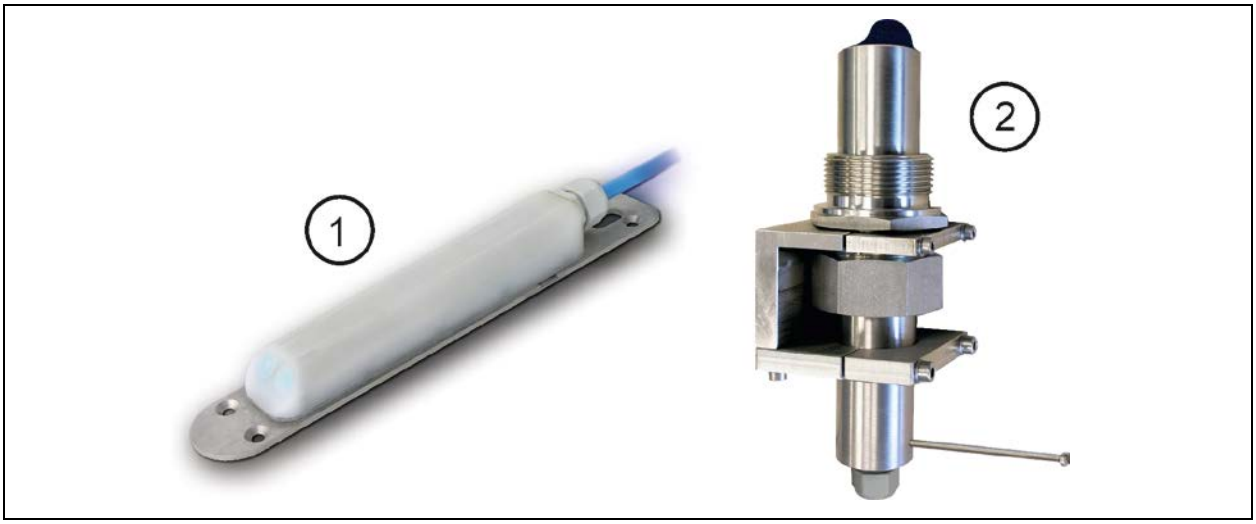
4 Overview and use in accordance with the requirements

4.1 Overview



1 Antenna
2 Cable gland M20x1.5 with pressure compensation (for KDS-Sensor) (cable diameter 6-13 mm)
3 Cable gland M16x1.5 (cable diameter 4.5-10 mm)
4 Solar cells
5 Terminal cover

Fig. 4-1 Overview Enclosure



1 Flow velocity sensor (wedge), type KDS
2 Flow velocity sensor (pipe), type KDS

Fig. 4-2 Overview Sensors

4.2 Use in accordance with the requirements

The device is exclusively intended to be used for purposes as described above.
Modifying or using the devices for other purposes without the written consent of the manufacturer will not be considered as use in accordance with the requirements.
Damages resulting from this are left at user's risk.
The device is designed for a lifetime of approx. 10 years. After that period an inspection in addition with a general overhaul has to be made.

The stationary measurement system type NivuLog SunFlow including the respective sensor technology supplied by NIVUS is intended to be used for discontinuous flow measurement of slight to heavy polluted media in part filled and full channels, pipes or similar.
The device is supplied by solar power and encloses a rechargeable battery pack to support power supply. The measured and detected data are saved on a non-volatile storage medium. Using the mobile phone network these data are transmitted to a central server for further processing. This is why the unit is equipped with a soldered SIM-Chip.
Please always observe the maximum permissible limit values as described in Chapter Specifications. All cases varying from these conditions which are not approved by NIVUS GmbH in writing are entirely left at the owner's risk.

Notes:

The integrated SIM-Chip ensures mobile phone connection thanks to a wide range of international service providers. Please make sure to be within the service range of such a provider to be able to use all the device functions available. You can find a list of all supported countries and the according service providers on www.nivus.com. To be capable of using the mobile data transmission option it is necessary to purchase a "Prepaid (Data) Pack without binding contract" from NIVUS GmbH. This pack includes the provision of the mobile phone connection using the network services of the providers.

Notes:

For installation and initial start-up the conformity certificates and test certificates of the respective authorities must be followed.

4.3 Specifications

Power Supply	10 W solar panel and 2 rechargeable batteries (13.6 Ah each)
Backup battery	Battery pack AP413D+: 2x Lithium-Ion-battery, ready made up with 13,6 Ah
External charging voltage (optional)	7...30 VDC (typ. 170 mA/12 V). The solar panel can be supported while charging the batteries by applying external charging current.
Enclosure	Material: Aluminium cast, VSG glass Weight: 15 kg (incl. Backup battery) Protection: IP68 (with terminal housing closed and cable glands tightened) Dimensions (BHT): 308x520x80 cm (incl. antenna)
Operation temperature	-40...+60 °C
Storage temperature	-40...+85 °C
max. humidity	90 %, non-condensing
Display	LED to signal operation conditions and error messages (visible only with terminal housing lid open)
Operation	via magnetic switch (accessible only with terminal housing lid open). Start the ALOHA mode using the magnetic key
Antenna	permanently attached dome antenna
Sensor connection	1 Compact Doppler active sensor, type KDS connectable (flow velocity; combi sensor additional with level measurement)
Universal input	4 x analog or digital modes: – 0...20 mA: resolution 6 µA, max. 22.5 mA, load 100 Ω – 4...20 mA: resolution 6 µA, max. 22.5 mA, load 100 Ω – 0...2 V: resolution 610 µV, max. 2.5 V, load 220 k1 – 0...10 V: resolution 8.3 mV, max. 32 V, load 8k9 – PWM: 1...99 %, max. 100 Hz, pulse length min. 1 ms, load 8k9 – Frequency: 1...1000 Hz, 8k9 – Digital: max. 32 V, low <1.36 V, high >2.73 V, load 8k9 – Digital LP: max. V batt., low <100 mV, high >200 mV, load 220 k1 – Day counter: pulse length min. 20 ms, load 8 k9 – Interval counter: pulse length min. 20 ms, load 8 k9
Outputs	1 x switchable sensor supply 24...31 V DC, max. 41 mA
Internal temperature sensor	1 x temperature sensor is permanently mounted in the measurement station
External temperature sensor	1 x temperature sensor (optional accessories)
Data storage	internal flash memory for up to 14.030 measurement cycles
Data type	f32 (32 Bit floating point)
Data transmission	via GSM/GPRS quad band modem to the respective Device to Web (D2W) Server
SIM	firmly integrated long-lasting SIM chip (use of own SIM card not possible)
Monthly data volume	See data rates of "NivuLog Prepaid"

Important note:

For outdoor use, the system has extensive protection against the ingress of humidity and dust.
If these products are connected to sensors or power supply using cables and plugs instead of the permanently installed fixed cables, the susceptibility to penetration of moisture and dust of plug and socket will increase significantly. The operator is responsible to appropriately protect plug and socket from the penetration of moisture and dust as well as to adhere to local regulations on safety.

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

We herewith particularly emphasize that replacement parts or accessories, which are not supplied by us, are not certified by us, too. Hence, the installation and/or the use of such products may possibly be detrimental to the device's ability to work.
Damages or measurement faults caused by using non-original parts and non-original accessories are left at user's risk (Accessories see chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**).

4.5 Storage of the Product

WARNING

Protect the battery against damage

Protect the integrated Lithium-Ion-Batteries against impact or physical damage. Flammability hazard exists if the package is damaged.

Prior to recharging the Lithium-Ion-Battery, please inspect it for damage!

To store the NivuLog SunFlow when not in use activate the transport lock by setting the "Operation mode" in the device configuration input window of the D2W server to "OFF". To transmit the modified configuration to the NivuLog SunFlow start the ALOHA transmission mode using the magnetic contact. During this transmission all data not yet transmitted to the D2W server up to now will be transmitted as well. Wait until the GPRS connection has been terminated after the status LED goes off. If you should use external power to support the solar panel charging the backup batteries, disconnect the external power source now. Then remove the remaining cables.
By activating the transport lock the NivuLog SunFlow will go to an extreme power-save mode. It may nevertheless happen that the backup battery will discharge completely if the unit is not in use for a very long period. Configuration settings and the data detected last however remain to be saved in any case. Re-triggering the ALOHA transmission mode will deactivate the transport lock and the NivuLog SunFlow will commence operation according to the configuration settings.

4.6 User's Responsibilities

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

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

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

Connections

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

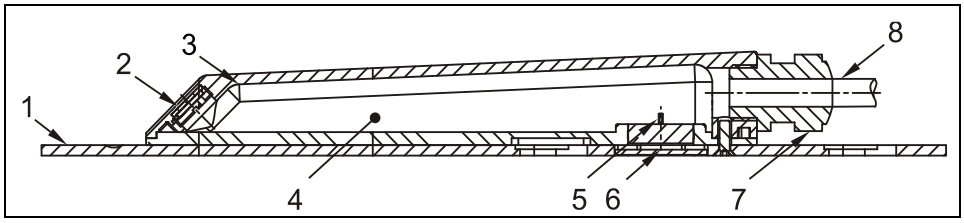
5 Functional Principle

5.1 General

The NivuLog SunFlow is a stationary, self-sufficient, solar-powered flow measurement system for discontinues flow measurement and data storage of detected measurement values. Using the mobile phone network these measured values are transmitted to a central server.
The NivuLog SunFlow is a measurement system and is designed for use in slight to heavy polluted media with various compositions. It can be operated in partial and fully filled channels and pipes with various geometries and dimensions. By using a built-in GPRS communication module (quad band modem) various data such as flow rate, internal temperature, signal strength of GPRS connection and many more are transmitted to the server-based data logging and recording system "Device to Web" (D2W).

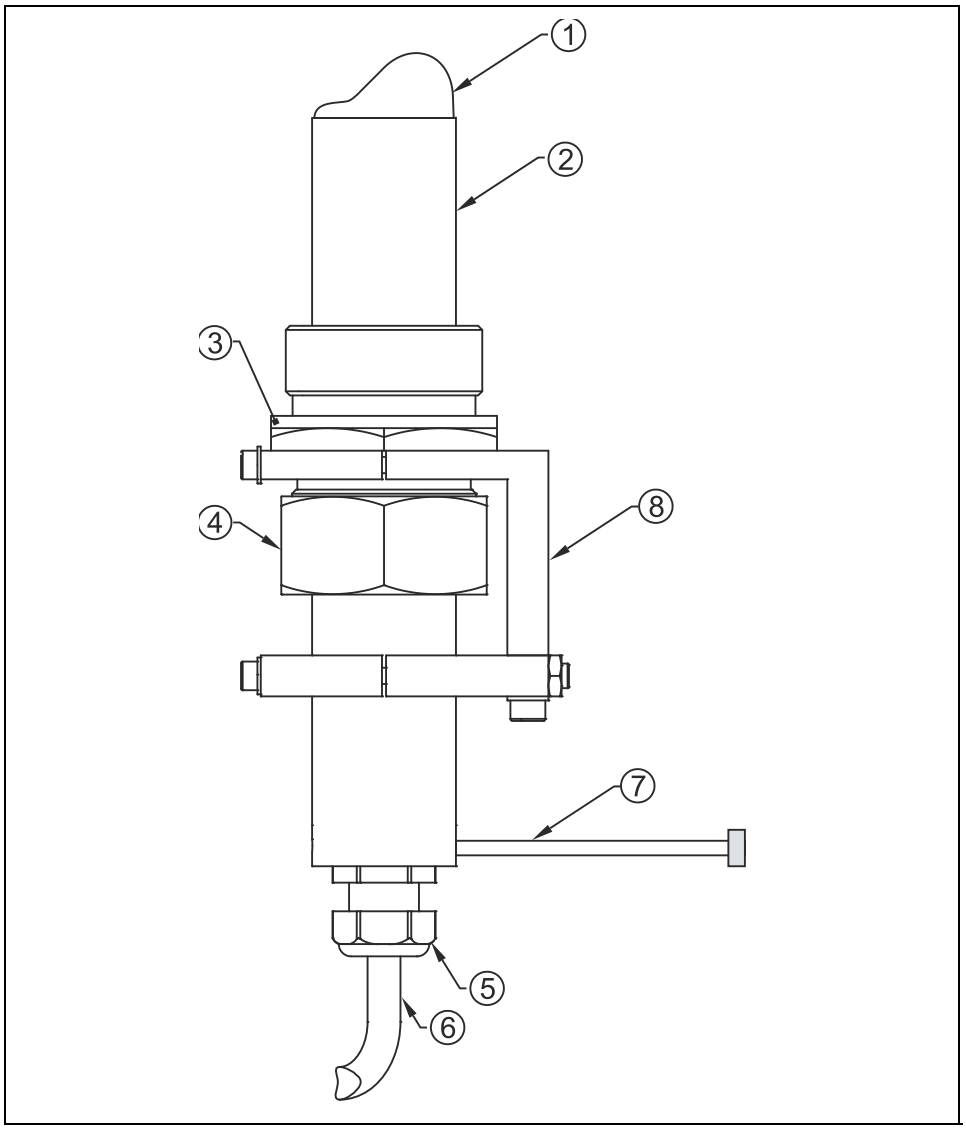
The measurement method is based on the ultrasound Doppler principle. Hence, it is indispensable for the system to work that there are particles in the water, which are able to reflect the ultrasonic signal sent by the sensor (dirt particles, gas bubbles or similar).

The NivuLog SunFlow uses compact Doppler active sensors (later called >KDS-Sensor< in this manual) which simultaneously determines flow velocity and flow level. The combi sensor Type “KDS“ can be combined with a sensor-integrated pressure measurement cell for hydrostatic level measurement.
The KDS pipe sensor is only available as a velocity sensor.



1 Ground plate
2 Acoustic coupling layer with sonic converter behind
3 Temperature sensor
4 Electronics
5 Pressure measurement cell (option)
6 Duct to pressure measurement (option)
7 Cable gland
8 Sensor cable

Fig. 5-1 Construction of combi sensor Type “KDS“



1 Sensor head
2 Sensor enclosure
3 Double nipple
4 Spigot nut
5 Cable gland
6 Sensor cable
7 Adjustment aid (screw M4)
8 Retaining element

Fig. 5-2 Construction pipe sensor, type KDS

5.2 Level Measurement using Pressure

The combi sensor type KDS additionally contains a hydrostatic level measurement via integrated pressure measurement cell.
The piezo-resistive pressure sensor operates according to the relative pressure principle, i.e. the pressure of the standing water column above the sensor is direct proportional to the flow level.

