Software-Revision Number 7.10

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Contents

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Warranty
The information in this manual is subject to change without previous notification. This manual may contain errors or may be incomplete despite the most care taken in its preparation.
No liability is assumed for errors or loss of data resulting from this.

All products are guaranteed for period of twelve months from defects in quality or workmanship, from date of delivery of the equipment

Notes to the User
Before wiring, connecting and powering up the OCM EM and putting it into operation, please note the following user instructions!

This manual includes all information for programming and for using the equipment. It is written by technically qualified staff, who have appropriate knowledge about measurement techniques, automation techniques, information techniques and wastewater hydraulics.
In case of any uncertainty on use, applications, etc., please contact the NIVUS Service Centre:

- in Europe, please contact NIVUS GmbH Eppingen
- in North/ South America and Asia, please contact NIVUS America Inc.

For ensuring an error-free operation of the OCM EM, these operating instructions must be thoroughly read!

The OCM EM must be wired as shown in the connection diagram (plan) in chapter 4!!!

For any possible difficulties regarding the assembly, connection or programming, please contact the technical department or the NIVUS-Service-Centre.

Your NIVUS-Team

1. General Summary

1.1 Warnings

1.1.1 General Warnings

All notes with this sign, are for avoiding dangers to health and life of personnel as well as for avoiding of material losses or error functions.

This sign refers to important information and notes. Special handling/assembly notes are also marked with this sign.

For connection, putting into operation and operation of OCM EM, take into account all of the following information and regulations (VDE, Ex-regulations, safety and accident prevention regulations).
All handling of the equipment, which includes the assembly, connection and programming, should only be performed by knowledgeable and trained staff.

1.1.2 Special Warnings

One of the most frequent applications of the OCM EM system is in the wastewater field (areas). It has to be taken into account when assembling/dismantling the system, that the measurement transmitter, cables and sensors may be contaminated/loaded with dangerous disease carrying germs and bacteria.
For this it is necessary to take precautions, to exclude physical dangers when working with the measurement system OCM EM.

1.2 Installation Conditions

The flow meter type OCM EM and it's sensors delivered by NIVUS is for the continuous flow measurement of liquid media in partially and full-filled pipes and channels. For maximum allowed limits for its use, see the limitations listed in chapter 2.1. All use in applications differing from these limits, is not the responsibility of NIVUS and does not confirm to the warranty or use of the equipment as provided by NIVUS.

1.3 Installation

Before laying out the operating voltage, it is necessary to carry out and to check for correctness, the installation of measurement transmitter and sensors thoroughly. Installation should only be carried out by knowledgeable and trained staff. Additionally, legal norms and regulations and technical sets of rules for each individual countries have to be taken into account.

1.4 Putting into operation

This may first be carried out after first checking the installation site and conditions. Please read the manual thoroughly before putting the system into operation to avoid errors and erroneous programming. Familiarize yourself with the operation the OCM EM via keypad and display or via PC, before starting the parameter setting.

1.5 Overhaul and Repairs

NIVUS products are only allowed to be overhauled or repaired by NIVUS staff or other knowledgeable and trained staff only.
Only original parts or assemblies from NIVUS are allowed to be used.
Any unauthorized or improper change renders any right to claim under warranty null and void.

2. OCM EM Overview

2.1 Technical data

2.1.1 Measurement Transmitter

Measurement Transmitter OCM EM Technical data:	
Display:	4x 20 digit LCD backlit
Operation:	Foil keypad (15 buttons)
enclosure:	Wall mount, synthetic material
Level of protection	IP65 (NEMA 6)
Power supply:	115 - 230V AC; 50-60Hz or 24V DC; ±15%
Power consumption:	max. 18V A
Input:	2x 0/4-20mA for level (max. 200Ω, 12 bit) 1x Velocity (Doppler frequency signal), max. 10 KHz 1x slide-end/regulator control 1x torque
Output:	2x 0/4-20mA galvanically isolated (load max. 600Ω, 12 bit) 4x Relay as totalizer, boundary contact, error message or slide control programmable, max. capacity 1A/230V AC (cos phi = 1) or 1A/60V DC
Control:	3-point-Step regulator with PID-Behaviour, Fast end control, adjustable slide construction at disturbance, auto flush function at slide transfer
Interface	RS232
Operating temperature range:	-20°C to 60°C (4 F to 140 F)
Storage temperature:	-20°C to 60°C (4 F to 140 F), max. 80% atmospheric humidity, non-condensing

2.1.2 Sensors

Flow velocity sensor: **Technical data:**	**Type OCR/D..B..**
Minimum reflecting particle size:	100 ppm; > 0.6 mm
Transmission frequency:	750 KHz
Measurement range:	-6m/s to 6m/s(-20 fps to 20 fps)
Power consumption:	max. 60mA
Power supply:	18 – 24V DC of OCM EM
Material:	Stainless steel; Epoxy resin; Polyurethane
Cable length	10m (33 feet) or 30m (99 feet). extendable up to 150m (492 ft)
Level of protection	IP 68 (NEMA 6)
Zero drift:	100% zero stable
Long-time drift:	0%
Accuracy	± 1% of measurement reading or +/- 0.03mm/s (whichever is higher)
Operating temperature range:	-10°C to 50°C (14 F to 122 F)
Storage temperature:	-20°C to 60°C (4 F to 140 F)

2.1.3 Level Transducer / Sensor

Please take the details out of manuals for separate level sensors.

2.1.4 Delivery

If upon delivery, you notice that ordered parts are missing or the OCM EM or additional accessories are damaged during transportation, please contact NIVUS immediately.

2.1.5 Documentation

The standard equipment of OCM EM includes this operation manual. This manual contains all information required for putting into operation the OCM EM measurement system.

2.2 Equipment Configurations

The OCM EM measurement transmitter is manufactured in several configurations which are different in the power supply, modem equipment and national language.
The equipment configuration is on the underside of the measurement transmitter on a weather-proof sticker according to the item number.
With the following item key the exact piece of equipment type is specified.

Measurement Transmitter				
OCM6 EM	4x 20 digit LCD backlit Display; 0/4-20mA output; 4 Relays; wall-mount IP65 (NEMA 4)			
	Data Transfer			
	00 via interface RS232			
	M0 via modem			
	MA via modem and akku			
	FM via radio modem			
	FA via radio modem and akku			
		power supply		
		AC 230V AC / 50 Hz		
		DC 24V DC		
			Menues (Language)	
			EN UK-english (metric)	
			FR français	
			US us-english	
OCM6 EM			**000**	

Figure 1. item code for measurement transmitter OCM EM

Flow velocity sensor for the OCM EM

OCR/ **Ultrasonic velocity sensors for OCM**

Type

DE Ultrasonic velocity sensor for OCM flow measurement transmitter

construction

R pipe sensor with R1½" outside threading

K wedge sharped sensor for mounting on the bottom of the channel or with mounting system RMS2

approval

S no Ex approval

cable length

10 10m cable

30 30m cable

- - special length per m (ft)

Sensor with ball valve (nur OCR/DxR... Typen)

0 no

A Sensor with ball valve

(length of sensor: min. 30cm)

length of sensors (only OCR/DxR... Types)

00 19cm

03 30cm; necessary, Typs: DxR ...A)

-- length in cm

OCR/	**DE**		**S**				**00**

Figure 2. item code for the sensor

2.3 Equipment combinations

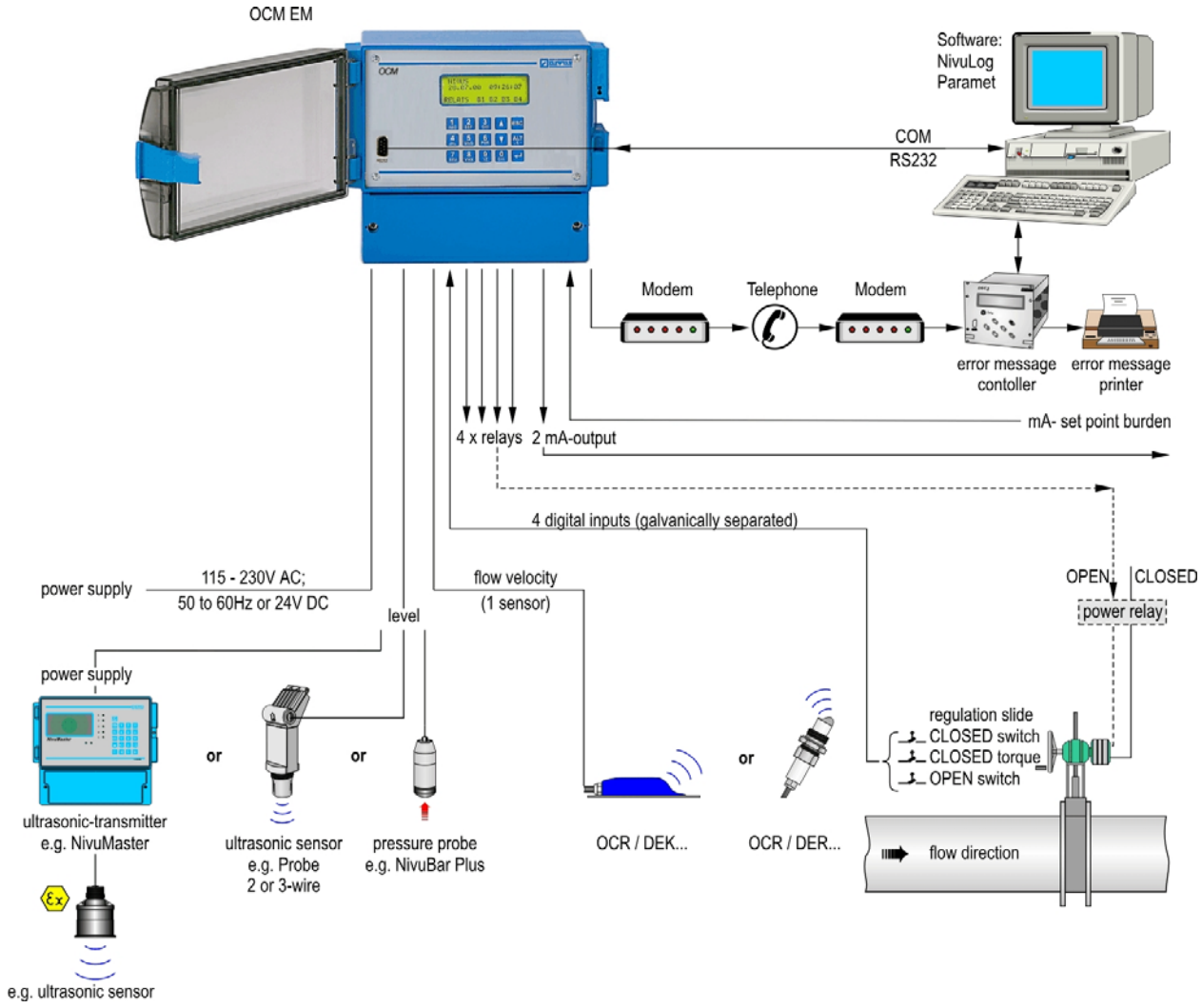


Figure 3. Combination possibilities of the measurement technique

2.4 Electromagnetic compatibility (CE)

Electromagnetic compatibility and disturbance radiation to CE (89/336/EWG) standard.

CE 0032

EMV	Norm	Testing Process	Test Result / Focus
Conducted and radiated emission	EN 55011		A / 3
Genetic immunity	EN 50082-2	IEC 1000-4-2	A / 3
		IEC 1000-4-4	A / 3
		IEC 1000-4-5	A / 3
		IEC 1000-4-8	A / 3
low voltage directives	EN 61010-1		

2.5 Functional principle

2.5.1 General

The OCM EM is a stationary measurement system for flow measurement in low and high suspended solids media with various composition. It is used in partially and fully filled streams, pipes and channels with various geometries and dimensions.
The measurement procedure is based on the ultrasonic Doppler principle. For this it is absolutely necessary that particles be present in the water, which reflect the ultrasound signal from the sensor (e.g. particles, air bubbles, gas).

A separate level/height measurement is required for the calculation of the wetted hydraulic area. For this, an ultrasonic transducer (echo sounding) is used as it is drift-free, easy to maintain and accurate. Difficult applications (e.g. heavy foam on the water surface), uses other types of measurement methods, e.g. hydrostatic pressure measurements. The corresponding measurement procedure for typically unusual conditions have in this case to be taken into account (e.g. it is recommended every 6-months a calibration of the zero for drifting pressure transducers be carried out).
The determined level/height is established as a unit of current signal (0/4-20mA) and accepted by the OCM EM.
Flow cross-sections of full pipes or channels or those defined with a constant level/height don't have to be equipped with level/height transducer. In this case a fixed value of level/height measurement is programmed in the OCM EM.
From the shape and dimensions of the channel and the measured results, the flow and the sum is calculated in the microprocessor of the OCM EM and reported in selected units on the display. The flow and total can be transferred, through the programmable analog outputs and relay contacts, to other recording systems.

For transferring parameters via a serial interface and transfer of readings to a PC or laptop computer, the parameter setting software “PARAMET” is required and available from NIVUS.
The program “NIVULOG” is used for data analysis and transfer directly via a PC.
To transfer the data to a head office with modem through the optionally built-in modem or radio modem with GSM card, requires the software program “NIVUDAT” as well as a separate modem at the head office.
Additionally, to have the ability for the OCM EM with modem or radio modem to transmit alarms and different disturbance reports, an additional disturbance reporting controller of the type “DSC1” is required at the head office as well as disturbance reporting printer with a serial interface. (Also see figure 3)

2.5.2 Flow Velocity Measurement

The flow velocity sensor operates in the Continuous Doppler mode. For this, 2 Piezoelectric crystals at an angle of 45° are embedded in the sensor. The surface of both crystals lies parallel to the slope of the flow velocity sensor, protected by an approximately 1.5 mm of strong sealing compound to protect them from of damaging influences. The piezoelectric crystal 1 works as ultrasound transmitter, piezoelectric crystal 2 as receiver of the reflected ultrasound signal, simultaneously. (see figure 4)

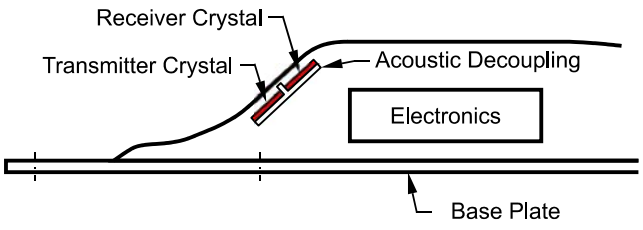


Figure. 4. Construction flow velocity sensor

The sealing compound allows an acoustic coupling of the emitted high-frequency ultrasound signal between piezoelectric crystal/sealing compound as well as between sealing compound/medium. An ultrasound signal at an angle of 45 degrees is continuously transmitted through the medium against the direction of the flow. When it arrives at the dirt particle, air bubbles etc., this ultrasound becomes a part of the sound energy reflected and can be remodelled in an electrical signal by the receiver crystal.

By the movement of the reflection particles with respect to the acoustic source the ultrasound signal is shifted in its frequency. The shifted frequency is directly proportional to the movement of the particles in the medium and hence, to the velocity of flow.
The received reflection signal is evaluated with respect to the frequency moving in the sensor and submitted to the measurement transmitter in a changed signal form for evaluation.
A frequency mixture results from various velocities of flow within the flow profile (from surface waves, whirls, rotation of single reflection particles etc) and is evaluated by the measurement transmitter by means of special algorithms and the average velocity of flow determined.
Since no local assignment of the measured velocity can be measured in hydraulically varying sites, it is required to calibrate every measurement site using a different measurement method, in accordance to VDI/VDE guideline 2640.
For this calibration, NIVUS recommends the portable velocity meter type "PVM/PD", or a suitable selective velocity gauge like the winged wheel instrument.

2.5.3 Limitations

The operating conditions for the OCM EM are limited by the limiting values of the technical data for sensors and measurement transmitter, the measured medium as well as the hydraulic conditions.

Technical limitations:

- Please, take into account here the temperature limits, Atmospheric humidity, electromagnetic disturbances, measurement ranges etc. You find technical details in chapter 2.1; 2.4 and 3.2.

Limitations of the measured medium:

- The method used is the Doppler principle based on reflection of the transmitted signal. Pure media like boiler food water, gas-less drinking waters and the like don't cause any reflections. A velocity of flow measurement with Doppler ultrasound isn't possible in such media therefore for physical reasons. The minimum particle size (e.g. air bubbles or feast substances) and particle quantity are indicated for the respective sensors in the technical data in chapter 2.1.
- For the used materials resistance lists, they are listed in chapter 9. When required more detailed lists are available from NIVUS.
- Abrasive media lead to mechanical wearing of the sensor. Particularly, at high velocities and heavily particle laden medium, the sealing compound of the velocity sensors can be easily damaged and destroyed.
- With foam formation on the water surface, it causes measurement errors when using an ultrasonic level sensor, due to poor reflection of ultrasonic signals.
- When using a hydrostatic pressure sensor, the specific gravity of the measured medium has a direct influence on the level/height measurement. The pressure sensor is referenced to the specific gravity of pure water. In measured media with heavily changing particles, it can lead to measurement errors.
- To determine the correct level/height with a pressure probe, only the hydrostatic pressure may be measured vertically over the probe. In fast flowing medium, an additional dynamic pressure component, which can distort the measurement result is produced. The relative measurement error is dependent on the magnitude of the velocity of flow and the level/height at that time.
  At velocities of flow of > 2m/s (6.56 fps) and h < 0.3m (1 ft), measurement of level/height using the pressure method has to be rejected.