5.3 Flow Velocity Detection

The flow velocity sensor, type KDS operates according to the continuous Doppler principle (CW-Doppler) using 2 built-in piezo crystals with a slope of 45° against the flow direction. The crystal surfaces are arranged parallel to the slope of the flow velocity sensor. One of the crystals continuously operates as ultrasonic transmitter, the other one as receiver detecting the reflected ultrasonic signal.
The sensor enclosure enables acoustic coupling of the high-frequency ultrasonic signal between piezo crystal/enclosure and enclosure/medium. Due to that reason an ultrasonic signal with an angle of 45° is sent permanently against the flow direction of the medium to be measured. As soon as the signal hits dirt particles, gas bubbles or similar a portion of the sonic energy is reflected, being converted into an electric signal by the receiving crystal subsequently.

Caused by the movement of the reflecting particles in relation to the acoustic source the frequency of the ultrasonic signal is shifted. The resulting frequency shift is directly proportional to the particles' movement within the medium and hence represents the flow velocity.
The KDS sensor processes the received reflection signal, converting it to be sent to the solar station.

Due to varying velocities within the flow profile (vorticity, rotation of single reflecting particles, surface waves etc.) a frequency mixture is emerging. This mixture is evaluated directly within the KDS sensor regarding statistic considerations related to average flow velocity.
It is recommended to verify the measurement whether conditions are disadvantageous from a hydraulic standpoint. Verification should not be based on the CW-Doppler method since in this case it is not possible to spatially allocate recorded flow velocities.
In this case the VDI/VDE Directive 2640 is very helpful and important.
NIVUS recommends the portable meter Type >PVM/PD< or >PCM Pro< as calibration measurement or the NIVUS initial start-up service.

5.4 General Product information

It is a stationary device for detecting, reporting and data transfer of flow measurement data. There are 4 multifunctional inputs (analog/digital) available. The first multifunctional input may be assigned per default depending on the level source selected. An additionally connection allows to connect an external temperature sensor.

There are several modes for the level measurement available:

- only KDS:
  The level is measured with the built-in pressure sensor in the KDS-KP. The mounting height of the pressure measurement is added.
- h = KDS + mounting height
- only AI1:
  The first universal input serves as input for the level measurement. It is possible to either connect an ultrasonic sensor or a pressure sensor.

Pressure sensor: h = dmA + so

or

Ultrasonic sensor: h = so - dmA

- KDS and AE1 combined:
  It is possible to define 2 or 3 height ranges. The level source (KDS or AI1) can be specified for each of these level ranges. Depending on the transition thresholds entered in the level configuration input mask the NivuLog SunFlow uses the sensor defined for the according level range. The level reading detected during the latest measurement is always used to determine the transition thresholds.

Depending on an adjustable level threshold the calculation method for flow measurement data will vary:

- Above the level threshold:
  The velocity measurement value required for calculation is taken from the data string generated by the KDS sensor. The physical connection between the NivuLog SunFlow and the KDS sensor is made using the RS485 interface. The source of the level reading depends on the method selected for level calculation.

Q = v • (h • A Profile)

- Below the level threshold:
  Below the level threshold then again there are multiple modes available for the calculation of flow measurement data:
- KDS:
  The velocity measurement value required for calculation is taken from the data string generated by the KDS sensor. The physical connection between the NivuLog SunFlow and the KDS sensor is made using the RS485 interface. The source of the level reading depends on the method selected for level calculation.

Q = v • (h • AProfile)

- Q/h:
  The measured data are calculated from the level measurement and a Q/h table entered

Q = h => Table Q/h

- Manning-Strickler
  The readings are calculated using the level measurement value, the hydraulic roughness entered in the configuration input window of the volume calculation as well as the slope specified in the configuration input window of the volume calculation according to Manning-Strickler.

Q = f (h, R, S, AProfile)

There are two operation modes for the KDS sensor:

- Interval mode:
  On each measuring time, the measurement data of the KDS sensor be required.
- Release mode:
  Readings are requested from the KDS sensor only if the trigger "I1" of an universal input is activated and the trigger condition is met.

The output channel directly switches the sensor power supply supplied for the analog sensors. It can be configured in a way to be activated by the unit itself prior to the start of the respective measurement (for analog sensor power supply) or for wireless switchover from a central point. The readings are buffered in an internal data memory from where they can be transmitted wireless to a central point in free selectable intervals. The same connection is used to configure the NivuLog SunFlow. The unit is equipped with a built-in SIM chip.

5.5 Device versions

The specifications contained in this manual are valid exclusively for units type NivuLog SunFlow.
The current type of device is indicated by the article number, which can be found on a weatherproof label on the right side of the enclosure.

NLM0 SUNF LOW	**NivuLog SunFlow - solar-powered measurement station with integrated data logger, GPRS data transmission, solar control and buffer batteries**[1]

Fig. 5-3 Type key for NivuLog SunFlow

KDS-	Compact Doppler active sensor					
	Construction					
	K010	Wedge sensor for fastening on channel bottom or by using the RMS 2* pipe mounting system.				
	KP10	Combi wedge sensor with integrated pressure measurement cell, suitable for simultaneous flow velocity and level measurement. For installation on channel bottom or for fastening using the RMS 2* pipe mounting system.				
	R007	Pipe sensor for installation with G 1½" screw thread				
		ATEX Approvals				
		0 none				
			Cable Length (with sensor type KP max. 30 m)			
			10 10 m			
			15 15 m			
			20 20 m			
			30 30 m			
			50 50 m			
				Sensor Connection		
				K Cable end, pre-configured, for Types K0 and R0		
				L Cable end, pre-configured, for Type KP		
					Pipe Length	
					0 for wedge sensors	
					2 20 cm (standard)	
					3 30 cm (Minimum length for stop valve)	
					X Special pipe length in dm, price per dm	
					G 20 cm + extension thread	
KDS-		**0**				

Fig. 5-4 Type keys for KDS sensors

6 Storing, Delivery and Transport

6.1 Receipt

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

Mistakes cannot be rectified later!

6.1.1 Delivery

The standard delivery of the NivuLog SunFlow measurement system contains:

- The instruction manual with the certificate of conformity. Here, all necessary steps to correctly install and to operate the measurement system are listed.
- A measurement system, type NivuLog SunFlow

Additional accessories such as KDS Sensor depending on order. Please check by using the delivery note.

6.2 Storing

The following storing conditions shall be strictly observed:

Transmitter	max. temperature:	+60° C
	min. temperature:	-40° C
	max. humidity:	90 %, non-condensing
Lithium-Ion battery	max. temperature:	+21 °C
	max. humidity:	60 %, non-condensing

When storing please make sure that the rechargeable Lithium-Ion battery cannot be damaged. Prior to restarting please verify whether the rechargeable Lithium-Ion battery is undamaged.

Damaged batteries must not be reused!!

Keep the NivuLog SunFlow away from corrosive or organic solvent vapours, radioactive radiation and strong electromagnetic radiation during storage.

6.3 Transport

WARNING

Transport restrictions

The integrated Lithium-Ion battery is subject to the transport restrictions of international rules ((UN 3481, hazard class 9) and must be marked with an according hazard class 9 label.

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

6.4 Return

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

Lithium-Ion-Batteries

In Germany the "Directive on the collection and disposal of spent batteries and accumulators (Battery Directive)" applies.

7 Installation

7.1 General

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

Before applying the rated voltage, the NivuLog SunFlow shall be installed completely and the correct installation shall be verified. The installation should be carried out by trained expert personnel only. Additional statutory standards, regulations and technical rulings shall be observed.
All external circuits, cables and wires connected to the unit need to have a minimum insulation resistance of 250 kOhm. The cable size of supply lines or power loop lines shall meet the technical requirements of the NivuLog SunFlow. For information on the unit protection degree please refer to chapter 3.2.1

7.2 Dimensions NivuLog SunFlow

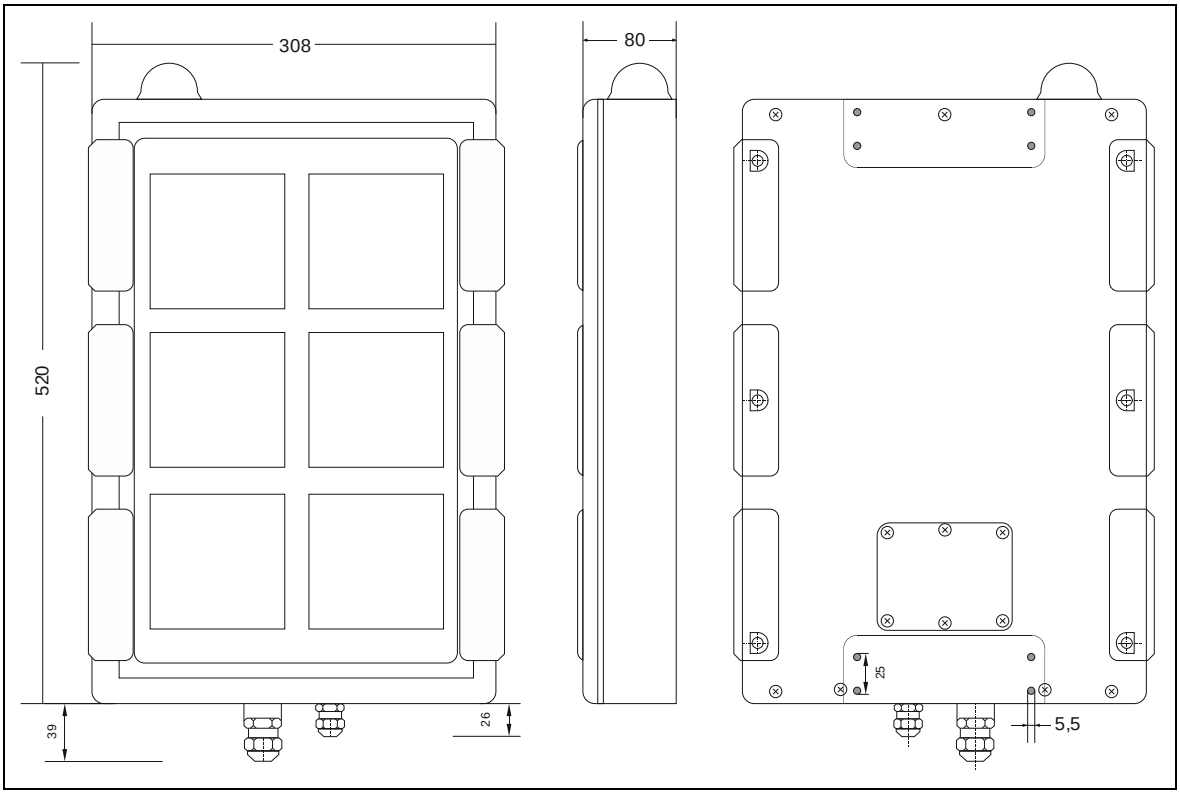


Fig. 7-1 NivuLog SunFlow dimensions

7.3 Installation NivuLog Sun Flow

DANGER

Risk due to radio waves

In following environments the measurement system Level Data Collector may not be operated – See also Special Danger Notes on page ***Fehler! Textmarke nicht definiert.****:*

- *in hospitals and or near medical devices, such as cardiac pacemakers or hearing aids*
- *near highly inflammable areas, e.g. filling stations*
- *in fuel depots, chemical plants and blasting sites*
- *near flammable gases, vapors or dust*

Important Note:

- *Ensure correct installation!*
- *Follow consisting, legal guidelines or company guidelines!*
- *Inappropriate handling may lead to injuries and/or damage the units!*

7.3.1 General

Please provide approx. 15 cm of space below the unit for cable connections. For more information regarding installation dimensions please refer to the respective subchapters.
The system mounting place has to be selected according to certain criteria. Please strictly avoid:

- shaded areas such as trees or similar
- heat emitting objects
- objects with strong electromagnetic fields (e.g. frequency converters, operational protection devices, electric motors with high power consumption or similar.)
- corrosive chemicals or gas
- mechanical shocks
- vibrations
- radioactive radiation

Please observe that during installation works electronic components might be damaged due to electrostatic shocks. To avoid impermissibly high electrostatic charge always make sure to take appropriate grounding measures during installation.

7.3.2 Safety Guidelines for wiring

During the wiring procedures for the NivuLog SunFlow, the following warnings and hints as well as the individual warnings and hints contained in the installation chapters shall be observed.

7.3.3 Hints for the avoidance of Electrostatic Discharges (ESD)

Important Notes:

For maintenance, since the NivuLog SunFlow does not require any power source, please disconnect the unit from mains before

The built-in sensitive electronic components of the unit may be damaged due to static electricity which may lead to malfunction on even device failure. The manufacturer recommends the following steps to avoid device damages due to electrostatic discharges:

- Make sure to discharge any static electricity from your body before touching the electronic modules of the unit (such as circuit boards as well as their components). To do so touch a grounded metallic surface, such as the enclosure frame or a metal pipe.
- Avoid unnecessary movements to reduce the risk of static charge.
- Use antistatic containers or packaging to transport static-sensitive components.
- Wear an antistatic wrist strap grounded via cable to discharge and to keep away any static electricity from your body.
- Touch static-sensitive components only within antistatic workspaces and always use antistatic floor covering and work mats.

7.4 Electrical Installation

Important Notes:

All installation work, which is described in the following section, must be carried out by NIVUS staff only due to reasons of safety and guarantee.

7.4.1 Connection of Sensors, Actors and power supply

Important Note:

To ensure enclosure tightness do not insert more than one cable per cable gland.

- Make sure that the assembly is correct!
- You must observe the general guidelines and company! instructions
- Equipment damage and personal injury may cause by improper handling
- Lay all data and power cables in a way that as to not cause any risk of tripping and without sharp bends.
- Never operate the NivuLog SunFlow on site with the terminal housing cover open.
- To guarantee the tightness of the housing never put more than one cable through each of the 2 cable glands!

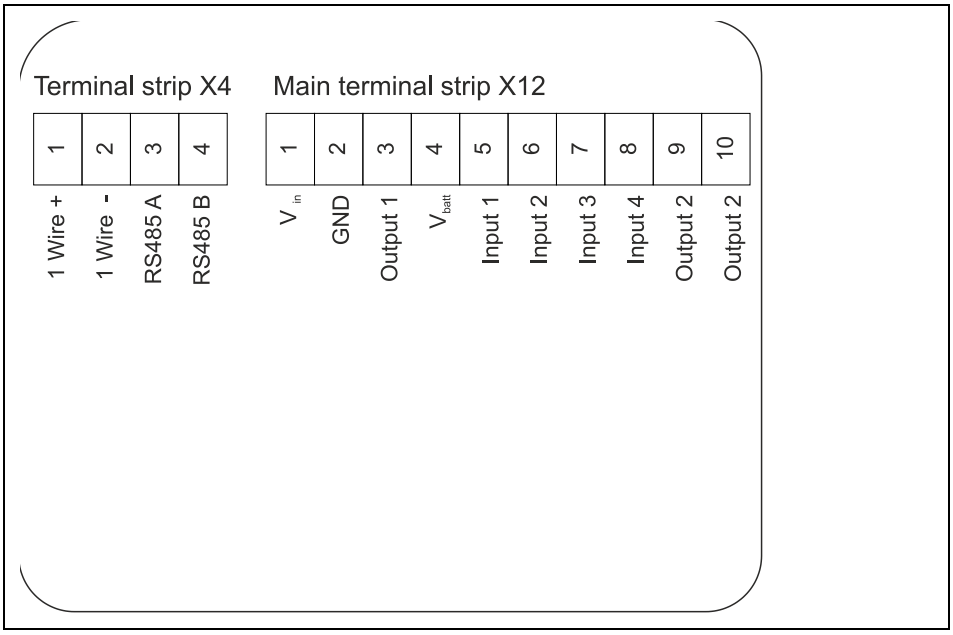


Fig. 7-2 Connection of sensors and power supply

Remove the six screws from the terminal space to open the NivuLog SunFlow.

When terminal compartment is open, please prevent water entering the enclosure at places where working in wet environment or in direct contact with water (rainfall).

Connecting the optional external temperature sensor

- Lead the sensor cable through the cable gland from the outside
- Connect wires for the external temperature sensor as per the wiring diagram to clamp X4
- To fix the sensor cable, tighten the cable gland.

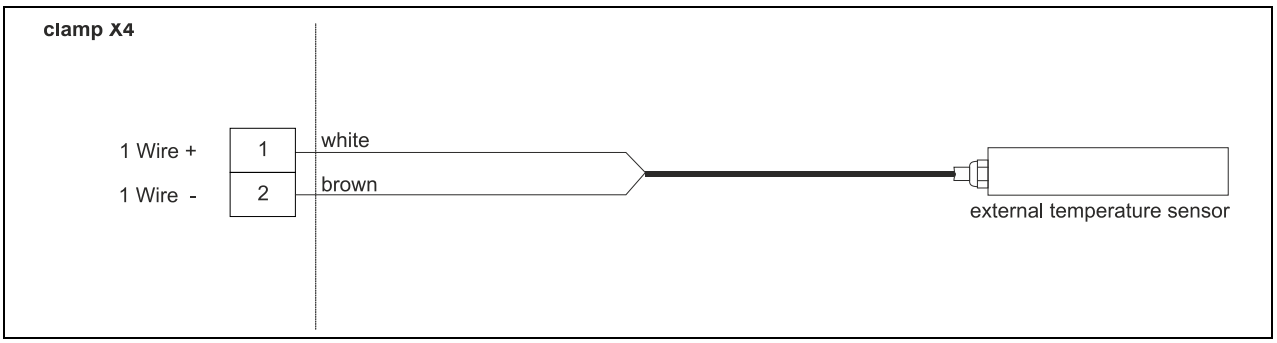


Fig. 7-3 Connection external temperature sensor to NivuLog SunFlow

Now connect your sensors and actors with the in- and outputs. If the solar panel shall support during the loading, please connect the external charging to Vin and GND. Ensure voltage-free state before connecting external charging!!

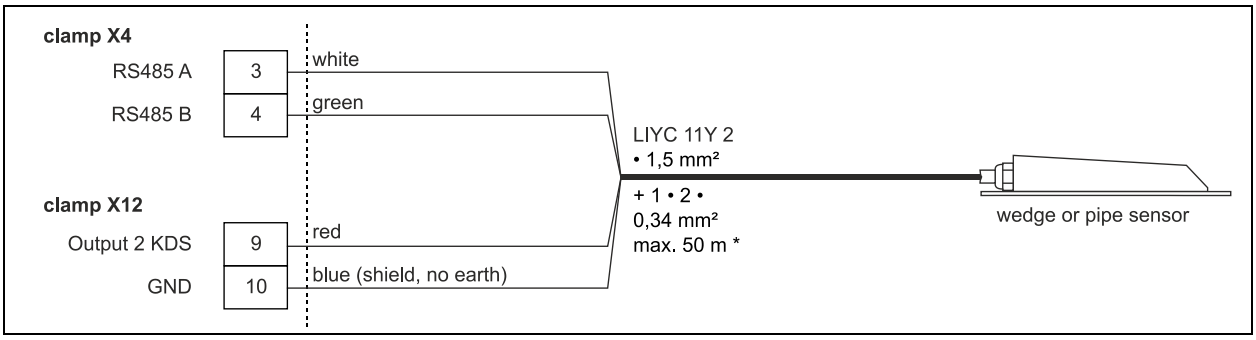


Fig. 7-4 Connection KDS sensor to NivuLog SunFlow

To fix the sensor cable, tighten the cable gland. Unused lead-ins have to be locked tightly with an appropriate dummy plug before the initial start-up.

Important Note:

Unused lead-ins of the NivuLog SunFlow have to be locked water tightly with an appropriate dummy plug.

Otherwise the protection grade of the entire unit is no longer guaranteed.

The next step is not absolutely necessary:

- Ensure that your access to the Device to Web is working.
- Close the enclosure cover. The best way to do this is to tighten the 6 screws crosswise to make sure that the terminal housing cover is seated evenly.

Important Note:

Before locking the terminal compartment lid, please make sure that the sealing is not damaged and clean. Debris and/or dirt shall be removed. Damages resulting from leakage or defect sealing are not covered by the manufacturer's liability.

Start the external power supply now. This step is only necessary when using external power supply to support the solar panel during the battery loading.

7.4.2 Technical Details of Universal Inputs

0/4...20 mA mode

Note: above 22.5 mA, the concerned input becomes high resistance (safety shutdown, to protect the universal input against damage).

Resolution	6µA
I_{max}	22.5 mA
Load	100 Ω

0...2 V mode

Resolution	610µV
U_{max}	2.5 mA
Load	220k1

0...10 V mode

Resolution	8.3mV
U_{max}	32V
Load	8k9

Standard Digital modes (PWM, Frequency, Digital, Day counter, pulse counter)

General	U_{max}	32 V
	Low	<1.36 V
	High	>2,73 V
	Load	8 k9
PWM	Measurement range	1...99 %
	f_{max}	100 Hz
	Pulse length min.	1 ms
Frequency	Measurement range	1...1000 Hz
Day counter and pulse counter	Pulse length min.	20 ms

Low Power Digital mode (Digital LP)

If a universal input is set to "Digital LP" mode, a switching contact shall be supplied via V_{batt} only. Applying external voltage will damage the universal input. However the "Digital LP" mode with the switching contact closed in turn will reduce the energy consumption approx. by the factor 13 compared with the "Digital" mode.

U_{max}	V_{batt}
Low	<100 mV
High	>200 mV
Load	220 k1

7.4.3 Technical Details of the Outputs

Output 1: switchable sensor supply (V out)

Note:
The switchable sensor supply is short circuit proof.

P_{max}	1 W
I_{batt}	66 mA at 15 V 41 mA at 24 V

7.4.4 Technical Details of the Interface

The sensor interface consists of a combination of RS485 (for the communication) and a voltage output for KDS sensor supply.

RS485-Interface

There is no termination resistor located between RS485 A and B line.

Sensor supply

The sensor supply of the system is only capitalized if the KDS sensor measurement values will be required.
The on-time of the sensor supply can be influenced using the configuration parameters "KDS Damping Time" and "KDS Measurement Time" found in the input mask to configure the output channels.

U_{out}	12,2 V
I_{max}	250mA at V_{batt} 3.3V
P_{max}	3W at V_{batt} 3.3V

The maximum possible output current I_{max} or the maximum possible output power P_{max} depends on state of charge (Backup-batteries).

Direct battery voltage output (V_{batt})

Protected by a PTC (I_{max} 200 mA) the battery voltage is directly available at the voltage output V_{batt} and therefore directly depends on the charging condition of the battery pack.

7.4.5 Technical Details of the Energy management

The NivuLog SunFlow is equipped with two charge regulators: one to monitor charging via solar panel and one to monitor charging by external charging voltage (V_{in}). These regulators operate completely independent from each other. If the NivuLog SunFlow is operated without external charging voltage (V_{in}) to support the solar panel, the unit insufficient solar irradiation operates until 3.1 V are reached. After that the unit falls to energy saving mode where only the charge regulators remain to be active. As soon as there is sufficient solar irradiation available again, the solar panel instantly begins to recharge the backup battery.

As soon as an external charging voltage (V_{in}) is applied during energy saving mode the backup battery can be recharged this way as well. If the backup battery neither is recharged via the solar panel nor by applying external voltage, the NivuLog SunFlow will remain to be in energy saving mode until the backup battery is deeply discharged.

The charge regulator of the solar panel will attempt to maintain the backup battery voltage constantly on a level of 3.9 V. This value has been chosen since permanent charging has no adverse effects on the battery lifetime within this range.
If external charging voltage (V_{in}) is used to support the solar panel the charge regulator of the external charging voltage will additionally deal with charging the battery pack.
This requires to select the battery type "AP413D+" in the unit configuration input window. With this setting the backup battery will be charged up to maximum voltage. Then the charging process will be shut down and will not be reactivated until V_{low} (3.7 V) is reached. This measure is to optimise the lifetime of the backup battery. The backup battery will be charged permanently as soon as battery type "AP413D+ Solar" is selected (recommended if an additional external solar panel is used to charge the backup battery).

To both settings however applies that the charging process will be carried out only as long as the ambient temperature does not exceed the permissible charging temperature range (-40 °C...+60 C).

8 Initial start-up

8.1 Notes to the user

For proper start-up of the entire system it might be necessary to additionally refer to the accessories manuals below:

>Technical instructions for Doppler sensors<

>Installation instruction for Correlation and Doppler sensors<

>User Manual for Device to Web Data Logging system D2W<

These manuals are part of the accessories standard delivery.

Before you operate the NivuLog SunFlow you should strictly follow the notes below!
This instruction manual contains all necessary information to operate the device, addressing qualified technical personnel with appropriate knowledge about measurement technology.
To ensure the correct function of the NivuLog SunFlow this instruction manual must be read thoroughly!
It is vital to read and comply with the safety instructions!
If any problems regarding installation, connection or configuration should occur please contact our technical division or our service centre.

NIVUS GmbH

Service hotline,	Phone +49 (0)7262 9191-955
Head office,	Tel. +49 (0)7262 9191-0
or by e-Mail to:	Hotline-worldwide@nivus.com

To install the entire system it may be possible to additionally refer to the instruction manuals of the according accessories. These manuals are part of the accessories standard delivery.

General Principles

The initial start-up of the complete measuring system is not allowed until the installation has been finished and checked. To exclude faulty configuration this instruction manual must be read before the initial start-up. Please get familiar with the NivuLog SunFlow operation and input masks of the D2W server by reading the instruction manual before you begin to configure the device.

8.2 Start-up of the system

We recommend the first initial start-up in the office before permanently mounting the device at the place of use. You should right now create a measurement site for the later operation on the Device to Web server and determine a site configuration simultaneously (see Manual D2W).
Use the opportunity to become familiarised with the device functions.
You may even use appropriate test signals to simulate the sensors in order determine the best possible configuration of the NivuLog SunFlow prior to the actual start-up procedure.
This will reduce the time needed for on-site installation.

The NivuLog SunFlow is shipped with the transport lock activated (measurement and transmission "off") and should be stored in this condition always. The transport lock is deactivated as soon as the ALOHA transmission mode is triggered. In this mode the first connection to the D2W server is established. The NivuLog SunFlow now is ready for operation as soon as all steps described in chapter 7.4.1 "Connection of Sensors, Actors and power supply" have been carried out correctly.

The following step is required only if external charging power (V_{in}) is used to support the solar panel:

- Check the battery type setting. Type "AP413D+ Solar" shall be selected only if an additional external solar panel is used as external charging power source (V_{in}). For any other case we recommend to set "AP413D+".
- Trigger the ALOHA transmission mode to transmit the configuration of the measurement place to the NivuLog SunFlow (see next chapter).

8.3 Communication

Prior to connecting it is necessary to create a measurement place for the NivuLog SunFlow in the NIVUS Device to Web (D2W) Internet portal!

8.3.1 General

After switching on the NivuLog SunFlow will automatically connect with the NIVUS Device to Web Internet portal! The prerequisite for this is that a measurement site for the NivuLog SunFlow has been created in the NIVUS Device to Web (D2W) Internet portal previously! For detailed information on the according procedure please refer to the D2W instruction manual. The NivuLog SunFlow must be assigned to the measurement site by specifying the device name and serial no. The serial no. can be found on the NivuLog SunFlow's nameplate.

8.3.2 Communication with Internet portal Device to Web (D2W)

Internet connection via connection portal D2W to Level data Collector

There is no need to install any additional software. All you need is the latest version of your preferred Internet browser and a network-compatible PC/laptop.

8.3.3 Communication Setup and Connection via Access Portal (D2W)

Setting up a modem connection (analog, ISDN, GPRS or similar) will cause access expenses. These expenses may vary in terms of different providers, time online, flat rate or similar agreements and are not influenced by NIVUS.

Please observe while transmitting data.

After the initial setup has been finished successfully following units, which are equipped with the same transmission system, can be set up by the customer or the customer's system administrator.

Starting the Internet connection requires a >Start Portal<. This Portal is available on the NIVUS homepage.
To start communication, enter the following address in your Internet Explorers:

www.nivus.de or www.nivus.com

The start screen of the NIVUS homepage will appear.
On the right-hand side of the start screen you can find the login area >NIVUS – Device to Web< with the fields "User Name" and "Password".

NIVUS will provide you with this information upon request on initial setup.
We strongly recommend to change the password during the first login or session.

Do not forward user names and passwords to unauthorised persons!
Keep user names and passwords separated from each other and in a way which avoids misuse.

Data are transmitted using SSL encryption to ensure access data security.
Entering user name and password unlocks access to the NivuLog SunFlow.

Fig. 8-1 Start of communication

After selecting the desired measurement place and clicking the >Log in< button communication with the selected NivuLog SunFlow will be established.
This may take between 15 and 120 seconds depending on modem type and quality of connection.

8.3.4 Data-transfer mode „Aloha“

For this section please additionally refer to the >User Manual for Device to Web Data Logging system D2W<.

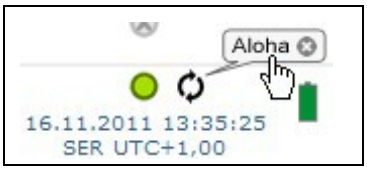
8.4 Testing the communication with the NivuLog SunFlow

For this section please additionally refer to the >User Manual for Device to Web Data Logging system D2W<.