Limitations due to hydraulics:

- At profile changes, hydraulic jumps, bends, confluences and slide in front of or after the mounting position of the sensors, installation have to be adhered in accordance with the assembly notes for the sensors and their required distances. These cause additional measurement errors for these applications and are not predictable. These can be reduced or, if necessary, even compensated by a calibration on the measurement conditions on the spot.
- Flow changes, streaming/shooting up or turned around may appear at the measurement place. The distance of a flow change to the sensor in this application is dependent on the conditions of velocity of flow, channel roughness, flow height-width relationship and channel shape. In the most favorable case, it is 3 x, channel width but can be fundamentally greater however. A direct judgment of the planned mounting place on the spot in this case is required.

3. Storage and Transportation

3.1 Initial Checks

Please check the delivered products and the invoice immediately after you receive it. You need to check the products for completeness and intactness
Any damages noticed during the transit must be immediately reported to the delivering courier.
You have to report this immediately to NIVUS GmbH / NIVUS America Inc. as well.
For any incompleteness in the delivery of your order, please report in writing to your responsible representative or direct to the NIVUS GmbH Eppingen/NIVUS America Inc within 2 weeks.

Late complaints will not be accepted!

3.2 Storage

The following storage conditions have to be complied with:

Measurement Transmitter:	max. temperature:	+ 60°C (140 F)
	min. temperature:	- 20°C (4 F)
	max. damp:	80 %, non-condensing
Sensor:	Max. temperature:	+ 60°C (140 F)
	Min. temperature:	- 20°C (4 F)
	max. damp:	100 %

The OCM EM must be protected from corrosion or steams from organic solvents, radioactive radiation as well as electromagnetic radiations.

3.3 Transportation

Sensor and transmitter are made for rough industrial use. It should be nevertheless protected from strong pressures, blows, tremors and vibrations.
The transport must be carried out in the original packaging.

3.4 Return

All returns must be in the original packing (freight prepaid) to NIVUS GmbH/NIVUS America Inc
(See >notes to the user<, page 5)
Insufficiently paid shipments, will not be accepted by NIVUS!

4. Installation

4.1 General

For electrical installation, please comply with the regulations VDE 0100 or local regulations.

The power supply of OCM EM has to be protected separately with 6A slow-blowing fuse. Also it has to be protected independently of other parts in the plant. (separately disconnectable, e.g. by automatic cut-outs with characteristics “B”)

All outside electrical circuits, cables and lines, which are connected to the equipment, must have an isolation strength of min. 115V
The cross section of the network (mains) cable must have min. 0.75mm² and correspond to IEC 227 or IEC 245.
The maximum permitted switching voltage at the relay contacts must not exceed 115V.

4.2 Assembly and Connection Measurement Transmitter

4.2.1 General

The place for the transmitter mounting must be selected following a definite criteria.
Avoid:

- direct solar radiation
- Objects which radiate strong heat (maximum environmental temperature: +40°C (104 °F)
- Objects with strong electromagnetic field (frequency transformer etc..)
- corrosive chemicals or gasses
- mechanical pressures
- vibrations
- radioactive radiation

The fastening of the wall mount enclosure, depending on place of mounting, must be carried out by using 4 machine screws, which must penetrate at least 40mm (1.5 in) into the wall.
The fastening of DIN rail mount enclosure must be carried out via snap standardized track type C 35 x 7,5.

4.2.2 Dimension measurement transmitter OCM EM:

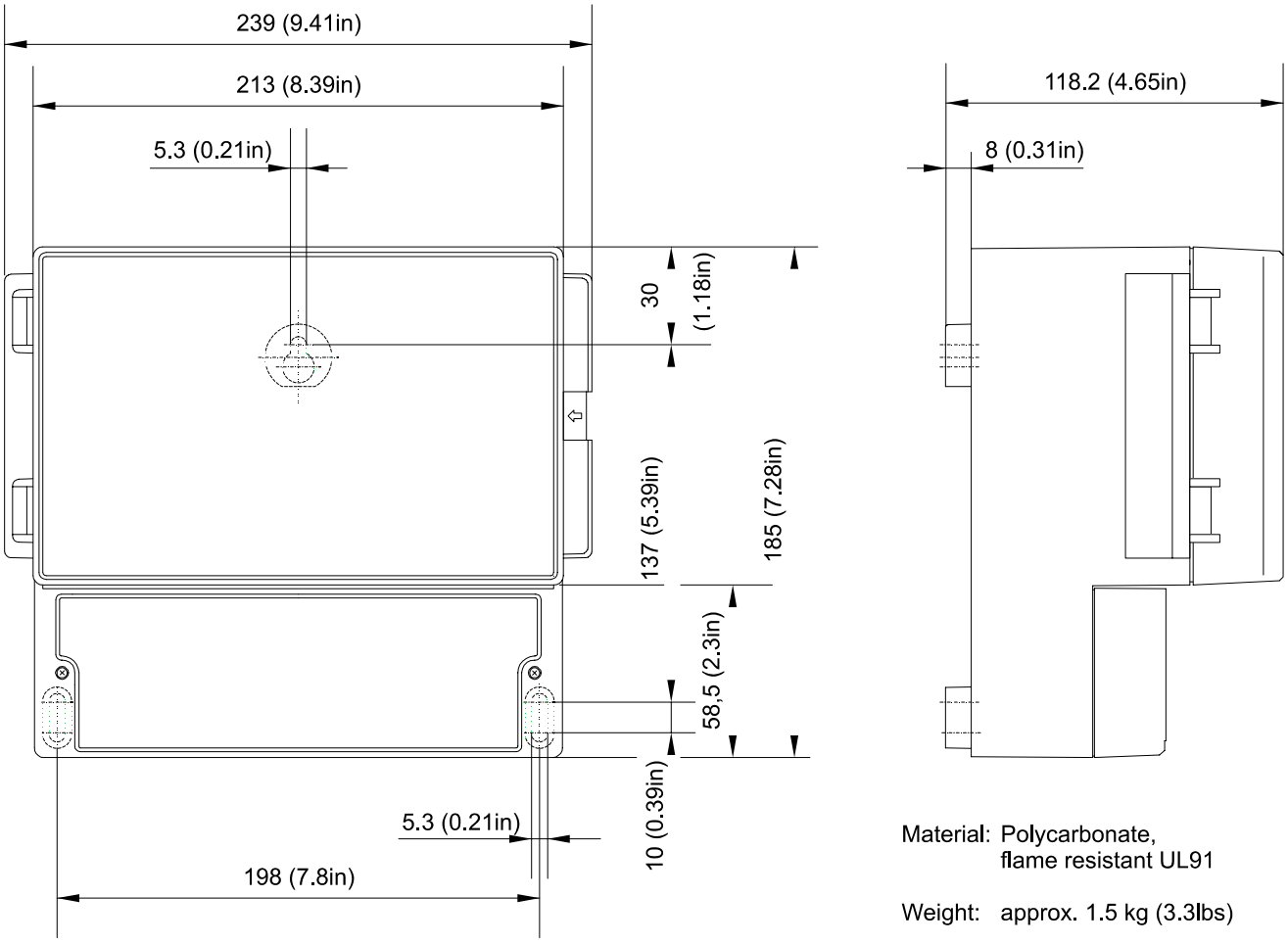


Figure. 5. Wall mount enclosure of OCM EM

There are six knock-out cable entry glands on the OCM EM underside (1 x PG9, 4 x PG11, 1 x PG13,5). Four other entries are on the rear side (4 x PG11). For opening the entries suitable tools must be used. Take care not to damage the circuit board inside whilst undertaking this. Do not use a hammer, as this may cause damage to the enclosure.

Cable glands which guarantee the protection rating of the enclosure (IP65 / NEMA 4) must be used.

4.2.3 Connection Measurement Transmitter

General

The clear view door of the measurement transmitter is provided with a protection foil for protection during transport, and from of scratches during assembly. This protection foil has to be immediately removed after the assembly.

Note

If the view door with protection foil has longer direct solar radiation, the foil cannot be cleanly removed.

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

The wall mount is equipped (unlike the other enclosure forms) with additional cable connections and blind plugs. These are partly installed or enclosed with the delivery.
The OCM EM contains the following types:

2 Pieces screws M20 x 1.5
5 Piece screw M16 x 1.5

Following cable cross-sections can be reliably assembled with the enclosed screws:

M16 x 1.5	3.5mm – 10.5mm
M20 x 1.5:	6.0mm – 15.0mm

If other screws are used (other cable diameter) please make sure, that they guarantee the minimum enclosure rating of IP65 (NEMA 4).
Cable openings, which are not needed, please lock by fitting blind plugs.

The transmitter is equipped with 3 types of clamps.
The power supply clamps are solderless lugs. It allows for clamping of one or more wires up to a nominal cross-section of 2.5mm². A screwdriver should be used for the fastening with a blade breadth of 3.0 or 3.5 mm.
All other connections are made as cage train spring clips. Push a screwdriver with 2.5 mm of blade breadth into the upper opening (1). „Tip over“ the screwdriver and the connection opening is opened (2). Now the wire end is inserted into the connection opening (3) now. By pulling out the screwdriver a durable and gastight snap-in connection is achieved.

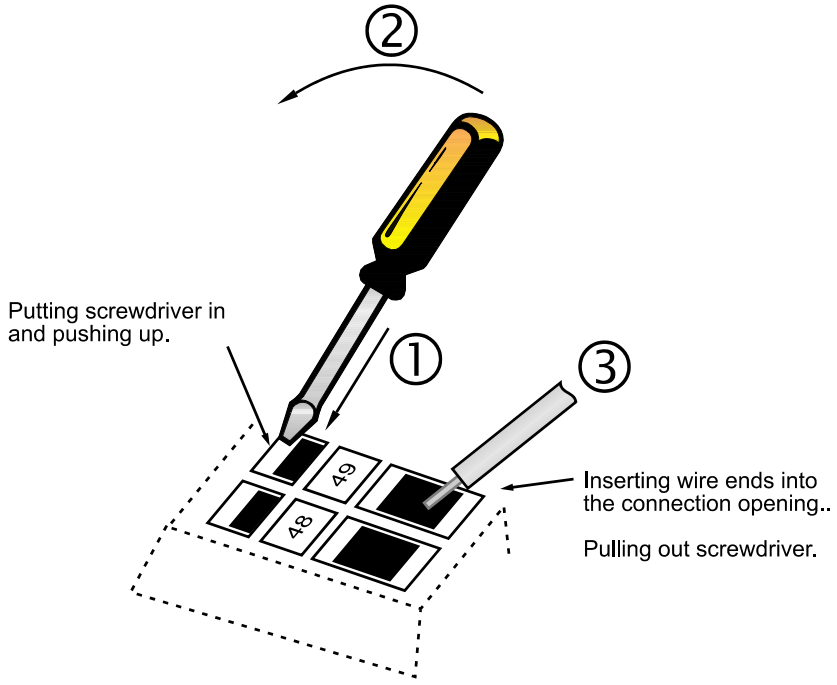


Figure 6. connecting the wires in Cage train spring clips

Cage train spring clips are used in 2 sizes in the OCM EM:
For the relay connections, larger clamps are provided, which can be also be used for one or more wirfes. The nominal cross-sections are up to 2.5 mm ² (fine wire) and 4.0 m ² (one wire) are usable. All other cage train spring clips (digital inputs, analog outputs, sensor connections ...) allows a connection of 1.0 mm ² (fine wiry) or 1.5 mm² (one wire).

Note

Before first connection with the screwdriver, please lightly push the screw of the clamping connection. It sometimes sticks on first use.

Note

Thick- and thin-wire cables which are introduced to the clamps don't have to be provided with wire-end sleeves. This is not important!

The cage train spring clips ensure a durable gastight connection.

The signal cables that exceed the maximum cross-section is automatically reduced by the clip.

Overview Connection Plan OCM EM

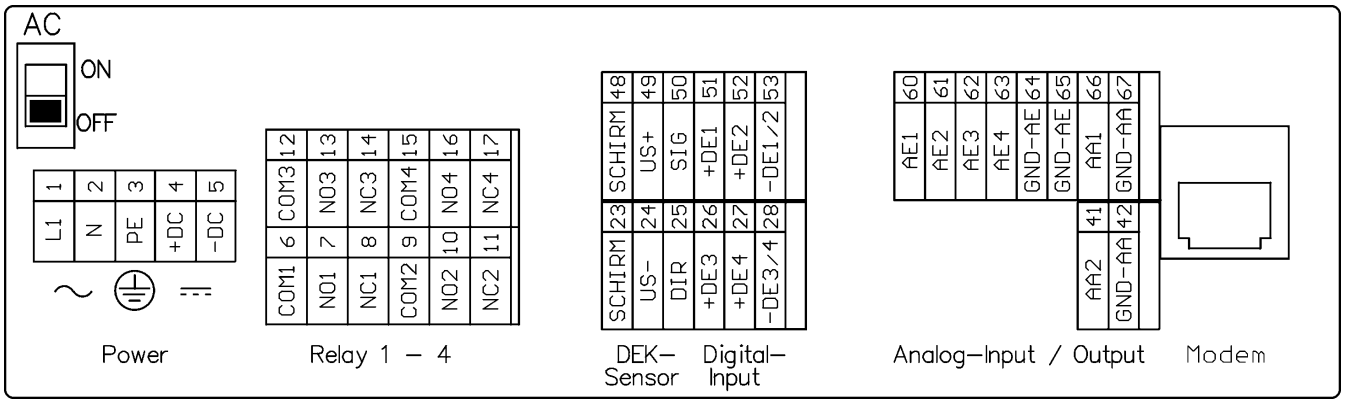


Figure 7. connection plan of the OCM EM

Note

The protection wire clamp must always be grounded (earthed). It is required for internal EMV measurements!.

4.2.4 Connection of Power Supply OCM EM

The OCM EM transmitter is delivered as 2 different types. The distinction is carried out with the item number. (see Figure1)
The two wiper switches situated above the terminals serve as additional one switch.

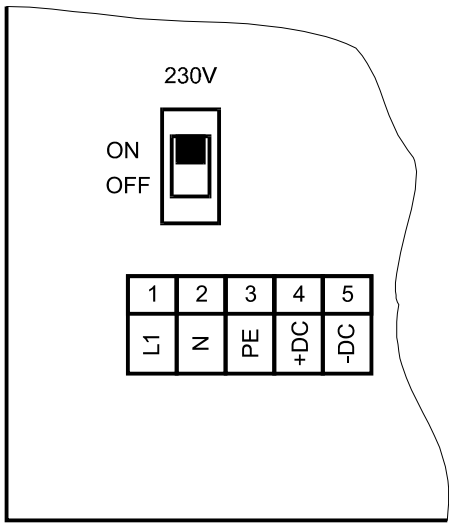


Figure 8. Position of the wiper switches on the Bus platine

Type >AC< is operated with 115 - 230V and 50-60 Hz. The connection carried out at clamps 1 -3. (also see Figure 8) The type > DC< is with operated 24V DC, +/-15%. The connection carried out (also see Figure 9) at clamps 4 and 5.

A transmitter with 24V DC can not be used with alternating current voltage. Just as it is not possible to use a 115 - 230V AC transmitter with direct current voltage.

When operating with an alternating current voltage, the direct current voltage supply clamps 4 and 5 provides a voltage of 24V and max. capacity of 120mA. Please note, when using this supply voltage (e.g. for digital inputs with control signals), it must not be shielded through the complete switchgear, for keeping disturbing couplings low, if possible.

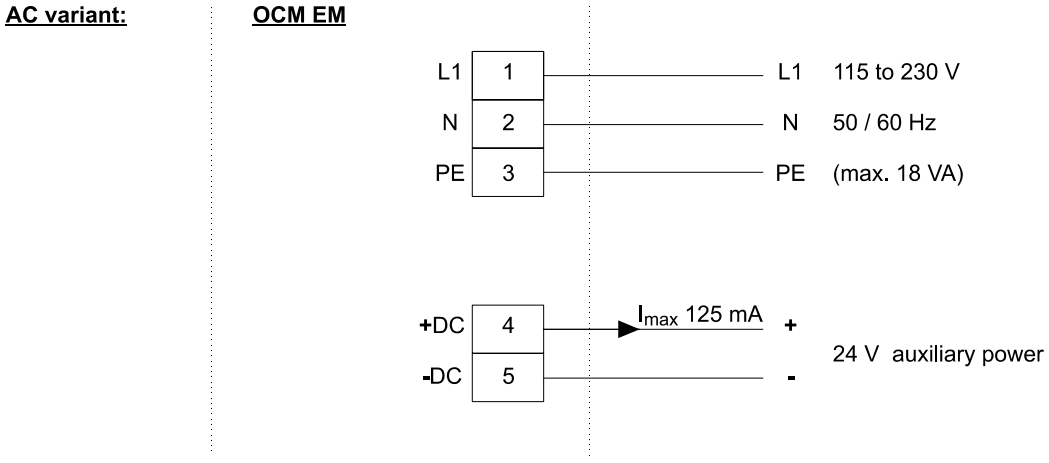


Figure 9. connection OCM EM, Type „AC“

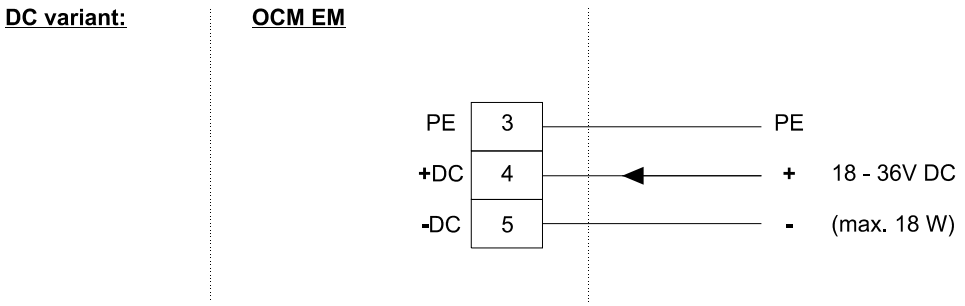


Figure 10. connection OCM EM, Type „DC“

4.3 Connection of Sensors

4.3.1 General

The sensors have to be fastened hard and tight. The inclined side of the velocity sensor must „look“ (face) against the flow direction of the medium. Use only non-corrosive fastening material!

The nipple ring of the insertion sensor deforms during the assembly. You can use it only once! Required substitute nipple rings have to be obtained from NIVUS America Inc.

For avoiding disturbances from electrical interferences, the sensor cable must not be laid close to engine (motor) lines or main power lines.

4.3.2 Sensor Dimensions

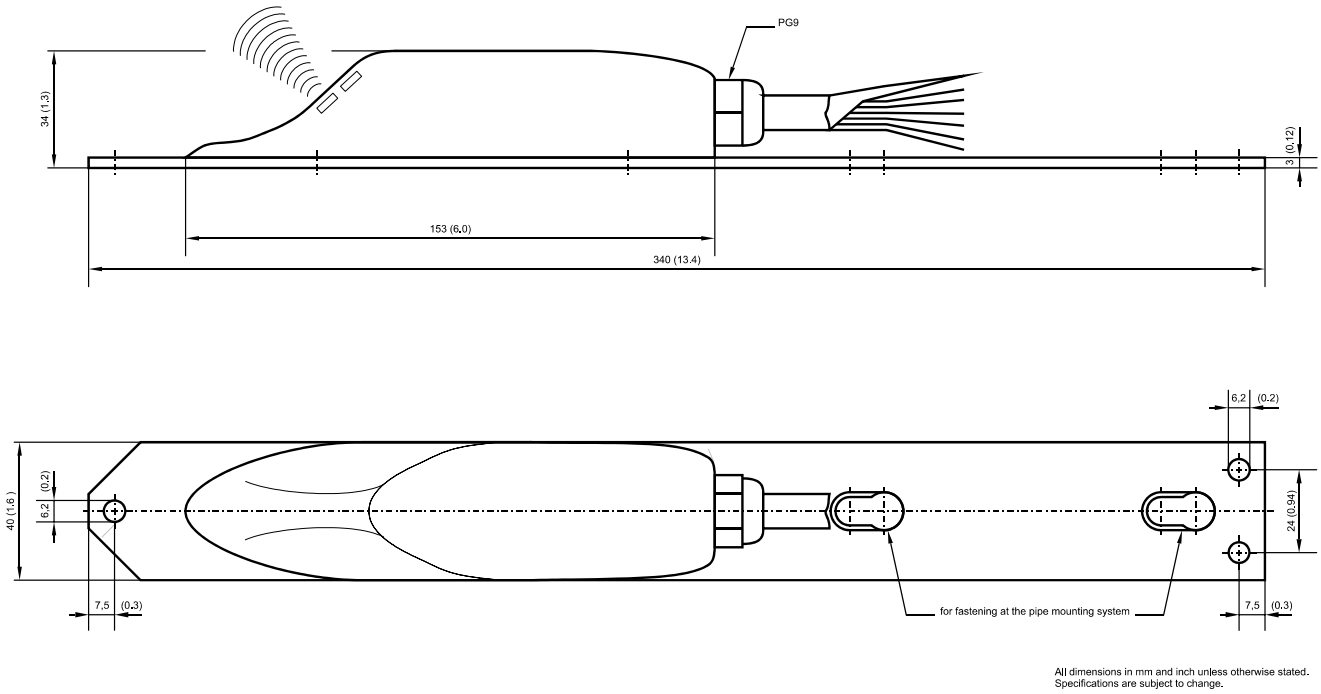


Figure 11. drawing wedge (mouse) sensor

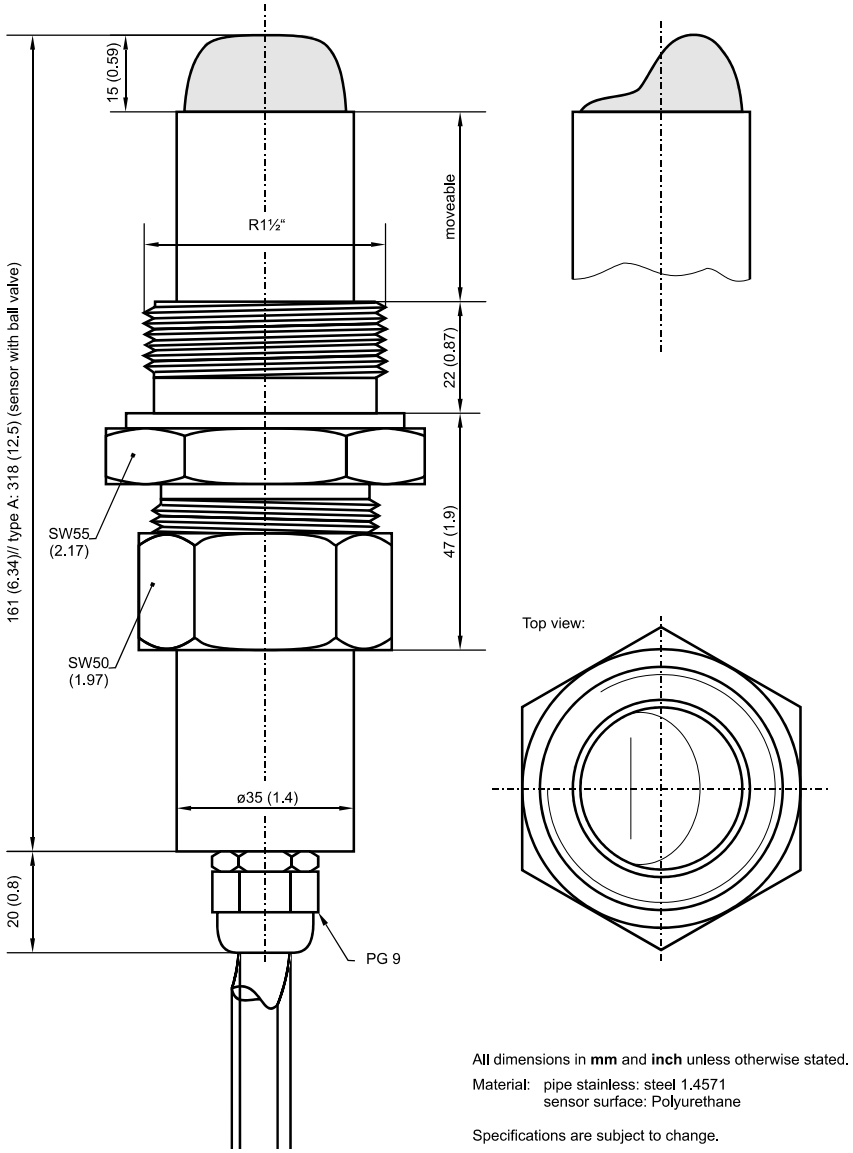


Figure 12. Drawing Insertion Sensor

4.3.3 Sensor Mounting

Wedge (mouse) Sensor

For fastening the wedge (mouse) sensor to the bottom of the channel, 3 screws (stainless steel) are needed.
The stainless steel screw on the sensor front (reduction of whirl formations) use a round head screw!
The sensor must be installed in the middle of the channel (if not arranged differently), Using the wedge (mouse) sensor with height (depth) measurement from bottom up, an absolutely horizontal mounting has to be undertaken (+/- 2 °).
The sensor shape is flow optimized for reducing the risk of build-up. Nevertheless, a risk of build-up is still possible at the sensor plate. For this reason, there mustn't remain any opening between sensor plate and bottom of the channel!

For mounting a sensor the at the bottom of channel, it must be flat (plane surface). Otherwise the sensor may break! It could be leaky!

Better would be to mount the sensor to a depth of max. 12mm (0.5 in). (Reduction of the least measurable height (depth) as well as reduction to the risk of build-up). When you have finished the sensor mounting, please fill the remaining columns with durable elastic material (cement…).

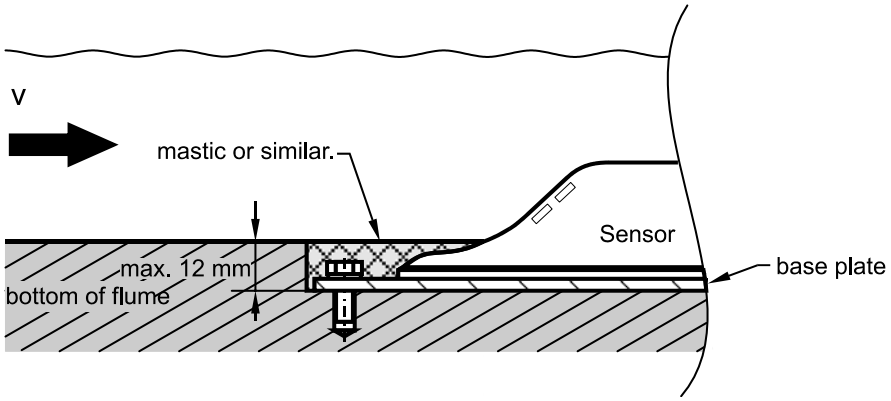


Figure 13. Mounting Suggestion for Wedge (mouse) Sensor Under the Floor

The sensor cable has to be installed on the bottom of the channel and covered with a thin stainless steel sheet to the channel wall.
As well you can make a cut, where the cable can be buried in. After that cover it with durable elastic material.

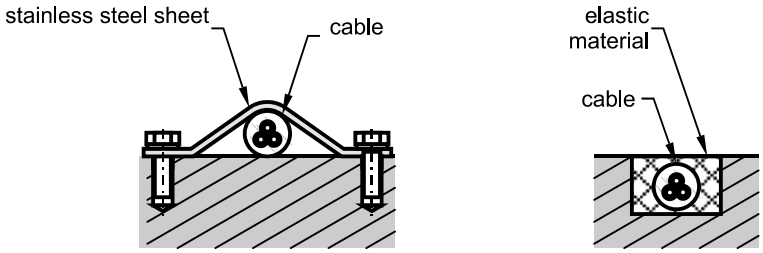


Figure 14. Mounting Suggestion for Laying Cable

Caution

The cable must not be laid in bulk under any circumstances, even unprotected or exposed to the media. Risk of build-up, sensor- or cable breaks!

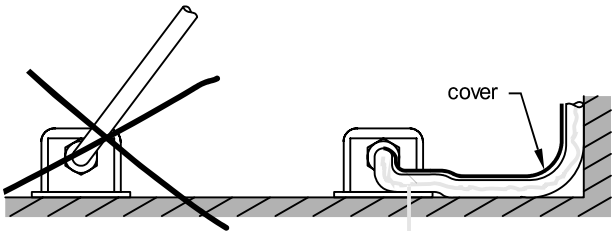


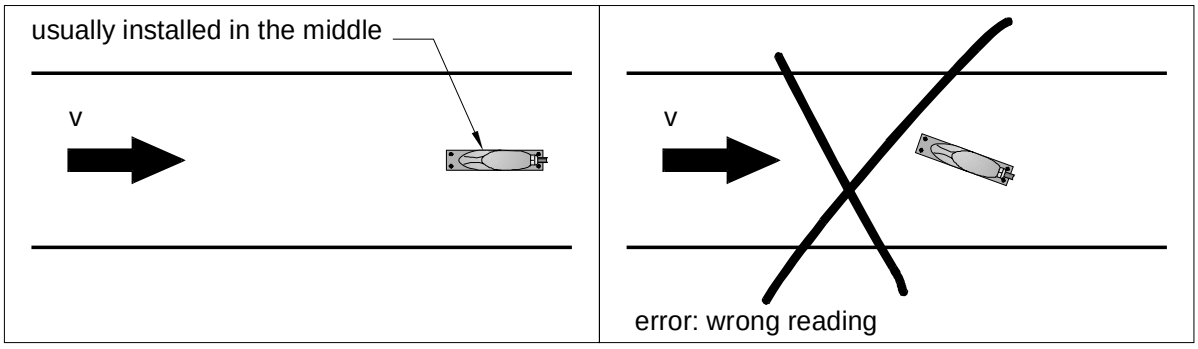
Figure 15. Notes for Laying Cable

Note

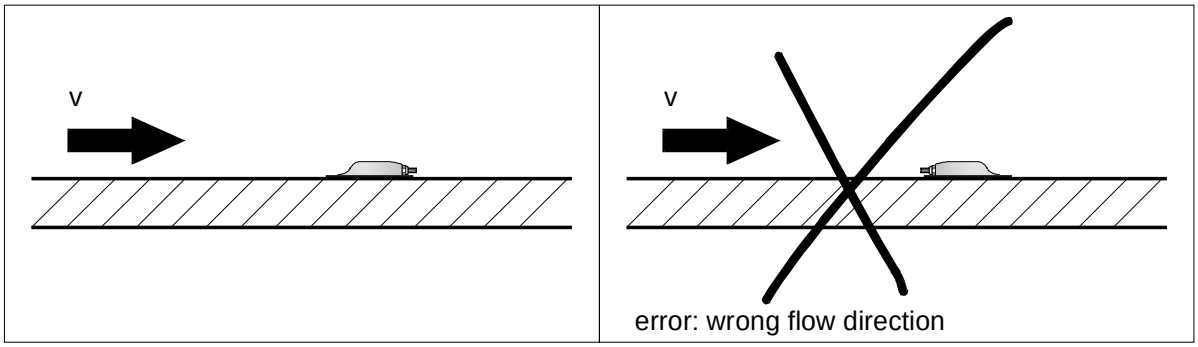
The minimum radius for bending the sensor cable is about 10cm (3.94 in). Failing this may result in a cable break!!

For installations at the bottom of the channel, please note the following :

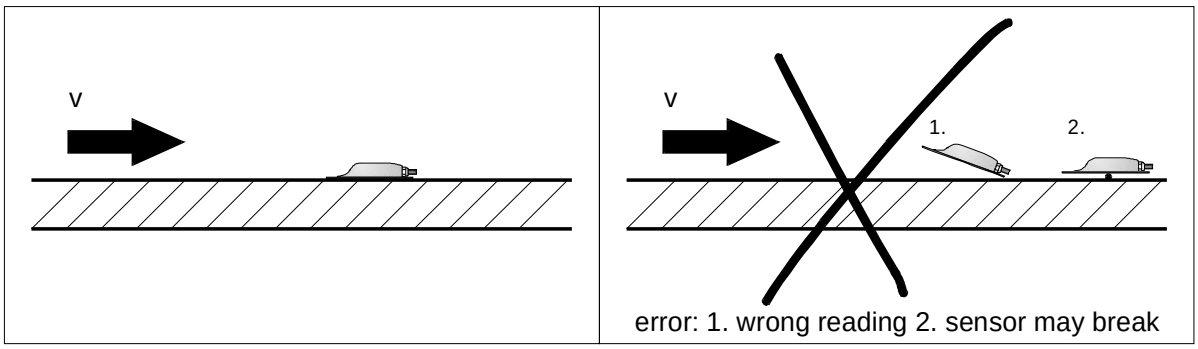
- installation must be parallel to flow direction



- Installation must be against the flow direction



- Installation must be parallel to the bottom



- Cable installation

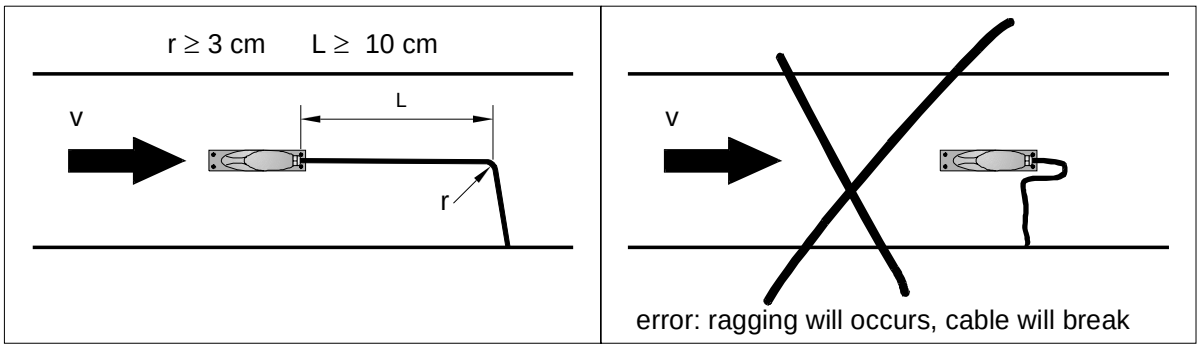


Figure 16. Mounting Notes for Flow Velocity Sensors

Insertion Sensor

The insertion sensor is screwed in tightly by nipple ring and pipe nut (additional option: ball valve for changing and control, during the operation) in the 1½" socket.
Important for mounting is that the horizontal part of the sensor must be installed flush with the pipe wall.