Important note:

All wiring work must be executed in the de-energised state

1. Create a site for the operation on the Device to Web server.
2. Configure the created site according to your requirements (see "Configuration of measurement points").
3. Connect the NivuLog SunFlow to the created measurement site.
4. Cause the ALOHA transmission mode, that the site configuration is transmitted to the NivuLog SunFlow.
5. The instrument list indicates whether the device is in ALOHA mode by using a speech bubble saying "Aloha".



The following steps are only required, if the data acquisition and data transfer simultaneously is to be tested.

- Stop the ALOHA transmission mode, clicking the "Aloha" speech bubble mark or wait until the ALOHA mode has terminated. The duration can be determined in the basic settings of the measurement place configuration. The default setting is 10 min.
- Then connect the sensor(s) (see chapter 7.4.1) and restart the ALOHA mode again.

Check the received data in the Device to Web data window of the server by clicking "ALOHA" speech bubble. It contains the internal measurement values. Check the received data in the ALOHA data window of the D2W server. Special attention should be given to the internal values "GSM strength" and "Battery".

Additional explanation to assess "GSM signal strength"

"GSM signal strength "	
> -64dBm	
-64...-73dBm	
-74...-83dBm	
-84...-93dBm	
-94...-107dBm	
<= -108dBm	

Additional explanation to assess "Battery":

" Battery"	
> 3.81V	
3.81V...3.70V	
3.71V...3.63V	
3.64V...3.59V	
3.6V...3.19V	
<= 3.2V or invalid value	

9 User Interfaces

The NivuLog SunFlow is configured via the web interface on the D2W server. You will get the web address from your local distributor.

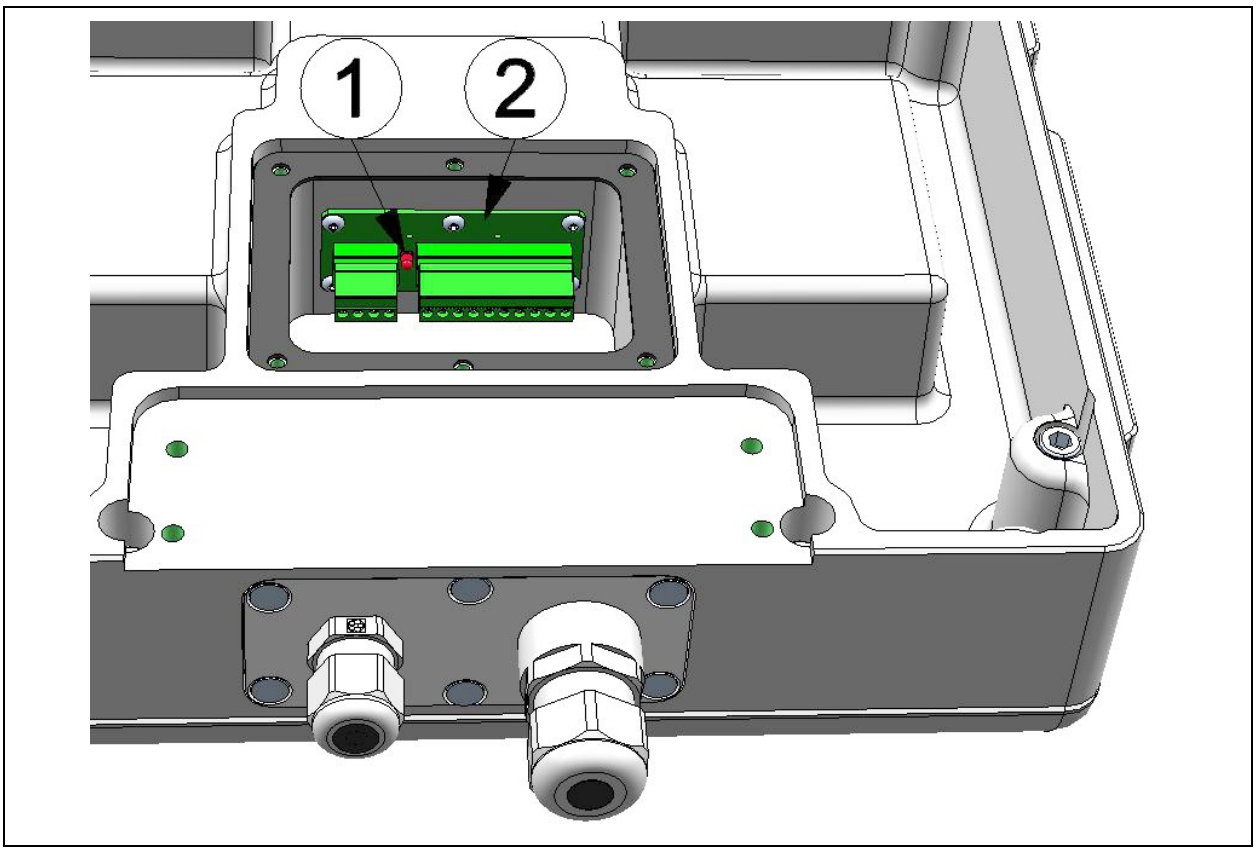
9.1 User Interface at the NivuLog SunFlow

9.1.1 Operating Elements

The operating elements of the NivuLog SunFlow are only accessible when the terminal cover is open.

Important Note:

In case of adverse weather conditions with precipitation or in places where water may leak into the unit from above the device shall be protected against moisture penetration sufficiently as long as the terminal clamp cover is open.



1 State LED

2 Magnetic switch

Fig. 9-1 Operating elements only accessible when terminal cover is open

9.1.2 Status LED

The status LED serves as an indicator for error/status codes as well as to indicate the current operation condition. If the ALOHA transmission mode has been activated or the battery pack has been connected (PowerOn) the status LED will show the current operation condition for the next 10 minutes. Within these 10 minutes the error/status codes will be indicated every 3 seconds.

Errors /Status Codes

Blink code	Description	Solution / Cause
0x	Transport lock (GPRS off, measurement off)	If the ALOHA transmission mode is triggered using pushbutton or magnetic switch the NivuLog SunFlow goes to "RUN" (GPRS on, measurement on) mode again.
1x	Last connection OK	
2x	Last transmission was faulty	try again later
4x	Standby (GPRS on, measurement off)	see " Transport lock "
6x	Offline (GPRS off, measurement on)	see " Transport lock "
7x	Network lock/no proper provider	- Verify antenna position - Check if the unit is within the service range of a service provider the built-in SIM chip is supporting (www.microtronics.at/footprint) - Unlock network lock
8x	no GSM network	- try again later - Verify antenna position
10x	no GPRS connection	Verify antenna position
11x	no D2W server available	check, if Port 51241 of the D2W-Server is activated
12x	faulty SIM-Chip	Contact NIVUS support

Operation conditions

State LED	Description
Flickers	connection establishment
Lights	GPRS connection is established or pressed button or magnetic switch
OFF	Standard measurement operation according to the configuration, until the next successful transmission

Magnetic switch

The magnetic switch can be used to trigger the ALOHA transmission mode or to cause the NivuLog SunFlow to immediately output error/status codes. Operate the switch by using the delivered MDN magnet.

User action	Device reaction	Operation after release button
Press shortly ca. 1 sec.	State LED turns on	Output of error /state code (see "state LED")
press and hold t for more than five seconds	State LED flashes 3 times and stays on	ALOHA transmission mode

9.2 User Interface at D2W-Server

9.2.1 Measurement site configuration

Depending on the according user level some of the configuration options mentioned in the following subchapters may be not available. In such cases please contact the administrator of the D2W server.

You can find the input window for the configuration of measurement places by clicking on the measurement place name found in the list of measurement places.

Measurement site

Customer	Specifies which customer is assigned to the measuring site.
 Symbol	Assign measuring site to another customers
Name	Name of measurement site (not relevant for device or data assignment)
Device S/N	Device serial number, which is linked to the measurement site (Device assignment!)

Comment

Comment	Empty comment field (indicated also below the device type in the list of measurement places)

Level

Level source	Select the level calculation mode. Depending on what is selected here the other input fields of this configuration section may vary.

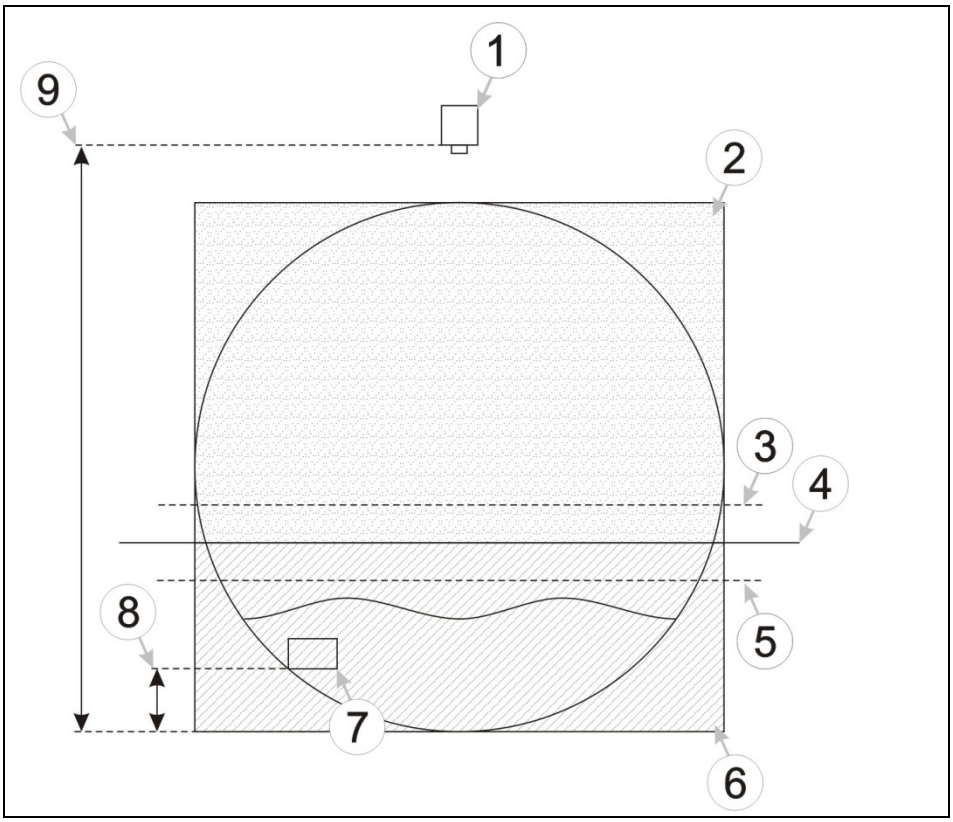
only KDS	Sensor offset KDS	Indicates the installation level of the KDS sensor Level = measurement value + sensor offset	
only AI1	Analog Sensor	Pressure sensor	To the first universal input a sensor measuring the liquid level shall be connected.
		Distance sensor	To the first universal input a sensor measuring the distance to the liquid surface shall be connected.
	Sensor Offset AI1	Indicates the installation level of the analog sensor – Pressure sensor: Level = measurement value + sensor Offset – Distance sensor: Level = sensor offset – measurement value	
KDS and AI1 combined (1/3)	Analog Sensor	Pressure sensor	To the first universal input a sensor measuring the liquid level shall be connected.
		Distance sensor	To the first universal input a sensor measuring the distance to the liquid surface shall be connected.
	Sensor Offset KDS	Indicates the installation level of the KDS sensor Level = measurement value + sensor offset	
	Sensor Offset AI1	Indicates the installation level of the analog sensor – Pressure sensor: Level = measurement value + sensor offset – Distance sensor: Level = sensor offset – measurement value	

KDS and AI1 combined (2/3)	Level ranges (1/2)	It is possible to define 2 or 3 level ranges. For each of these level ranges the level source (KDS or AE1) can be set.			
		2	Sensor for upper section	KDS	Level is taken from the data string of the KDS sensor
				AI1	The first universal input is the level source.
			Switchover threshold 1)	Threshold for switchover between upper and lower level range. – With switchover threshold +10 % upper level range – With switchover threshold -10 % lower level range	
			Sensor for lower section	KDS	Level is taken from the data string of the KDS sensor
				AI1	The first universal input is the level source.
KDS and AI1 combined (3/3)	Level ranges (2/2)	3	Sensor for upper section	KDS	Level is taken from the data string of the KDS sensor
				AI1	The first universal input is the level source.
			Switchover threshold H2 1)	Threshold for switchover between upper and lower level range. – With switchover threshold +10 % upper level range – With switchover threshold -10 % lower level range	
			Sensor for middle section	KDS	Level is taken from the data string of the KDS sensor
				AI1	The first universal input is the level source.
			Switchover threshold H1 [1]	Threshold for switchover between upper and lower level range. – With switchover threshold +10 % upper level range – With switchover threshold -10 % lower level range	
			Sensor for lower section	KDS	Level is taken from the data string of the KDS sensor
				AI1	The first universal input is the level source.

Note:

Supplemental explanation for level investigation with the use of 2 level ranges:

[1]The switchover between level ranges does not occur exactly at the switchover threshold since without using the +/-10 % hysteresis the ranges might change permanently.



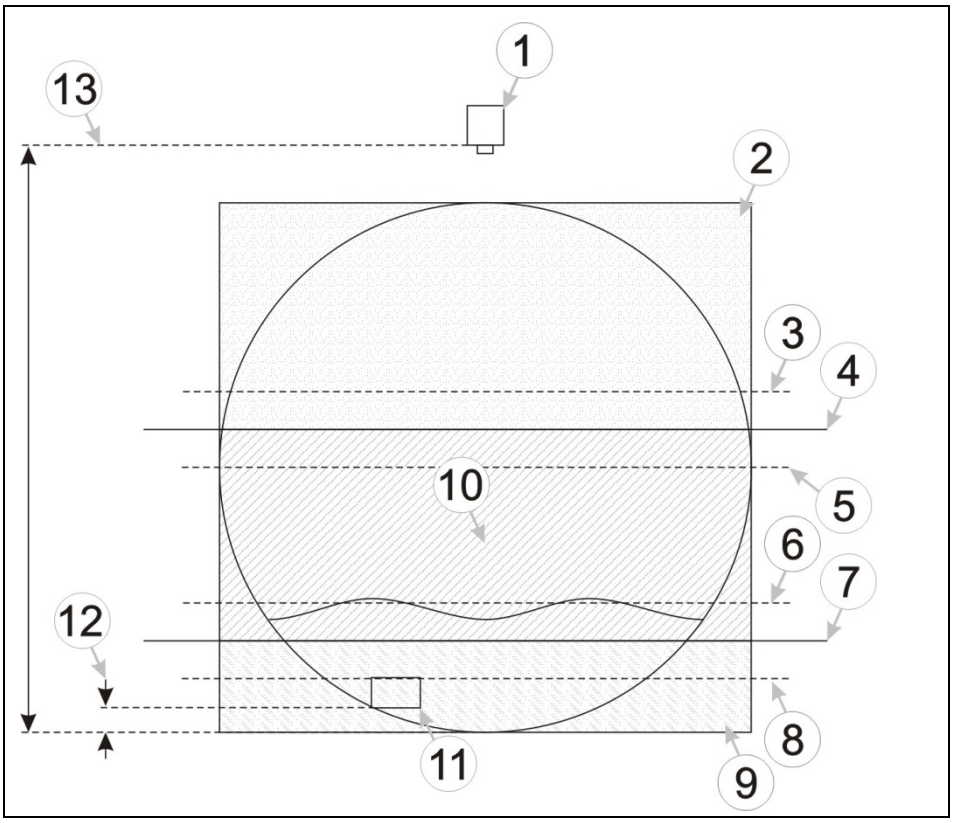
1 Distance sensor
2 upper section
3 transition threshold + 10 %
4 transition threshold
5 transition threshold– 10 %
6 lower section KDS sensor
7 KDS sensor
8 Installation level KDS sensor
9 Installation level distance sensor

Fig. 9-2 Level determination with two height sections

The distance sensor is used for the lower level range since the KDS sensor can no longer provide readings once the level falls below the sensor installation height. If the level rises the KDS sensor can provide data. As the level finally exceeds the +10 % switchover threshold, the KDS sensor is used. The "Level" value is now taken from the data string of the KDS sensor. If the level falls below the -10 % switchover threshold the distance sensor will be used again. The switchover between level ranges does not occur exactly at the switchover threshold since without using the +/-10 % hysteresis the ranges might change permanently.