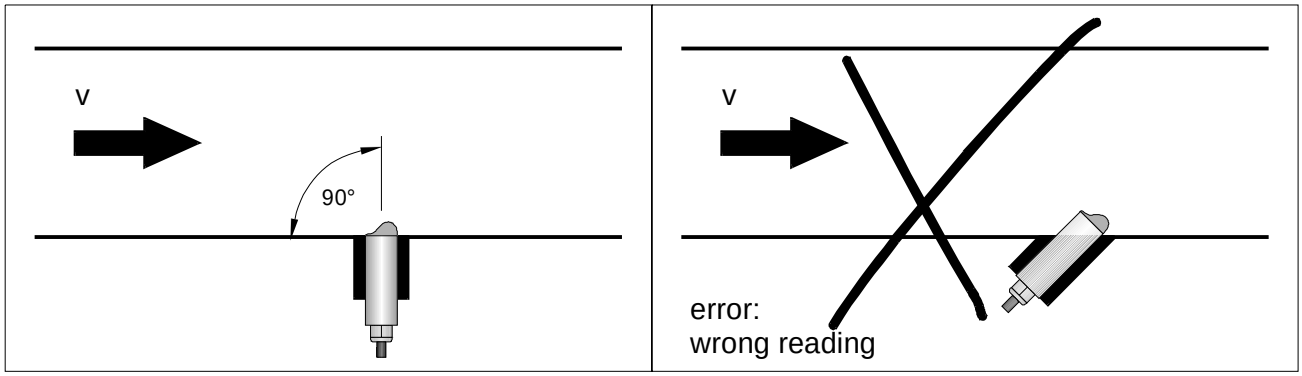
Note

When assembling the insertion sensor, a special grease-paste must be used for the stainless steel couplings, specified to DN 2353 (or equivalent). e.g. grease-paste 325-250 from Volz GmbH.

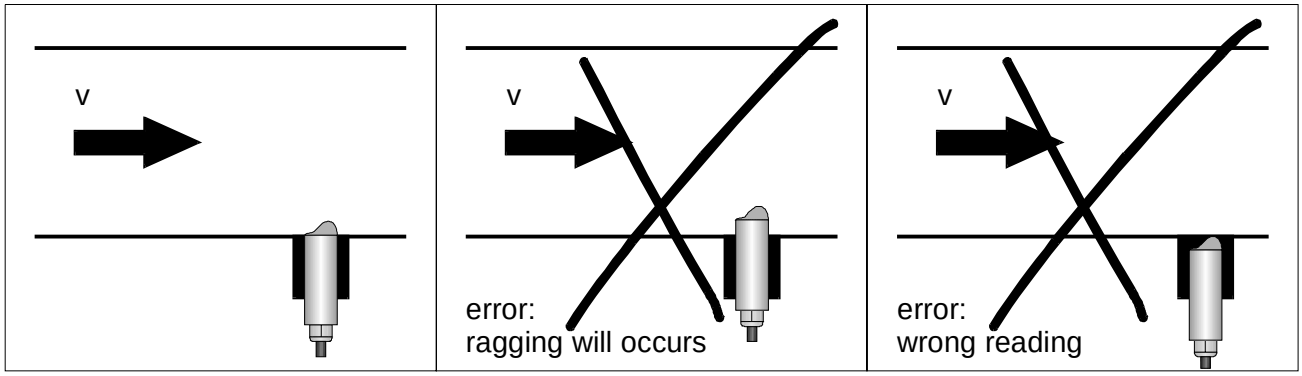
The cap nut thread, threads and cone as well as the cutting ring must be greased when pre-assembling the insertion sensor!

For the sensor installation inserted into pipe, please note the following:

- Nozzle 1½" in an angle of 90°



- Step or obstruction mounting



- transmission level 90° to the flow direction

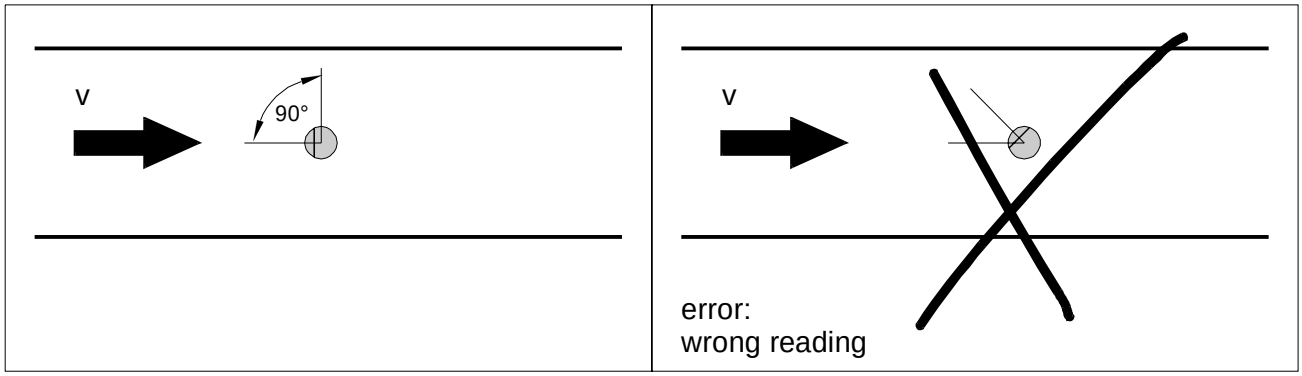


Figure 17. Mounting Notes for Pipe Sensors

For installing the sensor, the tapered side must be installed against the flow direction. (Figure 16).

For mounting in pipes with an ultrasonic level measurement device, please note the following:

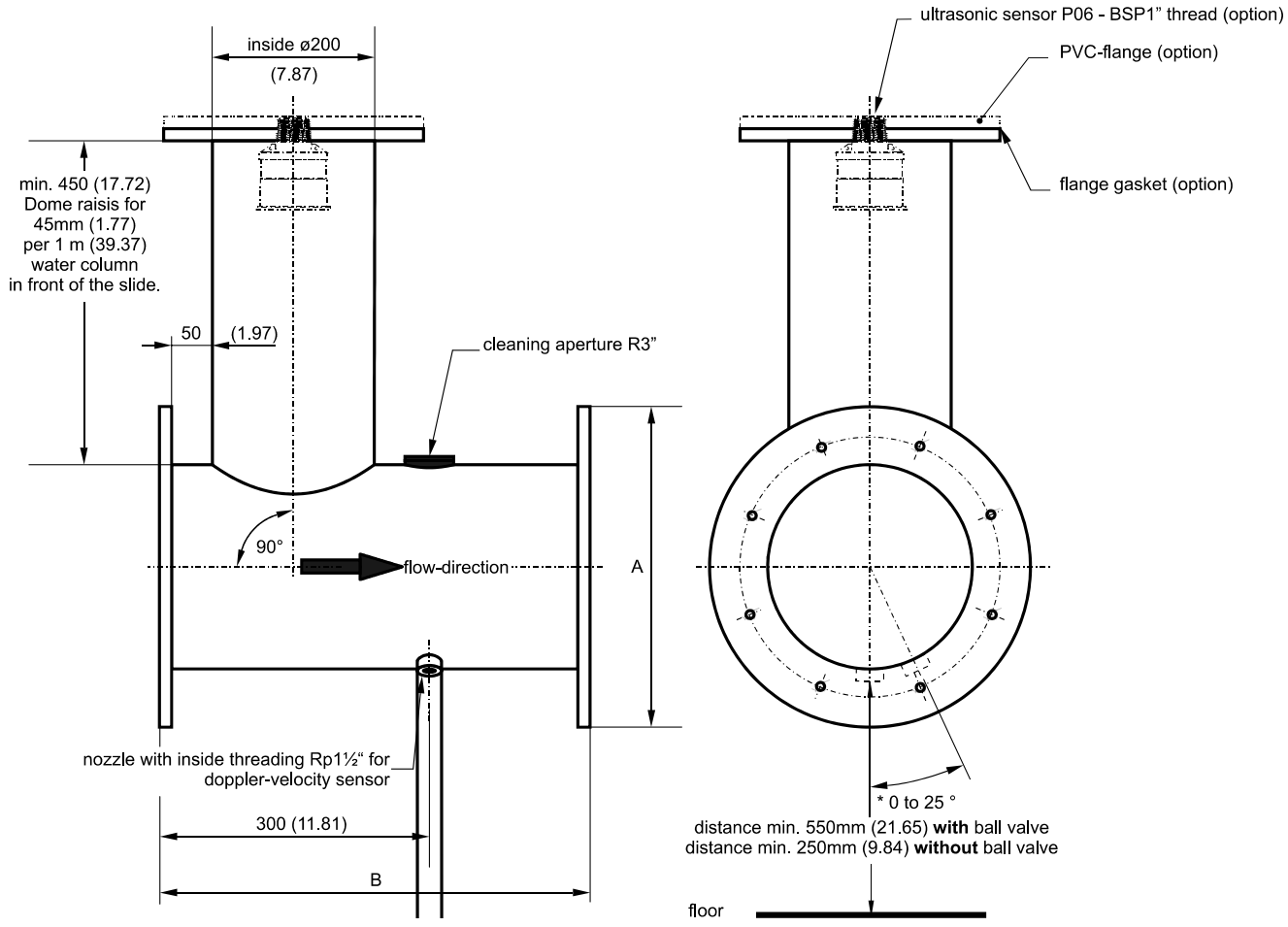


Figure 18. Pipe Measurement Section

*Nozzel
A second nozzle must be attached between 22 -25° outside of the bottom to be capable of screwing in the sensor at the side in case of sanding up.

- welding neck flange / nominal pressure PN10: placing of screw holes to DIN 2501, PN10
  - galvanized steel to DIN 2632, PN10
  - stainless steel VA4 (material 1.4571) similar DIN 2576 with reduced material thickness (t = 20mm (0.79))

- Dimensions of pipe measurement section (see Figure 18)

inside diamter		A		B		no. holes	ø holes		hole circle ø	
200	7.87	340	13.39	500	19.69	8	22	0.87	295	11.61
250	9.84	395	15.55	500	19.69	12	22	0.87	350	13.78
300	11.81	445	17.52	500	19.69	12	22	0.87	400	15.75
350	13.78	505	19.88	500	19.69	16	22	0.87	460	18.11
400	15.75	565	22.24	750	29.53	16	26	1.02	515	20.28
500	19.69	670	26.34	750	29.53	20	26	1.02	620	24.41
600	23.62	780	30.71	1000	39.37	20	30	1.18	725	28.54
700	27.56	895	35.24	1000	39.37	24	30	1.18	840	33.07
800	31.50	1015	39.96	1000	39.37	24	33	1.3	950	37.40
900	35.43	1115	43.90	1250	49.21	28	33	1.3	1050	41.34
1000	39.37	1230	48.43	1250	49.21	28	36	1.42	1160	45.67
1200	47.24	1455	57.28	1500	59.06	32	39	1.54	1380	54.33

- Min. Dome height is dependent on the form with a minimum:
  h = 450mm + (x * 45mm)
  (x = max. per 1 m (39.37) water column)
- If ultrasonic measurement transducer from another manufacturer rather than NIVUS is used, it is important that the dome height be accounted for. The required dome height from its sensor height must be ca. 120mm(4.72in) and a minimum dead band of 300mm (12 in).
- The used pipe measurement distance has to be installed exactly like in Figure 18 shown.
- If the pipe measurement section is not obtained from NIVUS a clean production has to be taken into account. Flanges, nozzles and the put-on Dome have to be welded on the outside. Welded seams inside lying have to be smoothed out so they are flush to the wall.
- The pressure steps of the used slides, flanges, consolidation and adapter piece as well as the pipes lying in front of and behind these must correspond to the pressure step to avoid heels or changes in the inside diameter of the pipe.
- To prevent sludge in the pipe, the measurement distance behind the pipe may not show any negative grade.
- Incoming pipes, fittings, extension pieces and streaming/shooting up have to be transferred in the same grade or around a change of the flow conditions from the measurement place and avoided at the measurement place.

The inside diameter of the construction must be adhered to strictly. At different pressure steps of the used pipes, flanges, flange connections and fittings, cause cross-section changes, jumps, and falls, in rising flange connections, and disturbing rough welded seams etc. and disrupt primarily the measurement considerably with low flow quantities. There can occur serious measurement errors or even a failure of the measurement.

For the construction of controlled systems the following construction has to be taken into account:

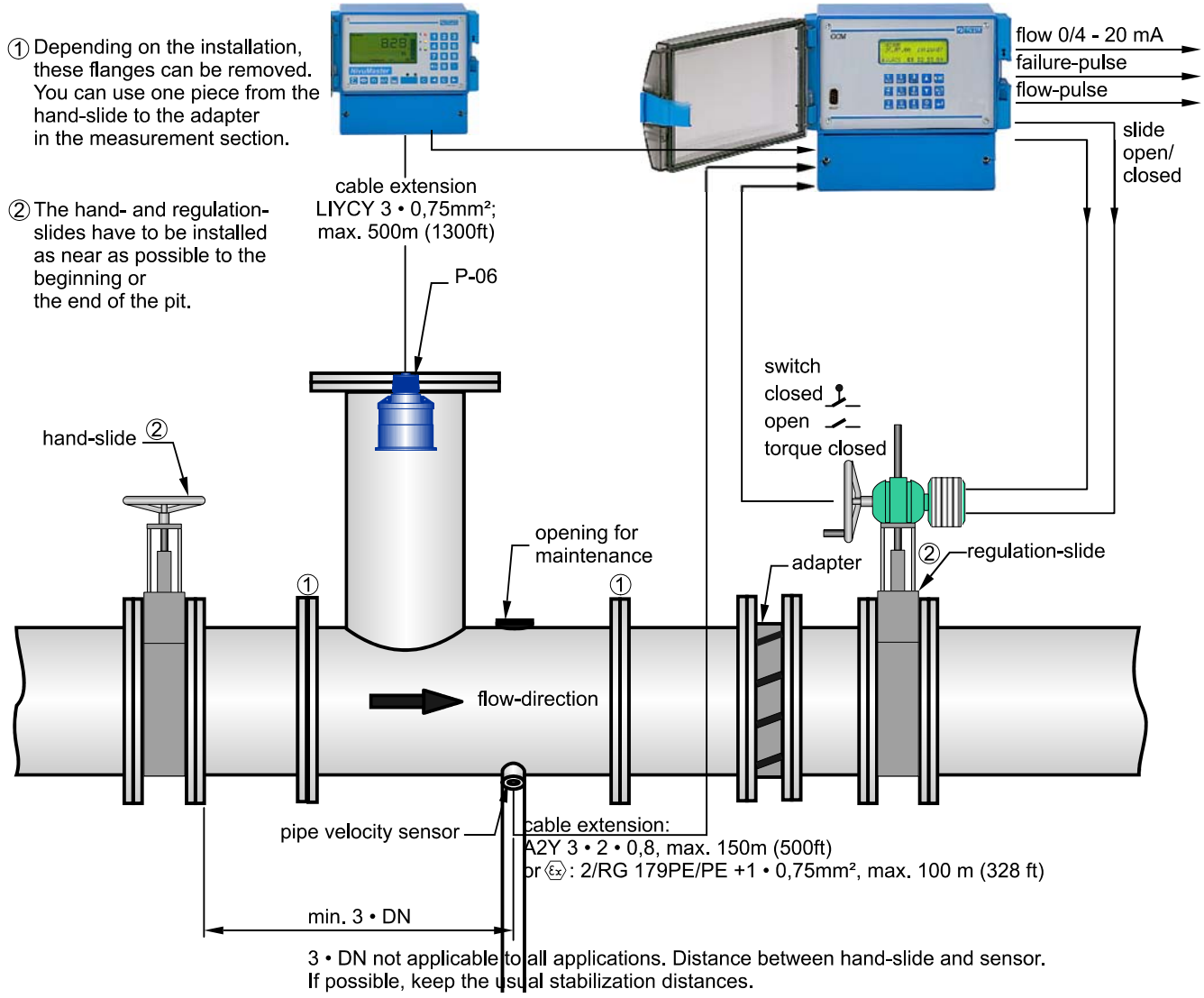


Figure 19. Construction measure-and controlled section

- Regulation slides have to be normally installed behind the measurement. The distance between velocity of flow sensor and rule slide should depending on drain set point at least 3 * DN, improved if it is 5 * DN.
- If the measurement isn't in front of but behind the rule slide, the reassuring distance must be up to the measuring of at least 12* of maximum height in front of the slide. Suitable energy destruction measures have to be taken if necessary. (Installation of baffles like bends, flappers etc.)
- Flow velocities in the regulation range shouldn't fall for reasons of stability below 50 cm/s (0.167 fps). This value has normally to be taken into account during the planning of the measurement distance.

4.3.4 Required Distances

Clear defined, hydraulic conditions are absolutely necessary for accurate measurements.
For this you need to take into account the information regarding hydraulics and their required distances

- Falls, step or obstruction, fittings, profile change of channels or lateral supplies right in front of, or behind the measurement point have to be avoided!
- Measurement place must be selected under normal operating conditions. No deposits! (sand, silt, rubble, sludge). Deposits are possible, when the flow velocity is too slow. Even a too low slope or structural defects can cause deposits to accumulate.
- At the measurement point, avoid changes of slopes.
- The influent measurement distance must be min. 3x diameters, the effluent measurement distance min. 2x diameters. Depending on disturbance of the flow profile, longer distances may be needed.

The following reassuring distances have to be adhered to at a minimum:

- Change of profile

h ≤ 2.5% of Diameter L ≥ min. 3 x Diameter
h > 2.5% of Diameter L = distance to where standing waves do not exist anymore.

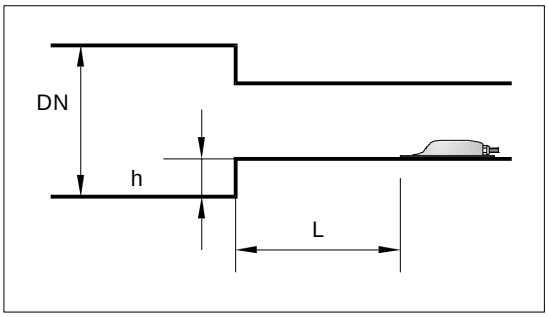


Figure 20. Require Distance after Profile changes

- Curves / Bends

for v ≤ 1m/s (3fps):
α ≤ 15° L ≥ min. 3 x Diameter for v > 1m/s (3fps):
α ≤ 45° L ≥ min. 10 x Diameter L = distance until the surface of the water reaches laminar position.
α ≤ 90° L ≥ min. 20 x DN

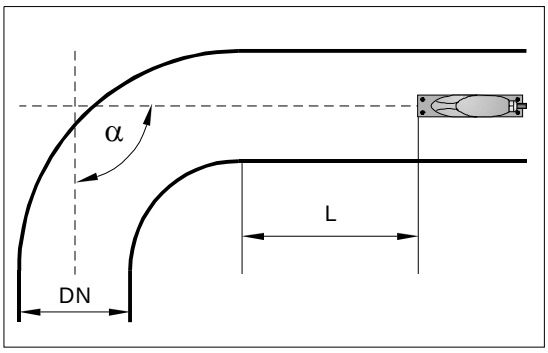


Figure 21. Require Distance behind Curves

- Step or obstruction

h ≤ 2.5% of Diameter L ≥ min. 3 x Diameter
h > 2.5% of Diameter L = distance until a steady flow rises plus 2 x Diameter

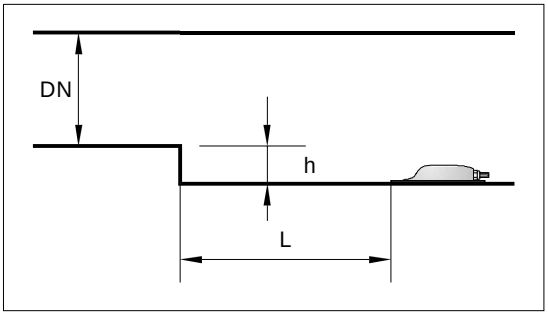


Figure 22. Required distance from a step or drop

- Sensors in front of slide gates

L = 3 x Diameter

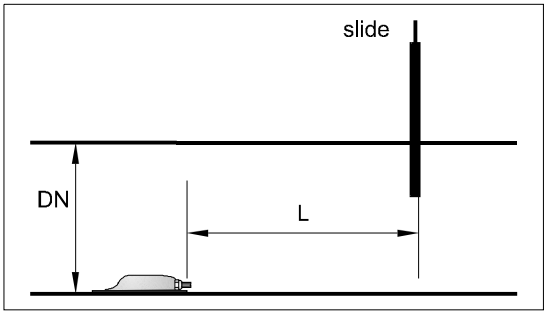


Figure 23. Require Distance in Front of Slide Gates

- Sensors behind the slide gate

L ≥ 12 x h

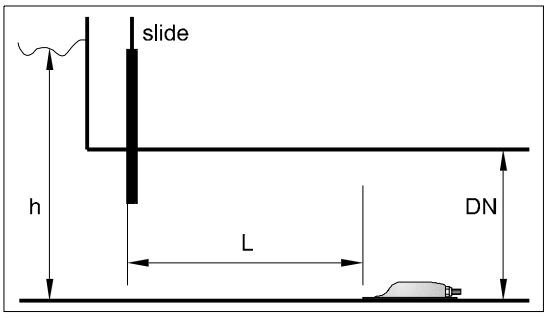


Figure 24. Require Distance behind Slide Gates

When uncertain regarding the choice or judgment of the planned measurement distance, please contact your NIVUS representative or NIVUS GmbH/NIVUS America Inc.

4.3.5 Connection of Sensors

Please, for connection of the sensor observe the following points:

- For the sensors a conventional signal cable comes with 6 singles wires, cross-section 0.34mm² and common shield. It can easily be prolonged (150m, 492ft) with conventional signal cables, like e.g. A2Y 3 * 2 * 0.8mm² or technically equivalent cables. In this case, make sure the prolonged end of the cable is weatherproofed, and write the same sensor type name.
- The prolongation must be via clamp- or soldered connections in a protection castes IP 67 or via corresponding sleeve connection.
- Please order the exact cable length when ordering OCM EM.

Improper connections or use of foreign cable can lead to the disturbance or failure of the measurement

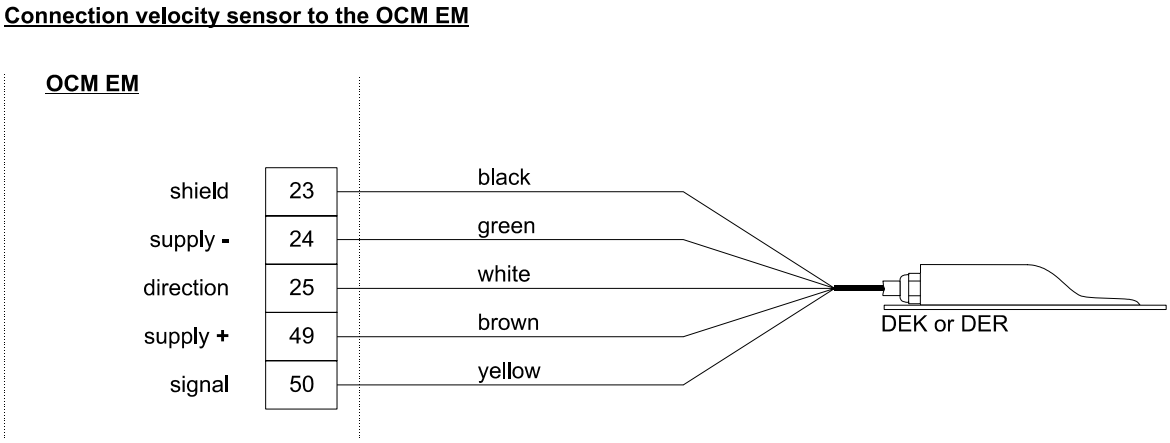


Figure 25. Connection of Velocity Sensor

4.3.6 Level Connection

There are 2 different kinds of connection for including the level measurement with OCM EM.
These are:

- Connection of an external level/ height sensor, which supplies a unit of current signal of 0/4-20mA (Figure 25).
- Connection of a 2-wire-sensor, e.g. NivuBar Plus, Probe etc, which are loop powered to the OCM EM with 4-20mA supplied (Figure 26).
- Connection of level/height sensor from other manufacturers only after consultation with NIVUS.

Please, depending on used sensor type attach according to one of the two drawings listed below.

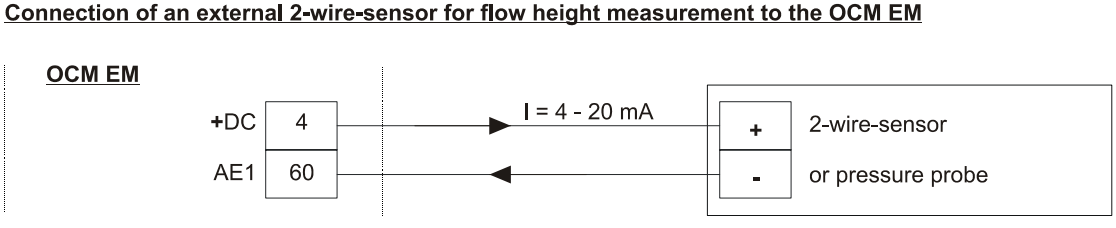


Figure 26. External 2- wire Sensor for level measurement

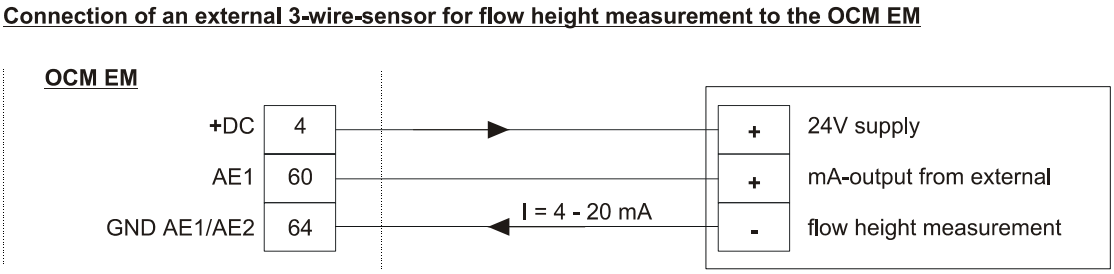


Figure 27. External 3- wire Sensor for Level Measurement

4.4 Connection Analog Outputs

Both analog outputs can give out (velocity, level or quantity) depending on different values.
If the mA-output is led outside a building or a control housing, lightning protection must be used as a protective measure. (See chapter 4.6)

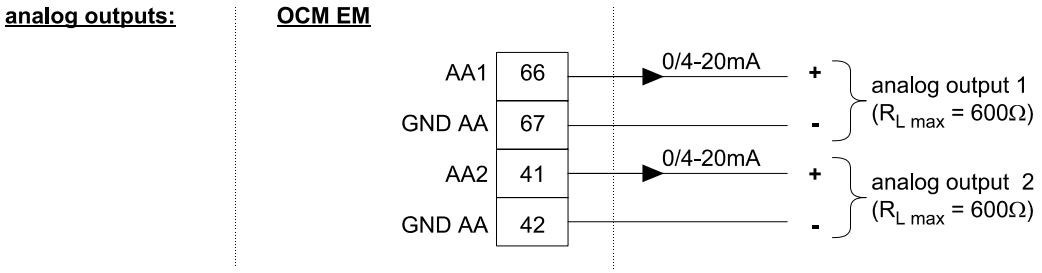


Figure 28. Wiring Diagram of analog outputs

4.5 Connection Relay Outputs

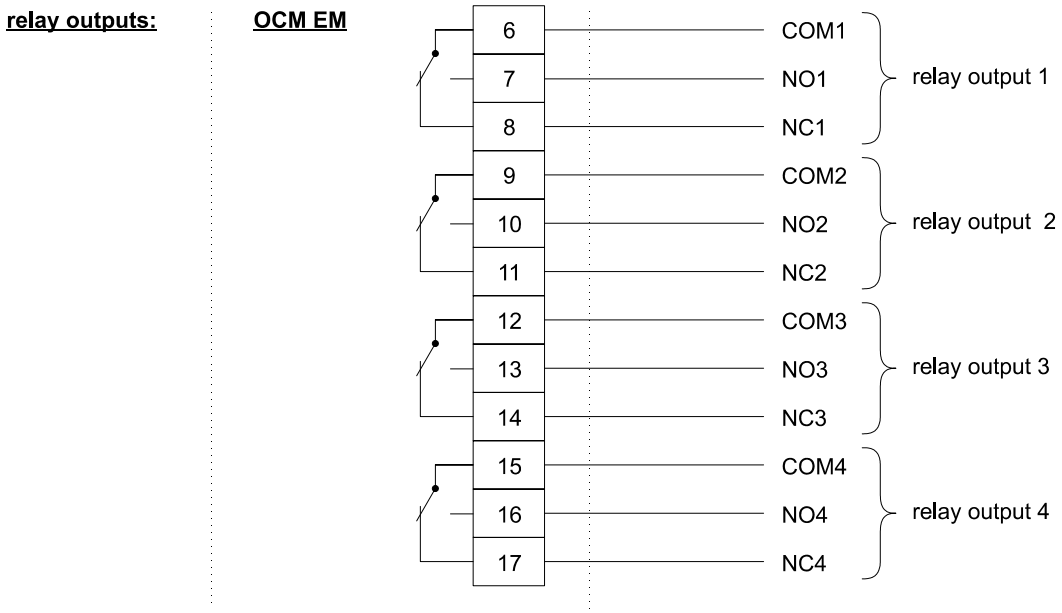
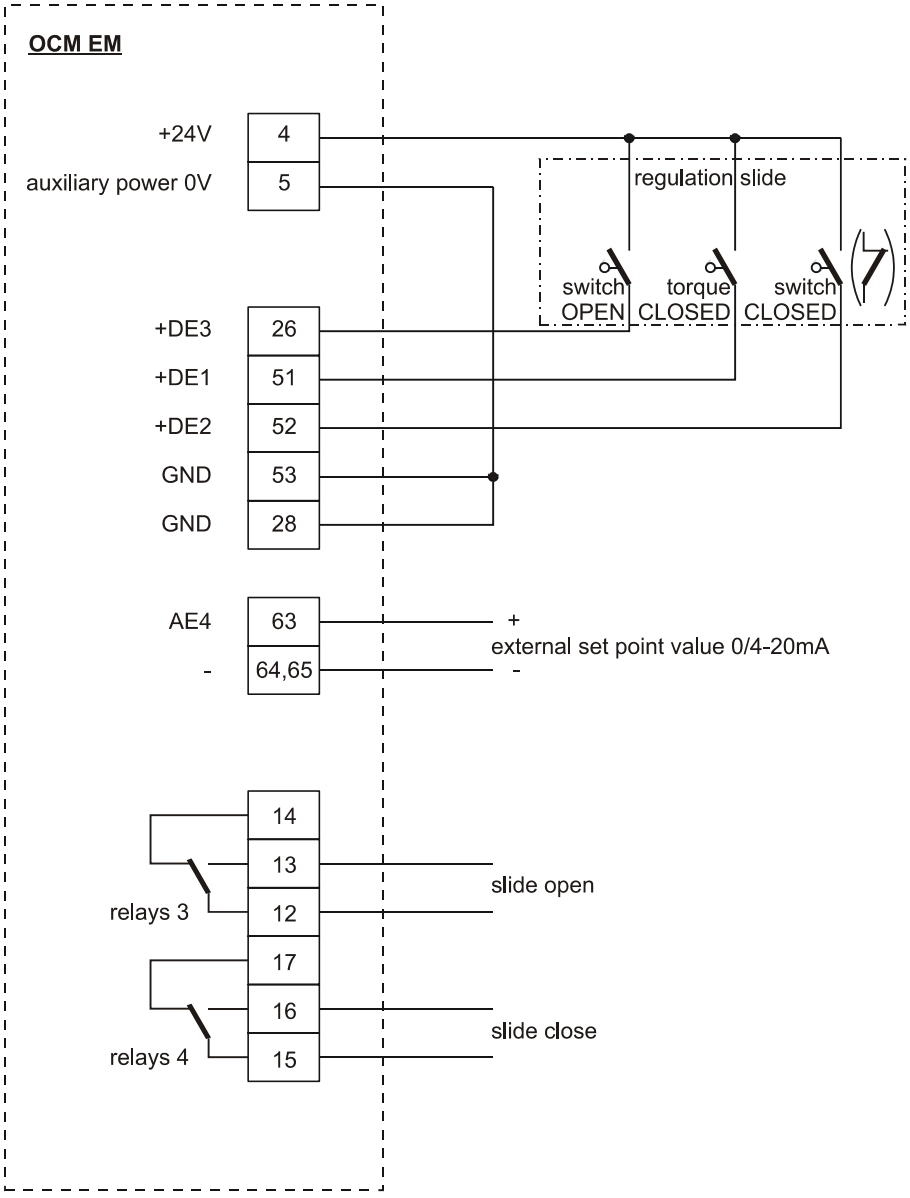


Figure 29. Wiring Diagram of relay outputs

4.6 Regulator Slide Connection

The OCM EM is able to control a slide and to undertake all required rule tasks. For this, the OCM EM besides the firmly adjustable internal set point, contains one of the outside changeable external set point receipt. It is able to copy a PID 3 point step regulator, to supervise slide transfers and to undertake a slide fast end at events starting into a defined position. More details about this operation is in chapter 6.3.2.
At activation of the regulator function, relay 3 and relay 4 of the OCM EM are reserved for the slide drive and cannot be used for other functions.

As shown in Figure 29, make sure that the rule slide has to be steered by relays with possible additional help from manual switch and the corresponding safety technical locks for the connection of slide. These have to be installed technically and the corresponding technical and safety relevant regulations have to be observed.
The power provided by the OCM EM must be separate from the supply-or motor lines, frequency converters and similar disturbing plant parts as well as must avoid disturbing couplings on the gauge transfers with as short as possible manageable distance.



Note: Relay 1 and 2 are not suitable to control the regulation slide.

Figure 30. Wiring Diagram regulator slide

4.7 Overvoltage Protection

For the effective protection of the OCM EM transmitter, it is necessary to protect power supply and mA-output.
NIVUS recommend surge arrestors types EnerPro 220Tr, EnerPro 24Tr (for 24V DC) for the mains supply, as well as for the velocity sensor in non-ex area and mA-output type DataPro 2x1 24/24 Tr for mA-outputs.