Note:

Supplemental explanation for level investigation with the use of 3 level ranges:



1 Distance sensor
2 upper level range
3 Switchover threshold H2 +10 %
4 Switchover threshold H2
5 Switchover threshold H2 -10 %
6 Switchover threshold H1 +10 %
7 Switchover threshold H1
8 Switchover threshold H1 -10 %
9 lower level range
10 middle level range
11 KDS sensor
12 Installation level KDS sensor
13 Installation level distance sensor

Fig. 9-3 Level determination with three level sections

The distance sensor is used for the lower level range since the KDS sensor can no longer provide readings once the level falls below the sensor installation height. If the level rises the KDS sensor can provide data. As the level finally exceeds the H1 +10 % switchover threshold, the KDS sensor is used (middle level range). The "Level" value is now taken from the data string of the KDS sensor. If the level continues to rise and exceeds the H2 +10 % switchover threshold, the distance sensor will be used (upper level range).

If the level should fall below the H2 -10 % switchover threshold, the KDS sensor will be used again. If the level falls even below the H1 -10 % switchover threshold, the distance sensor will be used again. The switchover between level ranges does not occur exactly at the H1 or H2 switchover threshold since without using the +/-10 % hysteresis the ranges might change permanently.

Quantity calculation

Switchover threshold calculation method [2]
Threshold for the switchover of the flow rate calculation method:

- With switchover threshold +10 %
  The velocity measurement value from the KDS sensor is used to calculate the flow rate. The source for the level reading depends on the method selected for level calculation.

Q = v x (h x A profile)

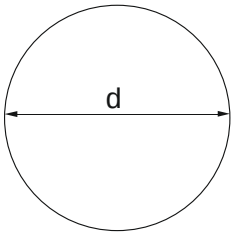
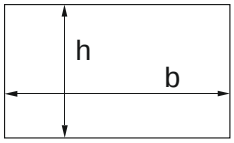
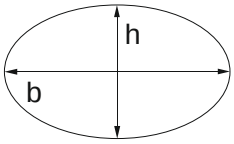
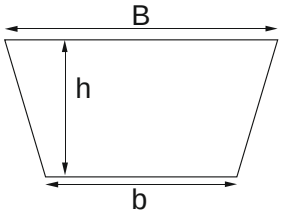
- With switchover threshold -10 %
  The flow rate calculation is carried out according to the "Calculation method lower range" configuration parameters.

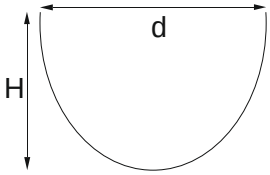
[2] The switchover between level ranges does not occur exactly at the switchover threshold since without using the +/-10 % hysteresis the ranges might change permanently.

Calculation method lower range

KDS	The velocity measurement value from the KDS sensor is used to calculate the flow rate. The source for the level reading depends on the method selected for level calculation. $Q = V_{KDS} \bullet (h \bullet A_{Profile})$	
	Daily time of change	Time of day to reset the "Flow volume"
Q/h	The flow rate is calculated from the level reading, the source of which depends on the level calculation method selected as well as from the Q/h table entered. Q = h => Q/h table The values between the lines of the Q/h table are calculated by linear interpolation. If the level reading is higher than the latest level value in the table, always the latest flow rate value from the table will be used as flow rate.	
	Daily time of change	Time of day to reset the "Flow volume"
	Button "import CSV/TSV"	Opens a dialog to select a CSV or TSV file containing the Q/h table. The first column here always must contain the level, the second column the flow rate corresponding to the level value. The content of the file is copied into the "Level [mm]" and "Flow [l/s]" input fields.
	Level [mm]	Level column
	Flow [l/s]	Flow rate column, corresponds to the level value
Manning- Strickler	The flow rate is calculated from the level reading, the source of which depends on the level calculation method selected (see "Level" on page 51), the hydraulic roughness as well as the slope entered according to Manning-Strickler. $Q = f (h, R, S, A_{Profile})$	
	Daily time of change	Time of day to reset the "Flow volume"
	Hydraulic roughness	Hydraulic roughness in mm
	Slope	Slope in per mill

Profiles

Profile 1/2	Table	The values between the lines of the table are calculated by linear interpolation. If the level reading is higher than the latest level value in the table, always the latest channel width value from the table will be used as channel width.	
		Button "import CSV/TSV"	Opens a dialog to select a CSV or TSV file containing the Q/h table. The first column here always must contain the level, the second column the channel width corresponding to the level value. The content of the file is copied into the "Level [mm]" and "Width [m]" input fields.
		Level [mm]	Level column
		Width [m]	Channel width column, corresponds to the level value
	Circle 	d	Channel diameter
	Rectangle 	b	width of the channel
		h	height of the channel
	Ellipse 	b	width of the channel
		h	height of the channel
	Trapeze 	b	width of the channel at the bottom
		B	width of the channel at the head
		h	height of the channel

Profile 2/2	Egg profile	The table contains the channel width corresponding to the according level. The values between the lines of the table are calculated by linear interpolation. If the level reading is higher than the latest level value in the table, always the latest channel width value from the table will be used as channel width. [3]	
		Button "import CSV/TSV"	Opens a dialog to select a CSV or TSV file containing the profile table. The first column here always must contain the level, the second column the channel width corresponding to the level value. The content of the file is copied into the "Level [mm]" and "Width [m]" input fields.
		Level [mm]	Level column
		Width [m]	Channel width column, corresponds to the level value
	U-Profile 	d	width of the channel at the head
		H	height of the channel

Velocity calibration table

This table is to enter a velocity-dependent correction factor. The correction factor directly influences the velocity read by the KDS-Sensor (see "Flow charts" on page 23). The values between the lines of the table are calculated by linear interpolation. If the velocity reading is below the first entry in the table, the correction factor will be set to 1. If the velocity reading is higher than the latest level value in the table, always the latest correction factor value from the table will be used as correction factor.

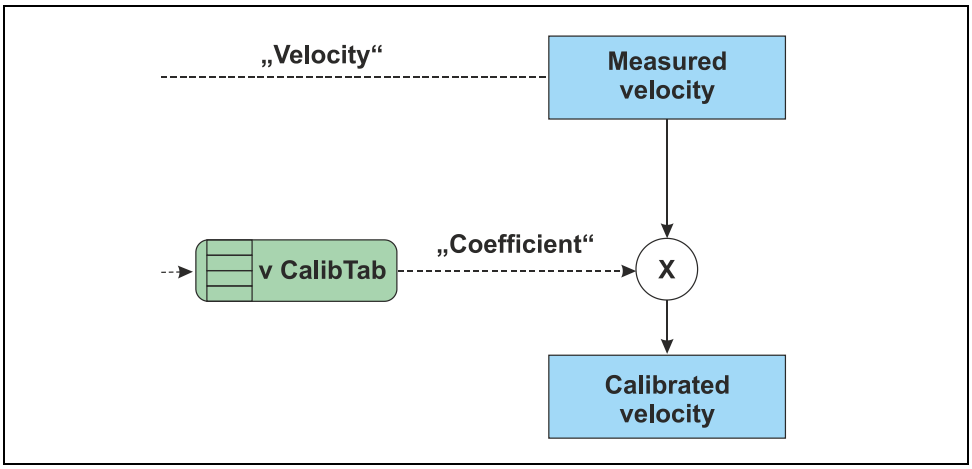


Fig. 9-4 Supplementary explanation to the velocity calibration table

[3] The same input fields are used to enter values for profile types "Table" and "Egg Profile". This means that the values of the input fields "Level [mm]" and "Width [m]" will be held as soon as you change between "Table" and "Egg Profile".

Button "Import CSV/TSV"

Opens a dialog to select a CSV or TSV file containing the velocity calibration table. The first column here always must contain the velocity readings, the second column the correction factor corresponding to the velocity readings. The content of the file is copied into the "Velocity [m/s]" and "Coefficient" input fields.

Velocity [m/s]

Velocity readings column

Coefficient

Correction factor column to be used for velocity readings

Level calibration table

This table is to enter a level-dependent correction factor. The correction factor directly influences the velocity read by the KDS-Sensor. The values between the lines of the table are calculated by linear interpolation. If the level reading is below the first entry in the table, the correction factor will be set to 1. If the level reading is higher than the latest level value in the table, always the latest correction factor value from the table will be used as correction factor.

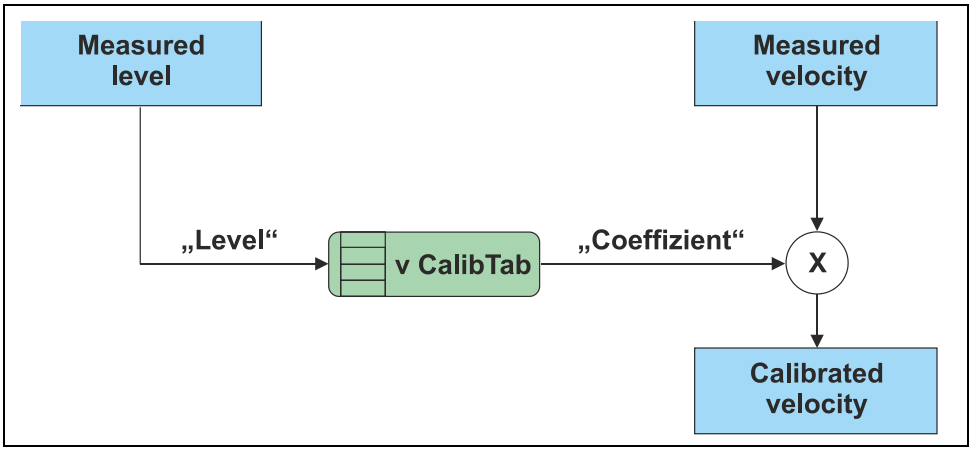


Fig. 9-5 Supplementary explanation to the level calibration table

Button "Import CSV/TSV"

Opens a dialog to select a CSV or TSV file containing the level calibration table. The first column here always must contain the level readings, the second column the correction factor corresponding to the level value. The content of the file is copied into the "Level [mm]" and "Coefficient" input fields.

Level

Level readings column

Coefficient

Correction factor column to be used for level readings

Measurement channel KDS

The latest valid KDS value will be held for up to 5 measurements if the KDS sensor was not able to read the data due to communication problems. The readings then will be set to "NaN" (break in the readings chart or empty field for data download.

Basic

KDS velocity

KDS velocity	freely selectable channel name for measurement value of KDS sensor "vKDS[m/s]"
Min	Defines the lower scale end of the pointer instruments
Max	Defines the upper scale end of the pointer instruments
Unit	Selection of the velocity unit used by all indication elements of the server
Digits behind the decimal point	The number of decimal places used by all indication elements of the server

KDS height

KDS height	freely selectable channel name for measurement value of KDS sensor "dKDS [m]"
Min	Defines the lower scale end of the pointer instruments
Max	Defines the upper scale end of the pointer instruments
Unit	Selection of the level unit used by all indication elements of the server
Digits behind the decimal point	The number of decimal places used by all indication elements of the server

KDS temperature

KDS temperature	freely selectable channel name for measurement value of KDS sensor "T KDS [°C]"
Min	Defines the lower scale end of the pointer instruments
Max	Defines the upper scale end of the pointer instruments
Unit	Selection of the temperature unit used by all indication elements of the server
Digits behind the decimal point	The number of decimal places used by all indication elements of the server

Measurement range

KDS velocity	Measurem. range Min	Lower limit for the valid range
	Measurem. range Max	Upper limit for the valid range
KDS height	Measurem. range Min	Lower limit for the valid range
	Measurem. range Max	Upper limit for the valid range (not modifiable)

Alarms

Warning	Value is low	A warning will be triggered if the reading should reach or fall below this value.
	Value is high	A warning will be triggered if the reading should reach or exceed this value.
Alarm	Value is low	An alarm will be triggered if the reading should reach or fall below this value.
	Value is high	An alarm will be triggered if the reading should reach or exceed this value.
Hyst %	Hysteresis for all-clear (or Hyst=5 %, alarm or warning at 100 -> all-clear at 95)	

Trigger

QU	Fast recording (recording interval = recording interval /factor)
SL	Slow recording (recording interval = recording interval • factor)
RO	Start recording
RF	Stop recording
XM	Trigger transmission
ON	Activate online-mode

Threshold	Triggering threshold	
	Greater/equal	For triggering the reading must be higher than/equal to the threshold.
	Less/equal	For triggering the reading must be lower than/equal to the threshold.

Measurement channel

Note: The level calculation method is determined using the "Level source" configuration parameter in the "Level" configuration section. Some calculation methods use universal input 1 as preset. If this is the case the basic configuration of this channel will vary from the standard basis configuration. The following chapters describe both versions (Standard, analog input 1) of the basic configurator.