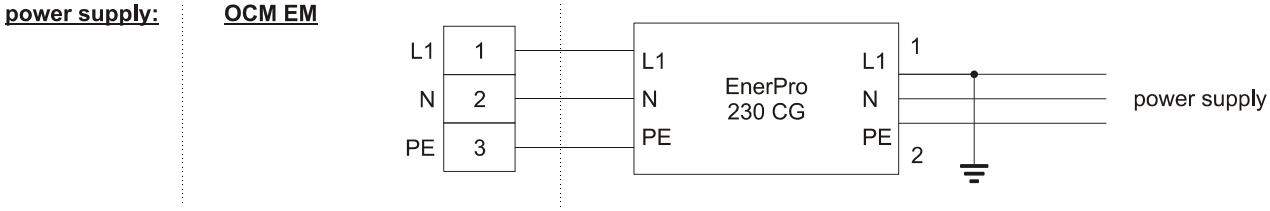


Figure 31. Connection Overvoltage Protection Power Supply

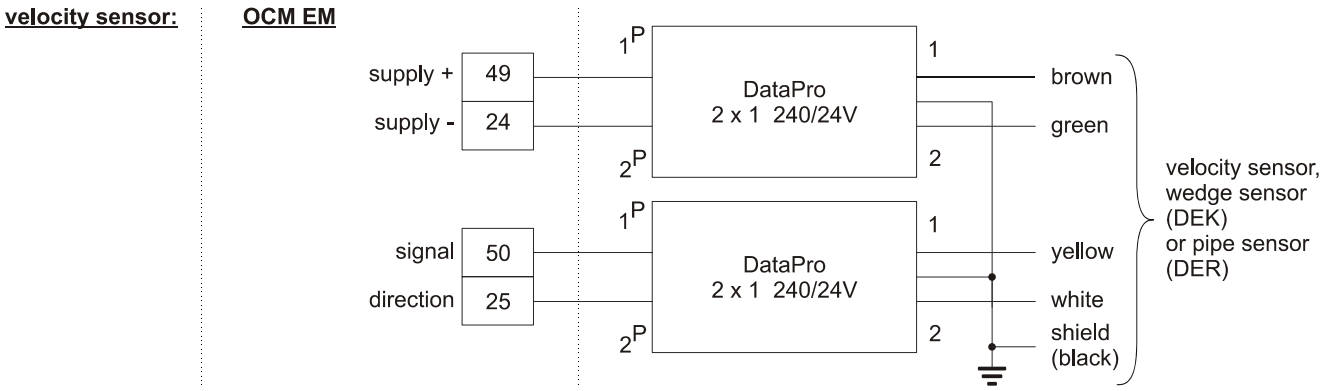


Figure 32. Connection Overvoltage Protection Velocity Sensor

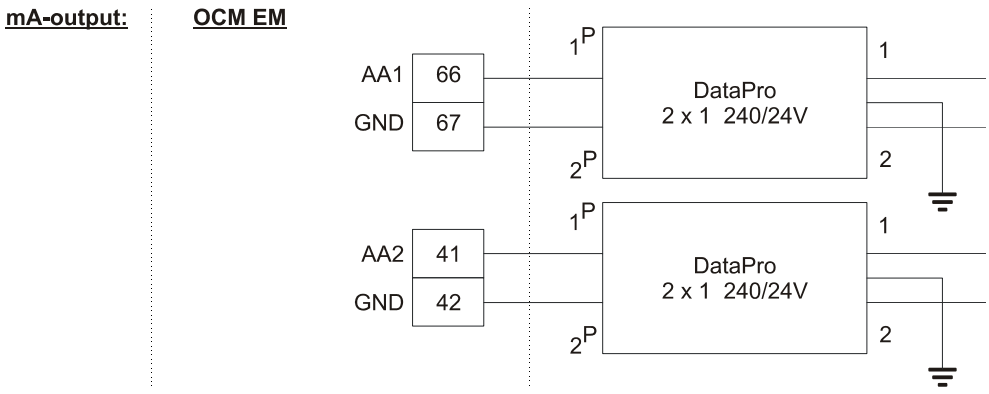


Figure 33. Connection Overvoltage Protection Analog Output

Connection of an external 2-wire-sensor for flow height measurement to the OCM EM

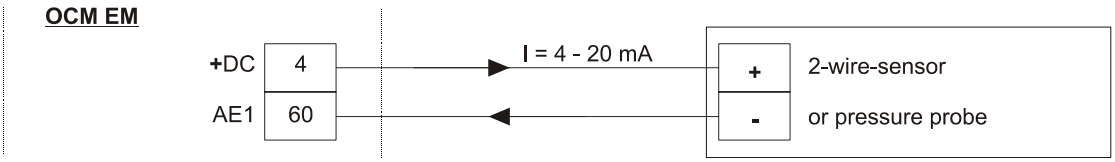


Figure 34. Connection Overvoltage Protection Level Sensor 2-Wire

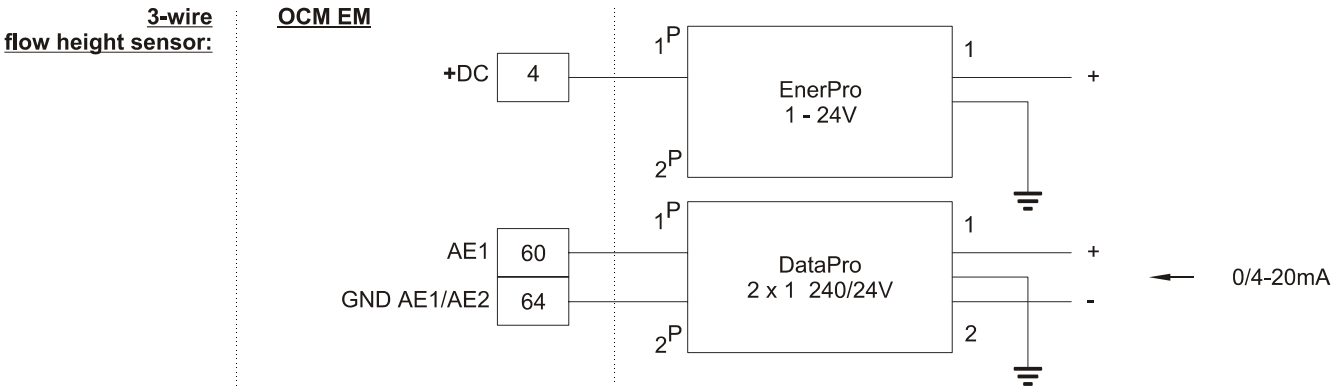


Figure 35. Connection Overvoltage Protection Level Sensor 3-Wire

Please, note the face-down connection of the DataPro for P side of the measurement transmitter as well as a correct, straight power supply.
It is absolutely necessary to ground (earth) the unprotected side.

5. Putting into Operation

5.1 General

After connection of transmitter and sensor (according to chapter 4), the parameter setting of the measurement place must be done.
For this it is enough in most cases to program:

- measurement point geometry
- sensors used
- display
- analog and digital outputs

The separate level/height measurement has to be programmed, if necessary, before. (For a 2-wire sensor with a fixed range and defined zero, e.g. NivuBar plus). This programming isn't part of the operating instructions in this manual. Use the instructions enclosed with the corresponding level/height transducer for this.

5.2 Key Board

For input of required data as well as Data retrieval, check and trouble shooting, a comfortable 15-button keypad is available. For reasons of mechanical and electronic protection the OCM EM has a printed foil (nonabrasive).

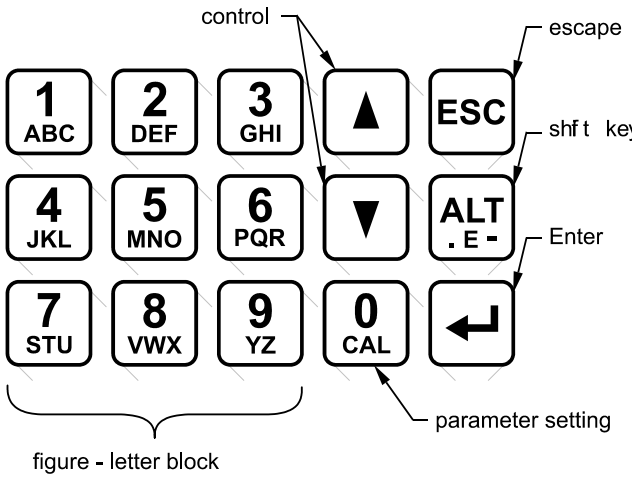


Figure 36. View of the Key Board

5.3 Display

OCM EM has a large 4x20 digits, alphanumeric, back-lit graphic display with a resolution of 128x128 Pixel. This creates a comfortable communication environment for the user.

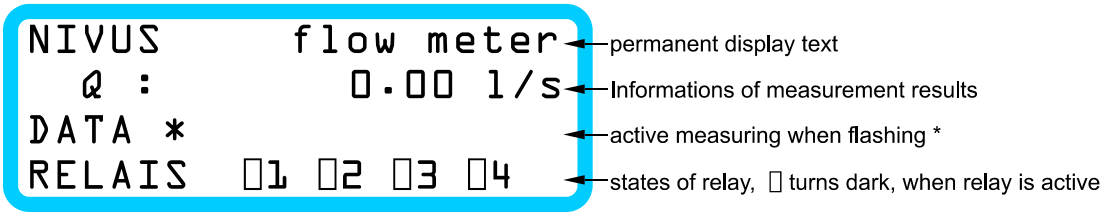


Figure 37. View of the Display

The display changes during the programming. By using the corresponding button activities, different additional information can be retrieved in the operation mode. These functions are further explained in chapter 5.4.1.

5.4 Principles of Operation with Key Board

The operation of OCM EM be carried out via the keyboard and a menu-driven dialog with the back-lit display. It's differs in function in "operation mode" (measurement mode) and "Parameter setting".
Some buttons have a multiple function like signal quality, Meter readings, analog outputs. The information is given in chapter 5.4.1.
All buttons are not used in the programming mode in parameter setting!

5.4.1 Single Functions of the Key Board Keys/Buttons

The single buttons of the keypad of the OCM EM have, depending on operating-or functions, following parameter setting:

1 ABC 2 DEF 3 GHI …

Operation mode: See below

Programming: These buttons have a multiple function. When pressing the button the numeric number appears first. By pushing the buttons again, the corresponding letters can be selected.

0 CAL

Operation mode: Press this button 1 x briefly, the measured level/height appears on the display in programmed units. If you press it 2x, you see the corresponding mA-value.

Programming: The parameter mode is opened to pressing for 4 seconds.

1 ABC

Operation mode: The measured velocity of flow appears at single short pushes in the programmed measurement units; if pressed twice and repeated, Doppler frequency and the signal results SQ0, SQ2, SQ4 SQ6 and SQ8 for corresponding signal qualities appear.

2 DEF

Operation mode: Display of the calculated flow in the programmed measurement units

3 GHI

Operation mode: Display of the meter reading.

4 JKL

Operation mode: (modem re-initialization: only active for internal modem)

5 MNO

Operation mode: This button in operation mode functions only if activated for regulator (option) control. The set point of the flow appears at single button push in the programmed measurement units; twice repeated press the mA-value of the external set point. (only at activated and attached external set point)

6 PQR

Operation mode: This button in operation mode functions only if activated for regulator (option). It appears for the actual value of the flow in the programmed measurement units.

7 STU

Operation mode: This button in operation mode functions only if activated for regulator (option). The deviation (set point – actual value) of the flow appears in the programmed measurement units.

8 VWX

Operation mode: Display of the analog outputs 1/2 in mA.

9 YZ

Operation mode: no function

ALT . E -

Operation mode: no function

Programming: This button serves for the entry of decimal points and negative results. If no value is entered in the select parameter, then this button gives a negative entry. If a value is already registered then activating this button allows entry of a decimal point.

▼

Operation mode: Scrolling through the display to show measured and calculated single results. (Velocity of flow, level/height, total, date + time as well as analog outputs 1 + 2)

Programming: The parameter numbers can be scrolled down to the next parameter. The value entry in the parameter can be deleted to the left of the entries or to the right by pressing this button. (Delete key)

▲

Operation mode: Scrolling through the display to show measured and calculated single results. (Velocity of flow, level/height, total, date + time as well as analog outputs 1 + 2)

Programming: The cursor "_" can be scrolled up to the parameter numbers, for entry of value in the parameter for every activity moved to the right. Through this, single entries of numbers or letters can be entered. (Important for decimal period entry)

ESC

Operation mode: Change to manual operation when active regulator

Programming: The parameter setting mode is exited by pressing this button. (Escape button)

↵

Operation mode: no function

Programming: The entered parameter contents are confirmed by pressing this button. Selection menu jumps automatically to the next parameter for more entries.

6. Parameter Setting

6.1 Principles of Parameter Setting

The programming of OCM EM can be carried out via the RS 232 interface and software program "Paramet", and an interface cable with an integrated panel in the OCM EM or by a PC.
The OCM EM is programmed by parameters and the program contains all parameter contents. These parameters are numbered P0 to P200.
With each parameter number there is a possibility for entering letters or numerical values, -, and for changing any measurement application for the operation of the OCM EM (parameter contents).

Not each parameter (P0 - P200) is in use. Different parameter numbers are for expansions or later additions and not used at the moment.

The parameter setting can be carried out by a maximum of 5 parameter groups, which have to be selected at the beginning of the programming by entry of a number. These 5 groups are:

0 = general parameter
1 = linearisation parameter fh (h)
2 = linearisation parameter fv (h)
3 = linearisation parameter fv (v_measured)
4 = linearisation parameter fv (v_check)

Parameter group 1 – 4 are only used, if in the general parameters (P120 – P123), the entries corresponding to these groups are activated.
It is only possible to select the general parameters in the form it was delivered.
If no button is pressed for 180 seconds, then the OCM EM returns to the operation mode.

Before every new parameter setting, the OCM EM should be returned to its original operation condition. For security reasons, please make a system reset. (P16)

For changing flow conditions and to obtain a higher measurement accuracy, hydraulic calibration of the measurement place (where the channel shape and size is greatly influenced by physical limitations of the measurement principle), is recommended. This is performed with a second, portable velocity meter using a different method of measurement e.g. a NIVUS PVM PD, propeller meters, electromagnetic point velocity meter, or similar and performed under the norms of VDE/VDI 2640. (also see chapter 2.5.2 and chapter 6.5.2) or similar local standards.
The programming of OCM EM for complex conditions should be made by a specialist with extensive knowledge of the programming tasks, difficult hydraulic conditions, special channel shapes, etc. NIVUS Service Centre is available to you for any help in this matter.

6.2 Parameter Setting with Key Board

This method is uncomplicated as it requires neither a laptop computer nor any PC knowledge. Therefore it is the preferred programming method rather than the laptop computer (with PARAMET software and RS-232), which is preferred when programming more than one similar measurement place.

Putting into operation for the first time, proceed as follows:

0 CAL Press the button for at least 4 seconds

The OCM EM displays for approx. 3 seconds:

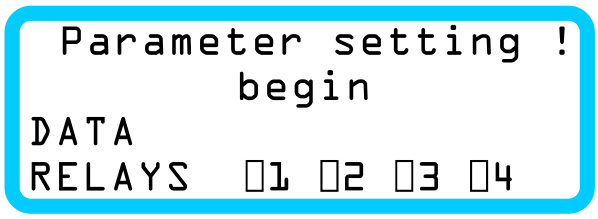


Figure 38. View parameter setting start

then changes to the following display:

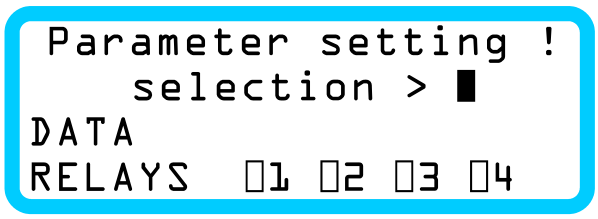


Figure 39. View parameter group choice

0 CAL Type the parameter group of "0" in and confirm with Enter

The OCM EM now display for approx. 2 seconds:

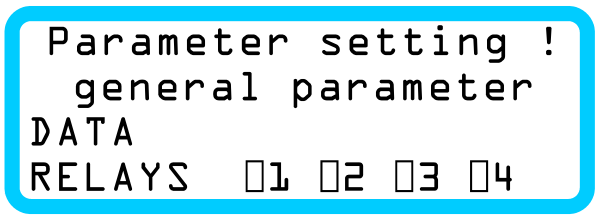


Figure 40. View parameter group indication

and then displays:

Figure 41. View parameter number petition

If you know the desired parameter number block, enter it and confirm and the parameter number to be changed and its parameter contents are displayed. This is, represented in the form for the selected parameter number and the present parameter contents appear in the first line. The second line has a blinking cursor for the new entry or change.
The display appears as:

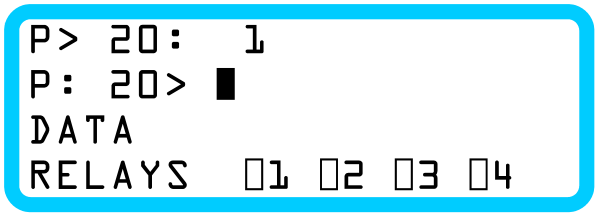


Figure 42. View Parameter contents petition

↵ Type the desired change now and confirm with enter key.

The parameter number accepts the new value. You can now type the next desired number

▼ ▲ or using the up or down cursor keys move the parameters forward or backwards respectively.

ALT .E- You can change to the entry of special signs or letters with the button into the ASCII code.

Enter by selecting the value in the following table for the desired sign.

value	sign	...															FWU\ASCII_01.XLS
32			48	0		64	@		80	P		96	´		112	p	
33	!		49	1		65	A		81	Q		97	a		113	q	
34	"		50	2		66	B		82	R		98	b		114	r	
35	#		51	3		67	C		83	S		99	c		115	s	
36	$		52	4		68	D		84	T		100	d		116	t	
37	%		53	5		69	E		85	U		101	e		117	u	
38	&		54	6		70	F		86	V		102	f		118	v	
39	´		55	7		71	G		87	W		103	g		119	w	
40	(		56	8		72	H		88	X		104	h		120	x	
41	)		57	9		73	I		89	Y		105	i		121	y	
42	*		58	:		74	J		90	Z		106	j		122	z	
43	+		59	;		75	K		91	[		107	k		123	{	
44	´		60	<		76	L		92	\		108	l		124	|	
45	-		61	=		77	M		93	]		109	m		125	}	
46	.		62	>		78	N		94	^		110	n		126	~	
47	/		63	?		79	O		95	_		111	o		127		

Figure 43. ASCII-Table

▼ ESC If erroneous entries are made, you can use one of these buttons to cancel the entry. With this button you also end your programming.

If you don't press any button during the programming for 3 minutes, the programming mode of the OCM EM is automatically exited and it returns to its original mode.

6.3 Programming with Laptop Computer

For programming the OCM EM via a laptop computer you need the DOS software program “PARAMET” obtained from NIVUS or an authorized company or representative, as well as a serial interface cable. Connect the interface cable to the selected COM interface of the laptop computer and the RS-232 port of the OCM EM to start the program. The following appears on the screen:

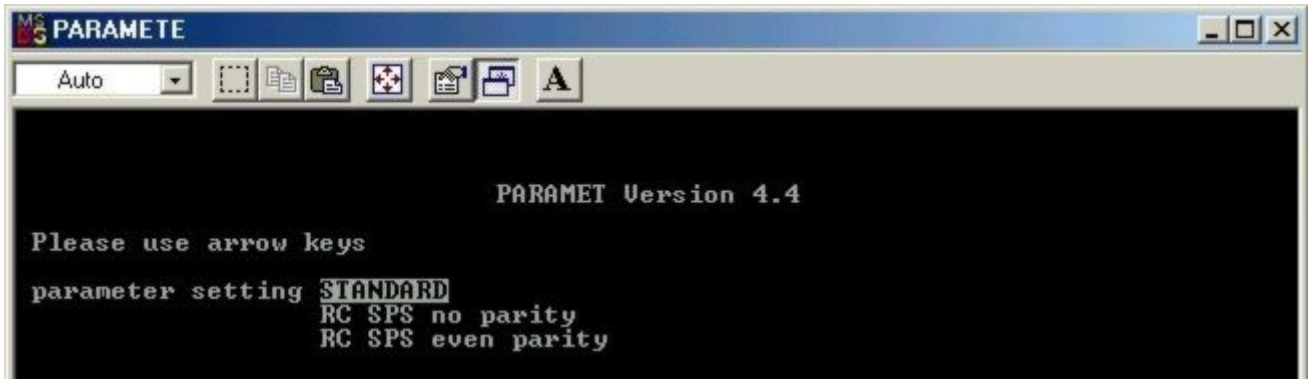


Figure 44. Paramet-Start figure

Press the arrow keys of the keyboard and confirm the parameters with enter key.
You can only select COM 1 and COM 2 between the interfaces. (COM 3 and COM 4 aren't supported with PARAMET)!
You can then adjust the transmission rate. These are normally 9600 bauds for the OCM EM.

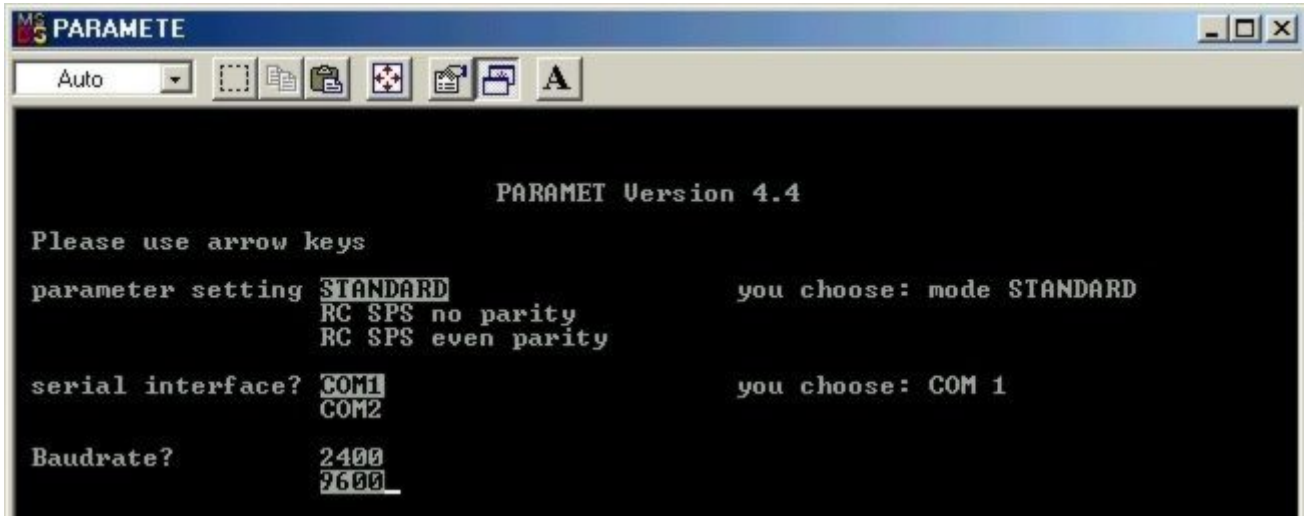


Figure 45. Paramet, Choice of interface and assignment installment

After renewed confirmation, the laptop computer disconnects from the OCM EM. If interface or COM assignment is not adjusted correctly or the interconnecting cable doesn't have any connection, the program breaks off automatically. Else, it appears. as follows:

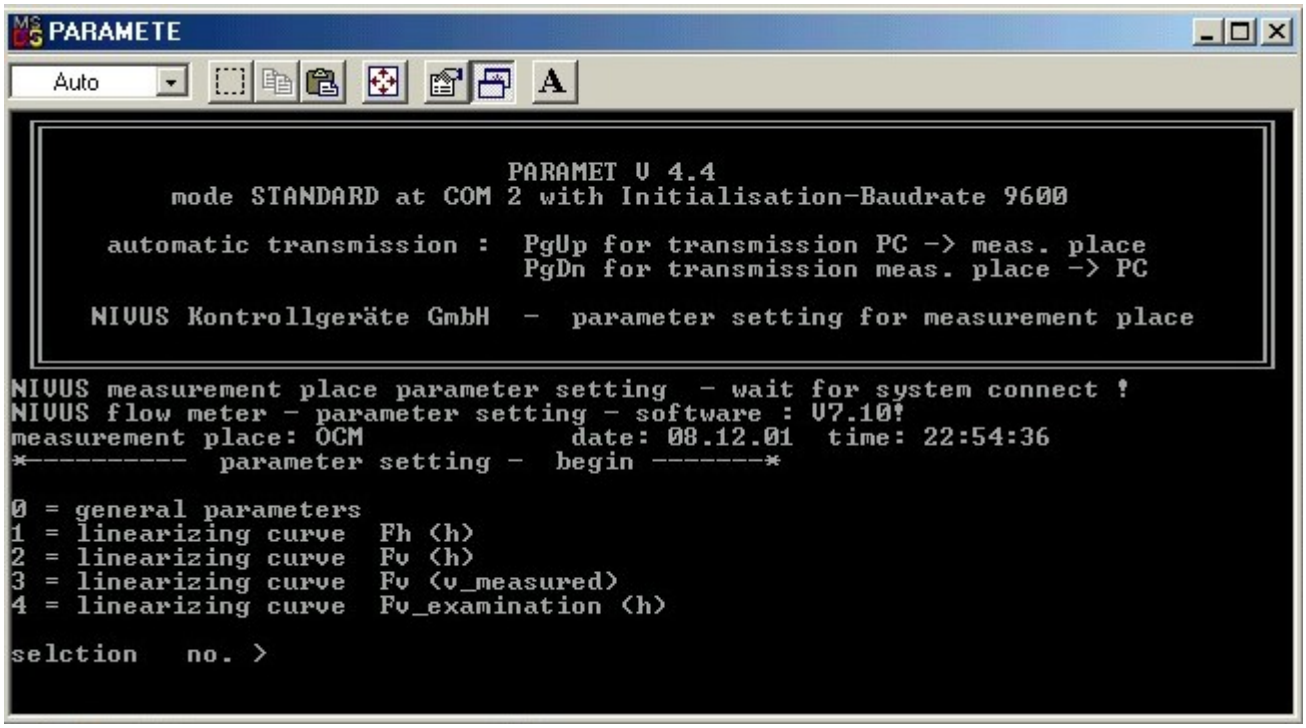


Figure 46. Paramet, Parametermenü

To start programming, select 0. You will now have the main parameters.
Groups 1 -4 on the list can only be selected, if in P120 –P123 on the main screen other than 0 are registered.
The parameter setting are set to the new parameter value by selection of the parameter number and new entered values. The old and new values of the parameter are displayed respectively. All entries are confirmed now.

Note

Vowel permutations, comma, [;] and colon may not be used as parameter value selection! Instead of the comma the decimal point has to be used!

Pressing the up arrow key without entering a new value doesn't change the parameter. With the up arrow key, the next parameter number can be accessed.
The >Backspace< key can be used for the correction of entries.
The parameter setting is ended by the >Esc< key.
No selection or key input for 3 minutes ends the program connection to the OCM EM automatically.

The programmed main parameters can be selected and saved in the PC by the OCM EM by means of the >PgDn< key. You save this by giving a desired file name.
None are saved in the same subdirectory as the >PARAMET< program sets the file control characters before the file name.
In the same way, stored files can be uploaded into the OCM EM by means of the >PgUp< key.

Caution

If the file named stored is not correct, PARAMET disconnects.

Note

Possible break points cannot be entered with PARAMET. These adjusted values have to be included manually!

6.4 Parameter List and Description

6.4.1 General

The OCM EM is programmed by means of parameter list for its function, calculation, display and version. It includes altogether 200 parameters, numbered according to its. These parameter contents influence the flow meter depending on the registered value.
Depending on the application and measurement task, normally only a part of all these parameters need to be adjusted or changed.

The OCM EM contains a fundamental characteristic (working parameter), that the transmitter always reports a value of the attached sensors. Because of various application fields and applications, however, the predefined results, measurements and measurement ranges may not correspond to the actual conditions. Therefore the display in the un-programmed condition represents function control but never the actual flow value.

The chapter for the listed parameters will be the terminology used for hereinafter. The operational selections of the parameter contents are in round brackets (xxx), the measurement units in square brackets, [xxx] and default values in bold.
Only when using the modem, the parameter numbers are a unity *.

6.4.2 Description of the Parameters

General Parameter

P00	Enter key	This parameter contains the pass key (67.) By changing the number to another value other than 67 all parameters are locked and cannot be changed. A display of the parameter contents is however possible.
P01	Measurement name	**(OCM)** Up to 20 alpha numeric characters can be entered. It defines the measurement place name and is displayed (see Figure 36). The entry of the numbers and letters is carried out as described in chapter 5.4.1.
P02	Date	The current date can entered or changed in the format [DD.MM.YY]. This value normally doesn't have to be changed or corrected, since the internal clock continues to operate even in power failure conditions.
P03	Time	The current time can be set or changed in the format [HH.MM.SS] here. This can be necessary for the internal clock at summer-/ winter-time changeover or insignificant time deviation. This value normally doesn't have to be changed or corrected since the time gets buffered by the internal clock during a power failure.

<table>
<tr><td>P04</td><td>Storage cycle</td><td>The memory cycle indicates the time in [minutes], the mean average value measured over this time period is internally logged. In the operation mode, a 15min cycle will datalog for 8 weeks before it wraps around.
The data logger is wrap-structured. i.e. if the storage capacity is full, the oldest data are always written over.

Wrap around time of the internal data logger:
<table>
<tr><td>Storage cycle</td><td>1 Min.</td><td>3</td><td>5</td><td>10 Min.</td><td>15 Min.</td><td>30 Min.</td><td>60 Min.</td></tr>
<tr><td></td><td colspan="7">Measurement Duration</td></tr>
<tr><td>1 measurement value: H/V/Q</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Hours</td><td>3752</td><td>1125.6</td><td>1875.9</td><td>3751.8</td><td>5627.8</td><td>112555</td><td>225110</td></tr>
<tr><td>^ = Days</td><td>15.6</td><td>46.9</td><td>78.2</td><td>156.3</td><td>234.5</td><td>469.0</td><td>938.0</td></tr>
<tr><td>2 measurement values: H+V</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Hours</td><td>1876</td><td>562.8</td><td>938.0</td><td>1875.9</td><td>2813.9</td><td>5627.8</td><td>11255</td></tr>
<tr><td>^ = Days</td><td>7.8</td><td>23.4</td><td>39.1</td><td>78.2</td><td>117.2</td><td>234.5</td><td>469.0</td></tr>
<tr><td>3 measurement values: H+V+Q</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Hours</td><td>125</td><td>375.2</td><td>625.3</td><td>1250.6</td><td>1875.9</td><td>3751.8</td><td>7503.7</td></tr>
<tr><td>^ = Days</td><td>5.2</td><td>15.6</td><td>26.1</td><td>52.14</td><td>78.2</td><td>156.3</td><td>312.7</td></tr>
</table>
</td></tr>
</table>

Note

Before making any change in the memory cycle, retrieve the data and delete the memory (P15). Data loss or Data corruption may otherwise result due to various memory cycles.

P05	Inactive	Parameter not used this time.
P06	Inactive	Parameter not used this time.
P07	Inactive	Parameter not used this time.
P08*	Power failure control	**(0)** = inactive 1 = active This parameter is used only for OCM EM with modem or GSM modem and integrated data logger. In case of power failure, a disturbing report is sent to the central reporting head office (DSC 1+disturbing reporting printer).
P09*	Communication	**(0)** = direct connection (RS 232) 1 = modem 2 = GSM-Modem This defines the data transmission parameter. It depends on the connected equipment.
P10*	Error message output	**(3)** [min] This parameter is used only for OCM EM with modem or GSM modem. Error message in this case would be for cable disruption or short-circuit, for the 4-20mA signal for height, at power failure, external mA for set point signal, Q_{min} or V_{min}-understep. The activation of P08 is required. Entry possibility between 0 – 60.

Parameter Modem Operation

P11*	Password	**(NIVUS)** This password allows "NivuDat", in which it must be entered to match the parity of the measurement place identity through the external input of the modem and software. It represents therefore an access authorization.
P12*	Modem Tel. N°. 1	Entry of up to 20 ASCII characters and if necessary an alarm filter (description under P13)
P13*	Modem Tel. N°. 2	Entry of up to 20 ASCII characters and if necessary, of desired disturbance filters. These allow alarm selection more specific to a definite phone number. For this, an external modem, an alarm reporting controller type DSC 1 and a protocol printer switched on are with serial interface are required. (For reporting head office, refer of NIVUS Service Centre) The alarm filters are listed, separated by a slash, at the end of the phone number. Several alarms are separated by comma. If no performance of selected alarms is carried out, then all disturbances will transfer to the said phone number. Alarm filter choice, alarms of: 1 = Level/Height 2 = Velocity 3 = Flow set point 4 = Slide 5 = Velocity sensor fails 6 = not used 7 = not used 8 = internal logger > 80% full 9 = Power failure Example: the alarms are in the level/height, flow set point and logger more than 80% full, then 081512345/1,3,8 is sent to phone number 081512345.

General Parameter

P14	Reset Totalizer	Putting grand total value in {P177}. The entry of code number **2718** is necessary for reset and in order to prevent an inadvertent adjustment.
P15	Delete Data Logger	By entry of code number **2718** the internal data logger is deleted. e.g. this is (see P04) necessary for reprogramming of the memory cycle
P16	Delete All Parameters	By entry of code number **2718** all parameters are put back to operation mode entries. The stored data remain unchanged
P17	Delete Error Buffers	By entry of code number **2718** the internal disturbance buffer is deleted. Perhaps unremoved alarms aren't distributed any more
P18	Complete-System-Reset	By entry of code number **8172** the OCM EM is reset to factory default. All stored data, characteristics, disturbing reporting buffer etc. are deleted. This Complete-System-Reset is recommended before every new application or in the case of an undefined program.
P19	Modem-Initializing-String	The current Initializing-string of the modem in use is typed here. You can type in up to 60 ASCII characters.