Basic (Standard) designation 1-4

- freely selectable channel name for the universal inputs

Designation 1 Wire

- freely selectable channel name for the external temperature sensor

Mode

Basic settings for the measurement channel

Universal inputs (Digital modes)	OFF	- - -	Measurement channel inactive
	Digital	Invert	inverts the input signal
	Digital LP	Invert	inverts the input signal
	Cnt.Day	Impulse	Impulse counter value in the measurement unit
		Max	Defines the upper scale end of the pointer instruments
		Unit	String used by all indication elements of the server as measurement unit
		Number of decimal digits	The number of decimal places used by all indication elements of the server
	Cnt.Intervl.	Impulse	Impulse counter value in the measurement unit
		Max	Defines the upper scale end of the pointer instruments
		Unit	String used by all indication elements of the server as measurement unit
		Number of decimal digits	The number of decimal places used by all indication elements of the server
	Freq	Factor	Factor input signal is to be multiplied with
		Min	Defines the lower scale end of the pointer instruments
		Max	Defines the upper scale end of the pointer instruments
		Unit	String used by all indication elements of the server as measurement unit
		Number of decimal digits	The number of decimal places used by all indication elements of the server
	PWM	0 %	Beginning of measurement range in measurement unit
		100 %	End of measurement range in measurement unit
		Unit	String used by all indication elements of the server as measurement unit
		Number of decimal digits	The number of decimal places used by all indication elements of the server

Universal inputs (Analog modes)	0-20 mA	0 %	Beginning of measurement range in measurement unit
		100 %	End of measurement range in measurement unit
		Unit	String used by all indication elements of the server as measurement unit
		Number of decimal digits	The number of decimal places used by all indication elements of the server
	4-20 mA	0 %	Beginning of measurement range in measurement unit
		100 %	End of measurement range in measurement unit
		Unit	String used by all indication elements of the server as measurement unit
		Number of decimal digits	The number of decimal places used by all indication elements of the server
	0-2 V	0 %	Beginning of measurement range in measurement unit
		100 %	End of measurement range in measurement unit
		Unit	String used by all indication elements of the server as measurement unit
		Number of decimal digits	The number of decimal places used by all indication elements of the server
	0-10 V	0 %	Beginning of measurement range in measurement unit
		100 %	End of measurement range in measurement unit
		Unit	String used by all indication elements of the server as measurement unit
		Number of decimal digits	The number of decimal places used by all indication elements of the server
ext. temperature sensor	OFF	- - -	Measurement channel inactive
	ON	Min	Defines the lower scale end of the pointer instruments
		Max	Defines the upper scale end of the pointer instruments
		Unit	Select the temperature unit to be used by all indication elements of the server
		Number of decimal digits	The number of decimal places used by all indication elements of the server

Basic (Universal input 1, pre-set as analog input 1)

Analog input 1

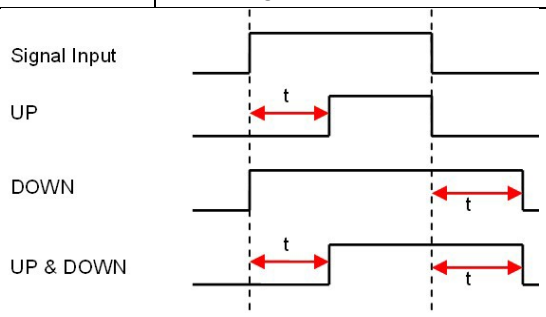
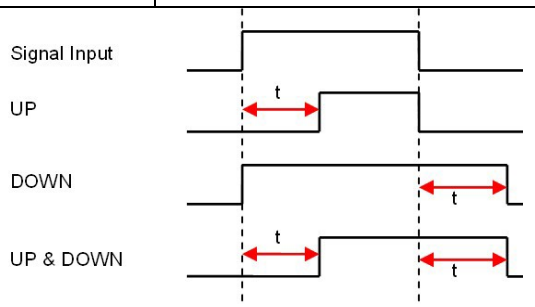
free selectable channel name for the universal input 1 pre-assigned as Distance/Level sensor ("dUl[m]")

Mode

Basic setting for the measurement channel

Universal inputs (Analog modes)	0-20 mA	0 %	Beginning of measurement range in measurement unit
		100 %	End of measurement range in measurement unit
		Unit	Select the level unit to be used by all indication elements of the server
		Number of decimal digits	The number of decimal places used by all indication elements of the server
	4-20 mA	0 %	Beginning of measurement range in measurement unit
		100 %	End of measurement range in measurement unit
		Unit	Select the level unit to be used by all indication elements of the server
		Number of decimal digits	The number of decimal places used by all indication elements of the server
	0-2 V	0 %	Beginning of measurement range in measurement unit
		100 %	End of measurement range in measurement unit
		Unit	Select the level unit to be used by all indication elements of the server
		Number of decimal digits	The number of decimal places used by all indication elements of the server
	0-10 V	0 %	Beginning of measurement range in measurement unit
		100 %	End of measurement range in measurement unit
		Unit	Select the level unit to be used by all indication elements of the server
		Number of decimal digits	The number of decimal places used by all indication elements of the server

Configuration

<table>
<tr><td rowspan="13">Universal inputs
(Digital modes)</td><td>Off</td><td>- - -</td><td colspan="2">- - -</td></tr>
<tr><td rowspan="12">Digital</td><td>Filter time</td><td colspan="2">Min. signal length for signal detection</td></tr>
<tr><td>Damping</td><td colspan="2">Temporal function in the measurement interval</td></tr>
<tr><td rowspan="4"></td><td>up</td><td>Min. signal length for x sec. with rising edge</td></tr>
<tr><td>down</td><td>Min. signal length for x sec. with falling edge</td></tr>
<tr><td>up&down</td><td>Min. signal length for x sec. with both edges</td></tr>
<tr><td colspan="2"> 
</td></tr>
<tr><td>Time</td><td colspan="2">Time x to be used with damping modes "up", "down" as well as "up&down"</td></tr>
<tr><td rowspan="6">Digital LP</td><td>Filter time</td><td colspan="2">Min. signal length for signal detection</td></tr>
<tr><td rowspan="4">Damping</td><td colspan="2">Temporal function in the measurement interval</td></tr>
<tr><td>up</td><td>Min. signal length for x sec. with rising edge</td></tr>
<tr><td>down</td><td>Min. signal length for x sec. with falling edge</td></tr>
<tr><td>up&down</td><td>Min. signal length for x sec. with both edges</td></tr>
<tr><td colspan="2"> 
</td></tr>
<tr><td>Time</td><td colspan="2">Time x to be used with damping modes "up", "down" as well as "up&down</td></tr>
</table>

Universal inputs (Counter modes)	Cnt.Day	Filter time	Min. signal length for signal detection	
		Reset	Temporal function in the measurement interval	
	Cnt.Intervl.	Filter time	Min. signal length for signal detection	
		Damping	Temporal function in the measurement interval	
			off	Damping inactive
			min	The minimum of the past x readings will be recorded.
			max	The maximum of the past x readings will be recorded.
			avg	The arithmetic average of the past x readings will be recorded..
			med	The median of the past x readings will be recorded..
			rms	The root mean square of the past x readings will be recorded.
		Time	Time window for damping. A maximum of 60 readings can be used for calculation (e.g. 1 channel: 60 measurement values; … 4 channels: 15 measurement values each). To calculate the number of readings to be considered.	

Universal inputs (Frequency mode 1/2)	Freq (1/2)	Filter time	Min. signal length for signal detection	
		Damping	Temporal function in the measurement interval	
			off	Damping inactive
			min	The minimum of the past x readings will be recorded.
			max	The maximum of the past x readings will be recorded.
			avg	The arithmetic average of the past x readings will be recorded..
			med	The median of the past x readings will be recorded..
			rms	The root mean square of the past x readings will be recorded.
		Time	Time window for damping. A maximum of 60 readings can be used for calculation (e.g. 1 channel: 60 measurement values; … 4 channels: 15 measurement values each). To calculate the number of readings to be considered.	
		Hold	Hold the latest valid reading for x measurement cycles	
			off	Function inactive
			1-5	Number of measurement cycles to hold the reading before the error value will be put out.
			on	In case of error the latest valid reading will be held until a new valid reading is available.
Universal inputs (Frequency mode 1/2)	Freq (1/2)	Overflow	Handling of measurement range violation	
			Ignore	The reading is calculated beyond the measurement value limits.
			Cut off	The reading is truncated at the measurement value limits
			Overflow	- Error "UF" (Under Flow) will be put out if the reading should be below the lower range limit. - Error "OF" (Over Flow) will be put out if the reading should be above the upper range limit.
			NAMUR limits	- Error "UF" (Under Flow) will be put out if the reading should be below the lower range limit. - Error "OF" (Over Flow) will be put out if the reading should be above the upper range limit.

Universal inputs (PWM-Mode 1/2)	PWM (1/2)	Filter time	Min. signal length for signal detection	
		Damping	Temporal function in the measurement interval	
			off	Damping inactive
			min	The minimum of the past x readings will be recorded.
			max	The maximum of the past x readings will be recorded.
			avg	The arithmetic average of the past x readings will be recorded..
			med	The median of the past x readings will be recorded.
			rms	The root mean square of the past x readings will be recorded.
		Time	Time window for damping. A maximum of 60 readings can be used for calculation (e.g. 1 channel: 60 measurement values; … 4 channels: 15 measurement values each). To calculate the number of readings to be considered.	
		Hold	Hold the latest valid reading for x measurement cycles	
			Off	Function inactive
			1-5	Number of measurement cycles to hold the reading before the error value will be put out.
			on	In case of error the latest valid reading will be held until a new valid reading is available.

Universal inputs (PWM-Modus 2/2)	PWM	Overflow	Handling of measurement range violation	
			Ignore	The reading is calculated beyond the measurement value limits.
			Cut off	The reading is truncated at the measurement value limits
			Overflow	- Error "UF" (Under Flow) will be put out if the reading should be below the lower range limit. - Error "OF" (Over Flow) will be put out if the reading should be above the upper range limit.
			NAMUR limits	- Error "UF" (Under Flow) will be put out if the reading should be below the lower range limit. - Error "OF" (Over Flow) will be put out if the reading should be above the upper range limit.

Universal inputs (0-20 mA-Mode 1/2)	0-20 mA (1/2)	Filter time	Min. signal length for signal detection	
		Damping	Temporal function in the measurement interval	
			off	Damping inactive
			min	The minimum of the past x readings will be recorded.
			max	The maximum of the past x readings will be recorded.
			avg	The arithmetic average of the past x readings will be recorded.
			med	The median of the past x readings will be recorded.
			rms	The root mean square of the past x readings will be recorded.
		Time	Time window for damping. A maximum of 60 readings can be used for calculation (e.g. 1 channel: 60 measurement values; … 4 channels: 15 measurement values each). To calculate the number of readings to conside see "Explanation examples Recording, measurement, burst interval (in conjunction with damping)" on page 93.	
		Hold	Hold the latest valid reading for x measurement cycles	
			off	Function inactive
			1-5	Number of measurement cycles to hold the reading before the error value will be put out.
			on	In case of error the latest valid reading will be held until a new valid reading is available.

Universal inputs (0-20 mA-Mode 2/2)	0-20 mA (2/2)	Overflow	Handling of measurement range violation	
			Ignore	The reading is calculated beyond the measurement value limits.
			Cut off	The reading is truncated at the measurement value limits
			Overflow	- Error "SC" (Short Cut) will be put out if the reading should be above 20.1mA.
			NAMUR limits	- Error "OF" (Over Flow) will be put out if the reading should be above 20.1mA. - Error "SC" (Short Cut) will be put out if the reading should be above 21mA.
Universal inputs (0-2V-Mode 1/2)	0-2 V (1/2)	Filter time	Min. signal length for signal detection	
		Damping	Temporal function in the measurement interval	
			off	Damping inactive
			min	The minimum of the past x readings will be recorded.
			max	The maximum of the past x

				readings will be recorded.
			avg	The arithmetic average of the past x readings will be recorded.
			med	The median of the past x readings will be recorded.
			rms	The root mean square of the past x readings will be recorded.
		Time	Time window for damping. A maximum of 60 readings can be used for calculation (e.g. 1 channel: 60 measurement values; … 4 channels: 15 measurement values each). To calculate the number of readings to consider see "Explanation examples Recording, measurement, burst interval (in conjunction with damping)" on page 93.	
		Hold	Hold the latest valid reading for x measurement cycles	
			off	Function inactive
			1-5	Number of measurement cycles to hold the reading before the error value will be put out.
			on	In case of error the latest valid reading will be held until a new valid reading is available.

Universal inputs (0-2 V-Mode 2/2)	0-2 V (2/2)	Overflow	Handling of measurement range violation	
			Ignore	The reading is calculated beyond the measurement value limits.
			Cut off	The reading is truncated at the measurement value limits
			Overflow	- Error "SC" (Short Cut) will be put out if the reading should be above 2.01V.
			NAMUR limits	- Error "OF" (Over Flow) will be put out if the reading should be above 2.01V.

Universal inputs (0-10 V-Mode 1/2)	0-10 V (1/2)	Filter time	Min. signal length for signal detection	
		Damping	Temporal function in the measurement interval	
			off	Damping inactive
			min	The minimum of the past x readings will be recorded.
			max	The maximum of the past x readings will be recorded.
			avg	The arithmetic average of the past x readings will be recorded.
			med	The median of the past x readings will be recorded.
			rms	The root mean square of the

				past x readings will be recorded.
		Time	Time window for damping. A maximum of 60 readings can be used for calculation (e.g. 1 channel: 60 measurement values; … 4 channels: 15 measurement values each). To calculate the number of readings to consider see "Explanation examples Recording, measurement, burst interval (in conjunction with damping)" on page 93.	
		Hold	Hold the latest valid reading for x measurement cycles	
			off	Function inactive
			1-5	Number of measurement cycles to hold the reading before the error value will be put out.
			on	In case of error the latest valid reading will be held until a new valid reading is available.

Universal inputs (0-10 V-Mode 2/2)	0-10 V (2/2)	Overflow	Handling of measurement range violation	
			Ignore	The reading is calculated beyond the measurement value limits.
			Cut off	The reading is truncated at the measurement value limits
			Overflow	- Error "OF" (Over Flow) will be put out if the reading should be above 10.05V.
			NAMUR limits	Error "OF" (Over Flow) will be put out if the reading should be above 10.05V.

ext. Temperature sensor	off	- - -	Measurement inactive	
	on	Hold	Hold the latest valid reading for x measurement cycles	
			off	Function inactive
			1-5	Number of measurement cycles to hold the reading before the error value will be put out.
			on	In case of error the latest valid reading will be held until a new valid reading is available.

Alarms

"Digital"-or "Digital LP"-Mode	WA	„High“ at the universal input triggers a „Warning“	
	AL	„High“ at the universal input triggers a "Alarm".	
	SW	„High“ at the universal input triggers a "Fault Warning".	
	SA	„High“ at the universal input triggers a "Fault Alarm".	
All other modes	Warning	Low value	A warning will be triggered if the reading should reach or fall below this value.
		High value	A warning will be triggered if the reading

			should reach or exceed this value.
	Alarm	Low value	An alarm will be triggered if the reading should reach or fall below this value.
		High value	An alarm will be triggered if the reading should reach or exceed this value.
	Hyst %	Hysteresis for all-clear (e.g. Hyst=5 %, Alarm or Warning at 100 -> all-clear at 95)	
"Digital"-or "Digital LP"-Mode	QU	Fast recording (recording interval = recording interval / Factor)	
	SL	Slow recording (recording interval = recording interval • Factor)	
	MS	Start measurement cycle immediately	
	XM	Trigger transmission	
	ON	Activate Online Mode	
	Edge	Selection of edges for triggering	
		upward	Rising edge will trigger
		downward	Falling edge will trigger
		both	Both edges will trigger
All other modes	QU	Fast recording (recording interval = recording interval / Factor)	
	SL	Slow recording (recording interval = recording interval • Factor)	
	RO	Start recording	
	RF	Stop recording	
	XM	Trigger transmission	
	ON	Activate Online Mode	
	II	Activates the release operation mode for the KDS sensor	
	Threshold	Trigger thresholds	
		Greater/equal	For triggering the reading must be higher than/equal to the threshold.
		Less/equal	For triggering the reading must be lower than/equal to the threshold.

Calculated Flow measurement data

The NivuLog SunFlow determines the flow based on the configuration parameters set under “Volume calculation” (see "Volume calculation" on page 57).

Basic

Velocity

Velocity	Free selectable channel name for the measurement value "v [m/s]" calculated by the NivuLog SunFlow
Min.	Defines the low end of the indication instruments scale
Max.	Defines the high end of the indication instruments scale
Unit	Select the velocity unit to be used by all indication elements of the server
Number of decimal digits	The number of decimal places used by all indication elements of the server

Level

Level	Free selectable channel name for the measurement value " h_{leve} [m]" calculated by the NivuLog SunFlow
Min.	Defines the low end of the indication instruments scale
Max.	Defines the high end of the indication instruments scale
Unit	Select the level unit to be used by all indication elements of the server
Number of decimal digits	The number of decimal places used by all indication elements of the server

Flow rate

Flow rate	Free selectable channel name for the measurement value "Q [m3/s]" calculated by the NivuLog SunFlow
Min.	Defines the low end of the indication instruments scale
Max.	Defines the high end of the indication instruments scale
Unit	Select the flow rate unit to be used by all indication elements of the server
Number of decimal digits	The number of decimal places used by all indication elements of the server

Flow volume

Flow volume	Free selectable channel name for the measurement value "V [m3]" calculated by the NivuLog SunFlow
Min.	Defines the low end of the indication instruments scale
Max.	Defines the high end of the indication instruments scale
Unit	Select the flow volume unit to be used by all indication elements of the server
Number of decimal digits	The number of decimal places used by all indication elements of the server

Alarms

Warning	Low value	A warning will be triggered if the reading should reach or fall below this value.
	High value	A warning will be triggered if the reading should reach or exceed this value.
Alarm	Low value	An alarm will be triggered if the reading should reach or fall below this value.
	High value	An alarm will be triggered if the reading should reach or exceed this value.
Hyst %	Hysteresis for all-clear (or Hyst=5 %, alarm or warning at 100 -> all-clear at 95)	

Trigger

QU	Fast recording (recording interval = recording interval / Factor) SL	
SL	Slow recording (recording interval = recording interval • Factor)	
RO	Start recording	
RF	Stop recording	
XM	Trigger transmission	
ON	Activate Online Mode	
Threshold	Triggering threshold	
Warning	Greater/equal	For triggering the reading must be higher than/equal to the threshold.
	Less/equal	For triggering the reading must be lower than/equal to the threshold.

Calculated channels

Note: The values of the calculated channels are computed directly each time during data output (indication on D2W server or download from Device to Web server). These values are not saved in the data bank of the server.

Basic

Designation 1-5
free selectable channel name for the calculated channels

Mode

Possible calculation modes for calculated channels

off	- - - -	Calculated channel inactive
Table	Min.	Defines the low end of the indication instruments scale
	Max.	Defines the high end of the indication instruments scale
	Unit	String used by all indication elements of the server as measurement unit
	Number of decimal digits	The number of decimal places used by all indication elements of the server
Digital	invert	Inverts the input signal
+, -, x, /	Min.	Defines the low end of the indication instruments scale
	Max.	Defines the high end of the indication instruments scale
	Unit	String used by all indication elements of the server as measurement unit
	Number of decimal digits	The number of decimal places used by all indication elements of the server


Move down element


Move up element

Calculation

off	- - - -	Calculated channel inactive
Table	source channel	Select the channel from which the input data are used
		Opens the value table input window (values between the lines of the table are calculated by linear interpolation, values out of the range of the defined table are calculated by linear extrapolation).
Digital	source channel	Select the channel from which the input data are used
	High Level	Threshold for signal detection
+, -, x, /	source channel	Select the channel from which the input data are used
	+, -, x, /	
	source channel	Select the channel from which the input data are used

Alarm

Hint: the alarm thresholds of calculated channels cannot be checked before the unit has transmitted the readings to the D2W-server.

Alarm low	Alarm will be generated as soon as the reading should equal or fall below this value.
Alarm high	Alarm will be generated as soon as the reading should equal or exceed this value.
Hyst %	Hysteresis for all-clear message (e.g. Hyst=5 %, alarm or warning at 100 -> all-clear message at 95)

- Output channel
- Basic
- External warm-up period

Defines the period an output channel set to "Ext warn-up period" will be activated prior to the measurement.

KDS Damping time

This configuration parameter is stored directly in the KDS sensor and defines the width of the window for the damping of the measurement values. A new reading after a jump in the measurement values will be output the latest after the KDS damping time has expired. This is valid too when turning on the KDS sensor. Valid readings hence are not available before the KDS damping time has expired.

KDS Measurement time

Period required for averaging of readings from the KDS sensor.

Mode

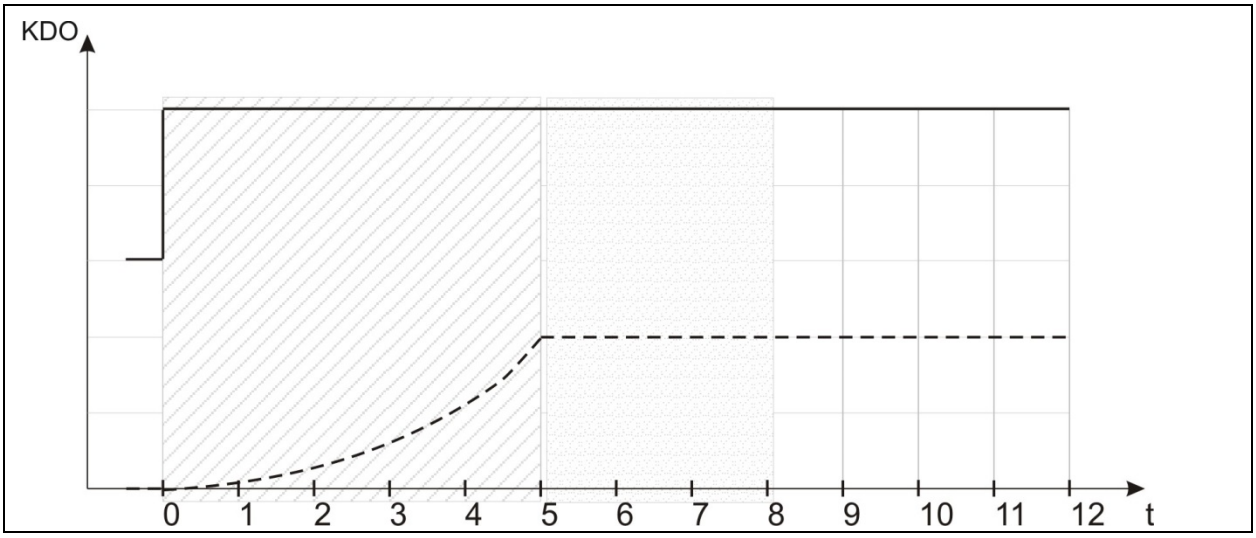
Basic settings for the output channel

off	- - - -	Output channel inactive
Ext. Warm-up time	The output channel will be activated "Ext. warm-up time" seconds prior to measuring. The channel will not be activated at all as long as the value set is "0".	
Digital	invert	Inverts the level on the device output
	Setpoint	Setpoint (on/off) for output
Freq	Factor	Setpoint multiplied by factor = frequency in Hertz.
	Min.	Defines the low end of the indication instruments scale
	Max.	Defines the high end of the indication instruments scale
	Setpoint	Setpoint multiplied by factor = frequency in Hertz.
	Unit	String used by all display elements of the server as readings unit
	Decimal digits	Number of decimal digits used by all display elements of the server
PWM	0 %	Start of measurement range in unit
	100 %	End of measurement range in unit
	Setpoint	Output value in measurement unit
	Unit	String used by all display elements of the server as readings unit
	Decimal digits	Number of decimal digits used by all display elements of the server
Impulse	Factor	Setpoint multiplied by factor = impulses/min.
	Min	Defines the low end of the indication instruments scale
	Max	Defines the high end of the indication instruments scale
	Setpoint	Setpoint multiplied by factor = impulses/min.
	Unit	String used by all display elements of the server as readings unit
	Decimal digits	Number of decimal digits used by all display elements of the server

Note:

Additional explanation to "KDS damping time" and " KDS measurement time "

_____	step in measurement value	
----------	KDS output value	
	KDS damping time	5 sec.
	KDS measurement time	3 sec.



The KDS sensor damps the measurement jump occurring when sensor supply is turned on. Hence a valid reading will not be available before the configurable KDS damping time, which is stored directly in the sensor, has expired. The NivuLog SunFlow does not begin to output readings before the damping time has expired. The "KDS measuring time" directly corresponds with the number of averaged readings since the KDS sensor will output one new reading per second.

Note:

Additional explanation Mode "Digital"

Invert	Setpoint	Device output
off	off	= off (Low)
off	on	= on (High)
on	off	= on (High)
on	on	= off (Low)

Config

off	- - -	
Ext warm-up time	- - -	
Freq	- - -	
PWM	- - -	
Impulse	Duration	Duration of an output impulse

Internal channels

Basic

Name voltage	Freely selectable channel name for V_{in} (External charging voltage)	
	Unit	String used by all display elements of the server as readings unit
Name battery	Freely selectable channel name for the internal battery voltage	
	Unit	String used by all display elements of the server as readings unit
Name GSM strength	Freely selectable channel name for the GSM field strength	
	Unit	String used by all display elements of the server as readings unit
Name Int Temp.	Freely selectable channel name for the internal device temperature	
	Unit	Temperature unit used by all display elements of the server as readings unit

Alarms

Warning	Value low	Warning will be generated as soon as the reading should equal or fall below this value.
	Value high	Warning will be generated as soon as the reading should equal or exceed this value.
Alarm	Value low	Alarm will be generated as soon as the reading should equal or fall below this value.
	Value high	Alarm will be generated as soon as the reading should equal or exceed this value.
Hyst %	Hysteresis for all-clear message (e.g. Hyst=5 %, alarm or warning at 100 -> all-clear message at 95)	

Trigger

QU	Fast recording (recording interval = recording interval • factor)	
SL	Slow recording (recording interval = recording interval • factor)	
RO	Start recording	
RF	Stop recording	
XM	Trigger transmission	
ON	Activate online mode	
Threshold	Trigger thresholds	
	Greater than equal to	Reading must be greater than / equal to the threshold for triggering.
	Lower than equal to	Reading must be lower than / equal to the threshold for triggering.

Alarms

Confirmation	Standard	The global server settings are used to decide if alarms need to be confirmed manually or automatically (see "User Manual for D2W-Server" 206.886).
	Automatic	Alarms will be confirmed automatically as soon as all messages have been transmitted. As soon as SMS messages including a transmission confirmation have been sent as well, the alarm will not be confirmed before the transmission confirmation has been received.
	Manual	Alarms need to be confirmed manually.
Alarm on transmission failure	Alarm if the instrument should not respond for a longer period than set as transmission cycles	
Transfer volume	Standard	The transfer volume alarm settings will be adopted from the global server settings (see "User Manual for D2W-Server" 206.886).
	Off	Transfer volume alarm is deactivated.
	Individual	The threshold used to trigger the transfer volume alarm can be entered in in KB in the adjacent input field.
On alarm	A	Alarm will be saved in the alarms list.
	Ü	Triggers immediate transmission.
On warning	A	Alarm will be saved in the alarms list.
	Ü	Triggers immediate transmission.
On error alarm	A	Alarm will be saved in the alarms list.
	Ü	Triggers immediate transmission.
On error warning	A	Alarm will be saved in the alarms list.
	Ü	Triggers immediate transmission.
Test alarm	All recipients (alerting plan type "parallel") or the first recipient (alerting plan type "serial") will receive a test message as soon as this page has been saved. The checkbox will then reset automatically.	

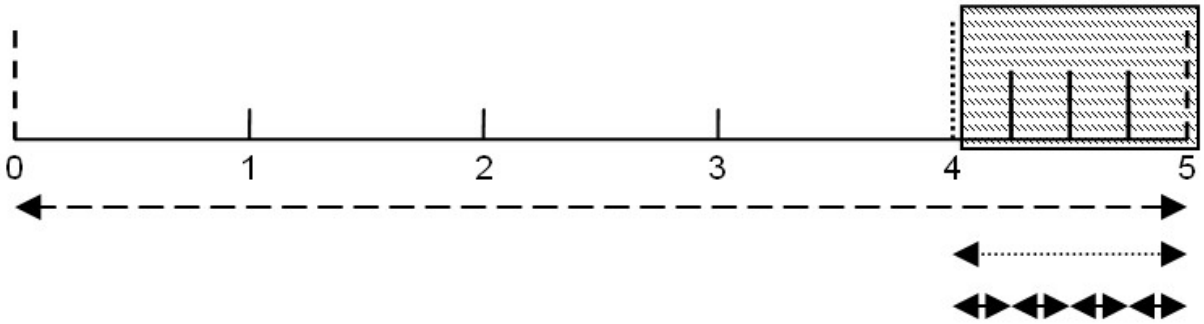
Basic Setting

Connection mode	Interval	The unit answers using the transmission interval
	Interval & Wakeup	The unit answers using the transmission interval and can be set to ALOHA transmission mode via server. 
	Online	The unit does not interrupt the connection and continuously transmits readings.
Aloha/Wakeup duration	Duration of Aloha/Wakeup connection	
Transmission interval	Time-lag between transmissions	
Recording interval	Time-lag between measurement data recordings	
Divisor fast recording	Recording interval = recording interval / factor (starting at triggering)	
Factor slow recording	Recording interval = recording interval * factor (starting at triggering)	
Measurement interval	Time-lag between measurements (00:00 same as recording interval)	
Burst interval	Period of time used for measurement within the measurement interval before the recording starts (00:00 measurement interval is continuously activated)	
Time zone	Regional settings (not relevant for raw measurement data, which are saved using UTC)	
Summer time	Configuration of automatic time shift	
	Standard	The configuration for the time shift is adopted from the global server settings.
	Off	Automatic time shift deactivated
	USA	Preset for American areas
	EU	Preset for European areas
Position interval	Time-lag between position updates	
Standard evaluation	Evaluation to load on click onto the device link within maps	

Hint:

Example for explanation of recording, measurement and burst interval (in connection with damping)

Basic setting 		5 min.
		1 min.
		15 sec.
Measurement channels -> Config.		med
		60 sec.



Creation of measurement values: the 4 latest readings are used to create the median and then will be recorded as measurement values.

Hint: additional explanation of connection types

Connection type	Energy consumption	Data volume	Responding time
online			
Interval & Wakeup			
Interval			

FTP Export Settings

Hint: this configuration section is available only if the "FTP Agent Extended" licence for the D2W server has been unlocked.

FTP Export Profile	Off	FTP Export deactivated
	"Name of FTP Export Profile"	List of FTP Export Profiles created in Device to Web-server.
Settings of selected profile	Shows an overview on the most relevant parameters of the selected FTP Export Profile	
FTP directory	Allows to overwrite the standard directory of the selected FTP Export Profile	

9.2.2 Device configuration

Hint: depending on the respective user level some of the configuration options mentioned in the following subchapters may not be available. In such cases please contact the administrator of the Device to Web-Servers.
The input mask required for device configuration can be accessed by clicking on the serial number in the list of measurement places or by clicking on the device name in the list of instruments.

Comments

Free comment field (displayed also in the instruments list below the measurement place name)

Instrument

Customer	Name of the customer assigned to the measurement unit	
IMSI	IMSI of the SIM chip or SIM module used	
Serial No.	Serial No. of the instrument	
Device class	To connect an instrument to a measurement place the device class of the measurement place and the instrument must coincide	
Phone No.	Phone number of the der SIM module. This is the number to receive control SMS messages (e.g. Wakeup).	
Device flags	Additional information on the device class (for internal use)	
Firmware version	Software version of the measurement controller currently installed	
Modem version	Software version of the modem controller currently installed	
OS Version	OS version of the modem	
Latest connection	Latest time stamp of the according operation	
Latest wakeup		
Latest connection		
Latest transmission error		
Latest Aloha connection		
Firmware update	off	Firmware update deactivated
	on	The new version of the selected firmware type will be installed immediately as soon as available.
	Even if tag not available	Firmware will be transmitted to the device even if the unit does not report the current firmware version to the server (not RECOMMENDED!).
	Allow downgrade	Allows installation of an older firmware version than installed on the unit (not RECOMMENDED!).
	once	Executes a firmware update once. The firmware update will be automatically set to "off" if no new firmware is available or if the firmware has been installed successfully.

Firmware type	Released	Only firmware versions where internal test as well as field test have been passed successfully will be installed (malfunction virtually impossible).
	Release Candidate	Only firmware versions where the internal test has been passed successfully will be installed (malfunction not impossible).
	Beta Release	Even firmware versions where not all internal tests have been passed successfully will be installed (malfunction quite possible).

Device-specific settings

Operation mode	HOLD	Measurement: off, Transmission: on
	RUN	Measurement: on, Transmission: on
	OFF	Measurement: off, Transmission: off
	OFFLINE	Measurement: on, Transmission: off
	Aloha	for internal use only
Battery type	Charging control for the rechargeable battery used (Temp...Charging conditions, V low ... Charging threshold)	
	AP413D+	Temp.:-30°C...+60°C, V low : 3.7 V
	AP413D+ Solar	Temp.:-30°C...+60°C, permanent charging

GPRS
SIM tariff
Selected SIM tariff

10 Maintenance

WARNING

Germ contamination

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

Important Notes:

The measures described in the following section of this manual shall be carried out by qualified personnel exclusively in order to avoid instrument damage.

It is absolutely necessary to disconnect the unit from mains power prior to maintenance, cleaning and/or repair works.

10.1 General Maintenance

The scope of maintenance as well as the maintenance intervals depend on the following factors:

- measurement medium and the according pollution
- general regulations for the operator of this measurement facility
- ambient conditions

Recommended measures:

- Regularly check the NivuLog SunFlow for mechanical damage.
- Regularly check all connections for tightness and corrosion.
- Regularly check all cables for mechanical damage.

If required clean the transmitter enclosure if with a dry, lint-free cloth. For heavy pollution NIVUS recommends the use of surface-active agents.
The use of abrasive cleansing agents is not allowed.

10.2 KDS Sensor

Please find a comprehensive description of details on maintenance and cleaning of KDS sensors in the "Technical Description of Doppler Sensors".

10.3 Charging the battery packs

DANGER

Risk of fire and burns

Please generally check rechargeable Lithium-Ion batteries for damage prior to charging.

Damaged rechargeable batteries must not be used any longer!!

Rechargeable batteries are subject to wear and tear and lose capacity over time. High and low ambient temperatures as well as intensive use will reduce capacity as well.

The NivuLog SunFlow comes with the transport lock activated (measurement and transmission "off") and the backup battery completely charged. If you should use external charging power (V_{in}) to support the solar panel, the backup battery will be recharged constantly thanks to the external power charging control.
If external power (V_{in}) should not be available during operation we recommend to recharge the backup battery prior to the initial start-up due to reasons of operational reliability.

Recharging the backup battery using external power (V_{in}):

- Connect the external power source to V_{in} and GND (see chapter 7.4.1). Please make sure to not apply power! You may use any power source (7...30 V DC, typ. 170mA@12V) or the MDN power adapter.
- Turn on the external power source now.
- Please set battery type "AP413D+ Solar. This setting will cause the external power source charging control to charge the backup battery instantly (see chapter 7.4.5).
- Trigger the ALOHA transmission mode to transmit the battery type setting to the NivuLog SunFlow.
- Regularly check the charging condition of the backup battery by using the readings chart of the Device to Web server. The backup battery is fully charged as soon as 4.2 V has been reached.

Please note that the maximum voltage possibly may not be reached due to ageing.

Hint: supplemental explanation to assess "Battery":

Battery	
> 3.81V	
3.81V...3.70V	
3.71V...3.63V	
3.64V...3.59V	
3.6V...3.19V	
<= 3.2V or invalid value	

- Deactivate the external power source now and disconnect the cables.
- Reset the battery type setting to "AP413D+".
- Trigger the ALOHA transmission mode to transmit the battery type setting to the NivuLog SunFlow.

10.4 Accessories

Mast holder set ZUB0 MASTHALT01	Robust mast holder set for fastening and adjustment of the NivuLog SunFlow on a mast with Ø70 - 90 mm, material: stainless steel 1.4571 Adjustable angles for 20°, 29°, 37° or 45° (29° south orientation recommended)

11 Dismantling / Disposal

Please make sure to dispose of (rechargeable) batteries in accordance with environmental regulations.

Lithium-Ion-batteries contain toxic substances and therefore must not be disposed of as normal household waste. Always dispose of such batteries in accordance with statutory regulations.

The device shall be disposed of according to the local regulations for electronic products.
Do not leave (rechargeable) batteries in the NivuLog SunFlow after being discharged. Please ensure to dispose of used batteries according to environmental regulations.

12 Troubleshooting

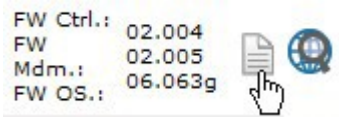
12.1 General Troubles

Error	Reason / Solution
No device reaction (status LED constantly off)	- Check cable connections - Backup battery exhausted
Communication problems	- Check the status LED flashing code. - Download the device log from the D2W server and use DeviceConfig for evaluation - Capacity of the backup battery almost exhausted.
Not all/no data available on the server	- Connection interrupted during transmission, can be identified by timeout entry in the connections list Solution: trigger ALOHA transmission or wait for the next cyclic transmission. - Device and measurement place not correctly assigned.
Data on universal input not plausible	- Check whether universal input configuration and sensor output signal match. - Check filter settings of the universal input
No data available or data gaps for KDS measurement channels	- Check cable connections
Alarm condition of analog channel has not been recognised	Increase measurement interval
Alarm condition not transmitted although data are available	- Check alarm settings of the measurement channel - Connection interrupted during transmission. Solution: trigger ALOHA transmission or wait for the next cyclic transmission.
Alarm message not transmitted although alarm has been signalised	- Check alerting plan settings - Check alerting plan address details
Output channel does not output the value determined in the input mask of the D2W server	Measurement place settings have been overwritten by server PLC.

12.2 Evaluating the device log

12.2.1 Evaluating the device log on the D2W server

The previous 300 log entries can be recalled from the D2W server by using the button depicted below which can be found in the measurement device list. Since log entries as well as readings are transmitted to the server using the transmission interval, data cumulated until the latest connection to the server are available only.



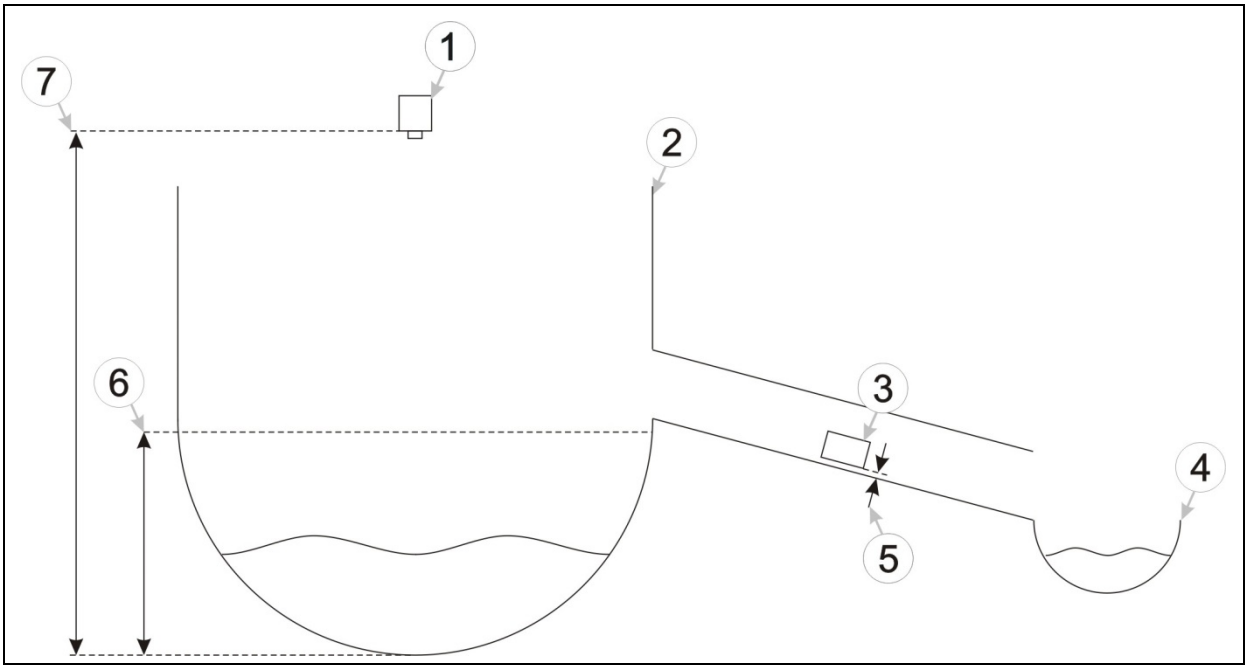
Amore detailed description on how to evaluate device logs on the D2W server can be found in the server manual.

13 Application Examples

13.1 Stormwater overflow

13.1.1 Requirements

The discharge volumes from a stormwater overflow tank into a river shall be detected. Since discharge will occur only in case of heavy precipitation and the KDS sensor hence is in idle mode most of the time while consuming a lot of power anyway, it is desired to use the Release mode (see "Release mode" on Page 20).



1 Distance sensor
2 Stormwater overflow tank
3 KDS sensor
4 River
5 Mounting height of KDS sensor
6 Level as from which the KDS sensor is to be activated
7 Mounting height of distance sensor

Fig. 13-1 Principle of measurement place

13.1.2 Required configuration

This section merely describes the most relevant settings to meet the requirements of the example above and not the complete configuration for the application example.

Measurement channels → Basis	Independent measurement value 2	"Tank level"
	Unit	m

Measurement channels → Alarm independent measurement value 2	Hyst [%]	10

Measurement channels → Trigger independent measurement value 2	I1	Select check box
	Threshold	"greater than or equal to"
		1

13.1.3 Explanation

A distance sensor measuring the level in the stormwater overflow tank is connected to universal input 2. The configuration depends on the type of sensor and its installation. It is possible to use any other universal input as well. By selecting the checkbox "I1" in the configuration section "Measurement channels" the release mode will be activated for the KDS sensor. The trigger condition (threshold "greater than or equal to" 1 m) can be determined in the same section. The threshold has been set slightly below the discharge level in order to certainly release the KDS sensor as soon as a discharge volume is reached. The same section contains an option to input the hysteresis value which undoes the trigger condition.

The KDS sensor remains inactive as long as the level in the overflow tank is lower than 1 m. The sensor will be activated if the level reaches the threshold and flow measurement data are detected as from this point in time. If the level falls below the "Trigger threshold - Hyst" (1 m – 10 % = 0.9), the KDS sensor remains to be locked.

14 Table of images

DE / EN / FR

EU Konformitätserklärung

EU Declaration of Conformity

Déclaration de conformité UE

NIVUS GmbH
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75031 Eppingen

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

Für das folgend bezeichnete Erzeugnis:

For the following product:

Le produit désigné ci-dessous:

Bezeichnung:	**solargespeiste Durchflussmessstation**
Description:	*solar powered flow measuring station*
Désignation:	*Station de mesure de débit par énergie solaire*
Typ / Type:	**NLM0SUNFLOW**

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

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

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

- 2014/30/EU
- 2014/35/EU
- 2014/53/EU
- 2011/65/EU

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

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

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

- EN 61326-1:2013
- EN 61010-1:2010
- EN 301489-1 V1.9.2:2011
- EN 301489-7 V1.3.1:2005
- EN 301511 V9.0.2:2003

Diese Erklärung wird verantwortlich für den Hersteller:

This declaration is submitted on behalf of the manufacturer:

Le fabricant assume la responsabilité de cette déclaration:

NIVUS GmbH
Im Taele 2
75031 Eppingen
Allemagne

abgegeben durch / *represented by / faite par:*

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

Eppingen, den 20.04.2016

Gez. *Marcus Fischer*