LCD-Display Parameter

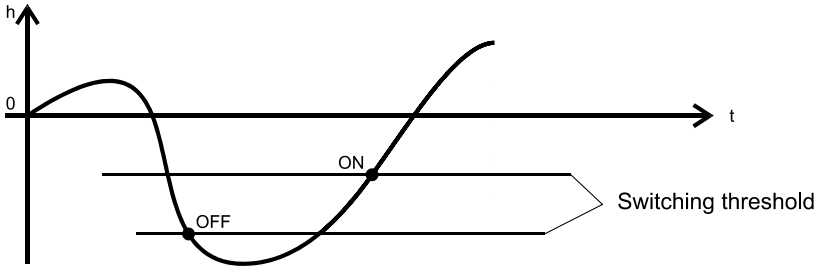
P20	Error Message	0 = Disturbances aren't displayed **(1)** = Disturbances are shown but not transferred to the display 2 = Disturbances are shown and transferred at the display
P21	**Function** (appearing on the display)	**(2)** This parameter defines the measurement value to be displayed continuously. The possibility of short-time displays of all other measurements is described in chapter 5.4.1. The choice of the display is any of the following: 0 = Level/Height 1 = Velocity **(2)** = Flow 3 = Totalizer 4 = Date and Time 5 = Set point Flow Regulation 6 = Actual Value Flow Regulation 7 = Regulation Difference
P22	Inactive	Parameter not used this time.
P23	Damping	**(20)** [s] This parameter only has an effect on the display, not on the analog outputs. It muffles visually the rapid changes in the display caused by hydraulics. The selection is in seconds. e.g. when **(20)** seconds is selected, any rapid change of the measurement from 0 to 100% is displayed after 20 seconds. In a similar manner, any rapid of the measurement from 25% to 50% is displayed after 5 seconds.
P24	Dimension Level/Height	This parameter sets the dimension of the level/height in the display as well as for data logging. The choice is: 0 = [cm] [in] **(1)** = [m] [ft]
P25	Level/Height Decimal Places	The number of desired decimal places for level/height display is selected here. The possibilities are 0, 1, 2, 3 or 4.
P26	Dimension Velocity	This parameter sets the dimension of the velocity in the display as well as for data logging. The choice is: 0 = [cm/s] [in/s] **(1)** = [m/s] [fps]
P27	Velocity Decimal Places	The number of desired decimal places for velocity display is selected here. The possibilities are 0, 1, 2, 3 or 4.
P28	Dimension Flow	This parameter sets the dimension of the flow in the display as well as for data logging. The choice is: 0 = [l/s] [gpm] **(1)** = [m³/s] [cfs] 2 = [m³/h] [mgd]
P29	Flow Decimal Places	The number of desired decimal places for velocity display is selected here. The possibilities are 0, 1, 2, 3 or 4.
P30	Dimension Total Quantity	This parameter sets the dimension of the total quantity in the display as well as for data logging. The choice is: 0 = [l] [gal] **(1)** = [m³] [cft] 2 = [10m³] [Kgal] 3 = [100m³] [Mgal]
P31	Total quantity decimal places	The number of desired decimal places for velocity display is selected here. The possibilities are 0, 1, 2, 3 or 4.
P32	Inactive	At present, this parameter isn't used.

The dimensions for P24/P26/P28 and P30 are also used for data logging and data transmission. To avoid erroneous data when any of these dimensions are changed, make absolutely sure that a new measurement place is set on the OCM and the PC.

Parameter Analog Outputs

P33	Mode	With this parameter, the activity of the analog output 1 is set. Modes available are the operation mode and the simulation mode: (**0**) = active operation mode 1 = active simulation mode
P34	Function	Within this parameter the desired analog output 1, of the measurement is set. 0 = level/height 1 = velocity **(2)** = flow
P35	Output Range	Specification of the output range of the unit of current signal for the analog output 1. 0 = 0-20mA **(1)** = 4-20mA
P36	Mode	With this parameter, the activity of the analog output 2 is set. Modes available are the operation mode and the simulation mode: **(0)** = active operation mode 1 = active simulation mode
P37	Function	Within this parameter the desired analog output 2, of the measurement is set. 0 = level/height **(1)** = velocity 2 = flow
P38	Output Range	Specification of the output range of the unit of current signal for the analog output 2. 0 = 0-20mA **(1)** = 4-20mA
P39	Output Damping	**(20)** [Seconds] This parameter acts simultaneously to analog outputs 1 and 2. A selection is possible between 0 seconds (no damping/recession) and 1800 seconds (maximum damping/recession). This selection reduces the rapid changes in the two analog outputs frequently caused hydraulics. e.g. when (20) seconds is selected, any rapid change of the measurement from 0 to 100% is displayed after 20 seconds. In a similar manner, any rapid of the measurement from 25% to 50% is displayed after 5 seconds.
P40	Output Range of Level	**(3)** Measurement of the level/height in [m] or [ft] at 20mA.
P41	Output Offset Level	**(0)** Measurement of the level/height in [m] or [ft] at 0 or 4mA (depending on P35/P38). Selection of negative value is possible.
P42	Output Range of Velocity	**(3)** Measurement of the velocity in [m/s] or [fps] at 20mA.
P43	Output Offset Velocity	**(0)** Measurement of the velocity in [m/s] or [fps] at 0 or 4mA (depending on P35/P38). Selection of negative value is possible.
P44	Output Range of Flow	**(1)** Measurement of the flow in [m ³/s] or [cfs] at 20mA.
P45	Output Offset Flow	**(0)** Measurement of the flow in [m ³/s] or [cfs] at 0 or 4mA (depending on P35/P38). The selection of negative value is possible.
P46	Simulation AA1	**(12)** Value in [mA] to be distributed for analog output 1, if this output was programmed for simulation. (P33)
P47	Simulation AA2	**(12)** Value in [mA] to be distributed for analog output 2, if this output was programmed for simulation. (P36)
P48	Inactive	Parameter not used this time.
P49	Inactive	Parameter not used this time.

Parameter Relays Outputs

P50	Mode Digital Output 1	In this parameter the operation of the relay 1 is programmed. Selection is: **(0)** = Relay 1 not active 1 = Closed (Relays turn-on when reaching the programmed value) 2 = Open (Relays turn-off when reaching the programmed value)
P51	Function Digital Output 1	With this parameter the activity of the desired signal for relay 1 is set. It sets on or off the relay to the mode selected in parameter P50 depending on reaching the limiting value, or when reaching the integrated total or a quantity pulse. A disturbance report is indicated. Boundary contacts also can be selected in the negative range. For this the following switching characteristics have to be taken into account.  The comparison is carried out as per diagram above, d. h. –2.0 > -3.0 **(0)** = Boundary contact level 1 = " velocity 2 = " flow 3 = Total quantity pulses 4 = Interference signal 5 = Control level measurement with time control
P52	Switch Turn-On Point	**(0)** This parameter is only used, if P51 was programmed as 0, 1 or 2. It defines the point of the incipient signal. The programming is carried in P51 depending on [m] [ft], [m/s] [fps] or [m ³/s] [cfs].
P53	Switch Turn-Off Point	**(0)** This parameter is only used, if P51 was programmed as 0, 1 or 2. It defines the point of the incipient signal. The programming is carried in P51 depending on [m] [ft], [m/s] [fps] or [m ³/s] [cfs].
P54	Quantity/Pulse:	**(0)** This parameter is only used, if P51 was programmed as 3. It allows for the recorded quantity pulse to be sent to an external meter or logger in [m ³] [cfs]. The entry of decimal numbers is possible. Only the "positive" pulses for the flow is sent. For flows going in the opposite direction, i.e. reverse flows, the pulse count is stopped, internally subtracted and started again, when the flow moves in positive direction again and so that a compensation has taken place.

Note

If the counting isn't possible for a corresponding pulse density for large quantities, then these pulses aren't lost but are "worked off" with quantity inversely.

Note

If the pulse count is later on taken into operation for a flow gauge, then the relay programmed correspondingly starts to distribute the quantities from the present operating time. This may lead to continuous pulse count.
If this isn't desired, then P15 has to be deleted.

Caution

The parameter for quantity/pulse cannot not be put as a negative value or on 0 for active quantity output.

P55*	Time Delay for Disturbance Report:	**(0)** This parameter is only used if a disturbing reporting is programmed in P51. This serves only for the oppression of short-term disturbing reports; arising due to short-time net fluctuations, add-on connection etc. It defines the minimum time period the disturbance must prevail before it is distributed. A selection is possible between 0 –180 seconds.
P56	Pulse Duration	**(4)** This parameter is only used if a pulse is programmed in P51. It defines the pulse version length in 0.125 s steps. The pulse break relationship is 1:1 and with selection possibility of 1 (0.125s) to 10 (2.5s).
P57	Inactive	Parameter not used this time.

As this parameter programming is similar for relays 2–4, the following parameter description is given in short form. For complete explanation refer to P50 - P56.

P58	Mode Digital Output 2	**(0)** = Relay 2 not active 1 = Closed 2 = Open
P59	Function Digital Output 2	**(0)** = Boundary contact level 1 = " velocity 2 = " flow 3 = Total quantity pulses 4 = Interference signal 5 = Control level measurement with time control
P60	Switch Turn-On Point	**(0)** only if P59 = 0, 1 or 2. Entry in [m] [ft], [m/s] [fps] or [m³/s] [cfs].
P61	Switch Turn-Off Point	**(0)** only if P59 = 0, 1 or 2. Entry in [m] [ft], [m/s] [fps] or [m³/s] [cfs].
P62	Quantity/Pulse:	**(0)** only if P59 = 3. Entry in [m³/s] [cfs].
P63*	Time Delay for Disturbance Report:	**(0)** only if P59 = 4. Entry in [s].
P64	Pulse Duration:	**(4)** only if P59 = 3. Entry from 1 (0.125s) to 10 (2.5s)
P65	Inactive	Parameter not used this time.

If using the regulator function, relays 3 and 4 are reserved for the slide drive and cannot be used for other functions.

P66	Mode Digital Output 3	**(0)** = Relay 3 not active 1 = Closed 2 = Open
P67	Function Digital Output 3	**(0)** = Boundary contact level 1 = " velocity 2 = " flow 3 = Total quantity pulses 4 = Interference signal 5 = Control level measurement with time control
P68	Switch Turn-On Point	**(0)** only if P67 = 0, 1 or 2. Entry in [m] [ft], [m/s] [fps] or [m³/s] [cfs].
P69	Switch Turn-Off Point	**(0)** only if P67 = 0, 1 or 2. Entry in [m] [ft], [m/s] [fps]or [m³/s] [cfs].
P70	Quantity/Pulse:	**(0)** only if P67 = 3. Entry in [m³/s] [cfs].
P71*	Time Delay for Disturbance Report:	**(0)** only if P67 = 4. Entry in [s].

P72	Pulse Duration:	**(4)** only if P67 = 3. Entry from 1 (0.125s) to 10 (2.5s)
P73	Inactive	Parameter not used this time.
P74	Mode Digital Output 4	**(0)** = Relay 4 not active 1 = Closed 2 = Open
P75	Function Digital Output 4	**(0)** = Boundary contact level 1 = " velocity 2 = " flow 3 = Total quantity pulses 4 = Interference signal 5 = Control level measurement with time control
P76	Switch Turn-On Point	**(0)** only if P75 = 0, 1 or 2. Entry in [m] [ft], [m/s] [fps] or [m³/s] [cfs].
P77	Switch Turn-Off Point	**(0)** only if P75 = 0, 1 or 2. Entry in [m] [ft], [m/s] [fps] or [m³/s] [cfs].
P78	Quantity/Pulse:	**(0)** only if P75 = 3. Entry in [m³/s] [cfs].
P79*	Time Delay for Disturbance Report:	**(0)** only if P75 = 4. Entry in [s].
P80	Pulse Duration:	**(4)** only at P75 = 3. Entry from 1 (0.125s) to 10 (2.5s)
P81	Inactive	Parameter not used this time.

Parameter Level/Height Measurement

P82	Measurement Analog Input 1	Depending on the application, various level/height measurements can be performed by the OCM EM. These are different depending on mA signals from a 2-wire sensor or external mA signal, e.g. from the NivuMaster. The level/height signal is accepted based on the parameter mode selected (see Figures 25 and 26). 0 = 0-20mA, Connection as in Figure 26 **(1)** = 4-20mA, Connection as in Figure 26 2 = 4-20mA, 2-wire sensor connection as in Figure 25
P83	Measurement Range	**(3)** [m] [ft] The measurement value indicates the level/height measurement at 20mA. This value has to be exactly the same as the output range of the level/height sensor
P84	Live Zero Check	The measurement range supervision allows control of the 4-20mA level/height signal on cable disruption. In case of disturbance (short-circuit or cable disruption) the modem transmits a disturbance report based on programmed delay time to the central office. For technical reasons, a supervision of the 0-20mA signal for P82 = 0 isn't possible. 0 = not active **(1)** = active
P85	Measurement Offset	**(0.0)** [m] [ft] The offset allows an addition of a fixed value to the level/height signal. It is used if the sensor is offset for mounting conditions or in channels or full-filled pipes where no level/height measurement is required (in this case, a constant level/height is obtained).

Parameter Velocity Measurements

P86	Inactive	Parameter not used this time.
P87	Inactive	Parameter not used this time.
P88	Inactive	Parameter not used this time.
P89	Inactive	Parameter not used this time.
P90	Inactive	Parameter not used this time.
P91	Flow Direction Recognition	The OCM EM has a flow direction recognition capability which transfers a signal the measurement transducer integrated in the velocity sensor. This allows for the additional evaluation of negative velocities and therefore reverse flows. This calculated quantity is subtracted by the grand total. The programming of negative pulses isn't possible. **(0)** = not active 1 = active (DE12)

The velocity sensor is hydraulically optimized for a positive flow direction. Measurement errors may increase during reverse flow.

P92	Calibration Factor	The determined velocity is multiplied by this factor before it is displayed and used for calculation of flow.
P93	Frequency	**(728)** [Doppler frequency in Hz per 1 m/s] **(222)** [Doppler frequency in Hz per 1 fps] This value is 728 Hz or 222 Hz for sensor type B and 1941 Hz or 592 Hz for sensor type >C< (See also chapter 2.1.2) For other velocity sensors or newer sensor types, the Doppler frequency to be entered should be obtained from NIVUS America and the change must be noted for this particular serial number of the sensor.

For a substitute velocity sensor, the provided Doppler frequency must be entered exactly, else erroneous velocities and therefore erroneous flows are determined.

P94	Inactive	Parameter not used this time.
P95	Inactive	Parameter not used this time.
P96	Inactive	Parameter not used this time.
P97	Inactive	Parameter not used this time.
P98	Inactive	Parameter not used this time.
P99	Inactive	Parameter not used this time.
P100	Inactive	Parameter not used this time.

Following parameters are for the frequency analytical evaluation of the Doppler signals. For this evaluation the graphical frequency analysis software “V Diag” is necessary and obtained from NIVUS America. The standard analysis is optimized for normal applications and should only be changed for hydraulically exceptional sites by trained staff or NIVUS America’s service personnel. For this reason a detailed explanation of the parameters is given below.

P101	Number Measurements	**(100)** The number measurements per measurement cycle. Selection possibility between 1 -100.
P102	Measurement Time	**(3)** measurement time/measurement cycle**.** Selection possibility between 1-10 seconds.
P103	Damping	**(5)** Measurement signal damping in seconds. Selection possibility between 1-19.

P104	Number Measurement Error	**(8)** Maximum number of measurement errors. Selection possibility between 0-20.
P105	Main Peak Width	**(1)** Number of the evaluated frequency groups on the left and on the right of the Main Peak. Selection possibility between 1-9.
P106	Signal Quality 1	**(15)** Lower limit value of the 1st signal. Quality in [%]. Selection possibility between 1-60.
P107	Signal Quality 2	**(5)** Lower limit value of the 2nd signal. Quality in [%]. Selection possibility between 1-60
P108	Inactive	Parameter not used this time.
P109	Diagnosis	Activation via the RS232 and evaluation of the Doppler signals by means of graphical frequency analysis software "V Diag". **(0)** = not active 1 = active

The assignment of the Doppler signals must be deactivated for parameter setting of the OCM EM by means of software "Paramet". (P109 = 0!)

Evaluation Parameter

Following parameters are used for the storage of calculated results for the evaluation, calculation and scaling.

P110	Maximum Value Level/Height	**(3.0)** Refers to registered value in [m] [ft] for all calculations and linearization curves. It represents, therefore, an essential reference point for the following parameters. This value additionally also serves as the scaling of the level/height. A value of as close as expected level/height should be selected for improved representation and to avoid a reduction of the resolution. Example: The maximum level/height: 85 cm (2.8ft), select: 1.00 m (3.00 ft)
P111	Maximum Value Velocity	**(3.0)** This value in [m/s] [fps] is used for the scaling of velocity. A value of as close as expected velocity should be selected
P112	Maximum Value Flow	**(1.0)** This value in [m ³/s] [cfs] is used for the scaling of flow. A value of as close as expected velocity should be selected
P113	Minimum Value Level/Height	**(0.0)** in [m] [ft], this parameter is used for the optimization of the data logger. A storage of the level/height is only carried out, if the mean average value exceeds programmed minimum value as set in storage cycle P04.
P114	Minimum Value Velocity	**(0.0**) in [m/s] [fps], this parameter is used for the optimization of the data logger like P113. A storage of the velocity is only carried out, if the mean average value lies over the programmed minimum value.
P115	Minimum Value Flow	**(0.0)** [m ³/s] [cfs], this parameter is used for the optimization of the data logger**.** A storage of the flow is only carried out, if the calculated mean average value lies over the programmed minimum value.
P116	Data Overflow Totalizer	**(999999)** defines the meter reading, at which the internal sum meter jumps to the value of > 0 again in [m ³] [cft]. Selection possibility between 0 and 1 x 1017
P117	Inactive	Parameter not used this time.
P118	Inactive	Parameter not used this time.
P119	Inactive	Parameter not used this time.

The following parameters P120 to P123 are to be selected according to their supporting sets 1 -4.
It is possible now to create the required selection of sets (minimum 2) for setting up the program.
It is also possible to do this during a restart of the program by means of selection of corresponding sets (also see chapter no. 6.1)

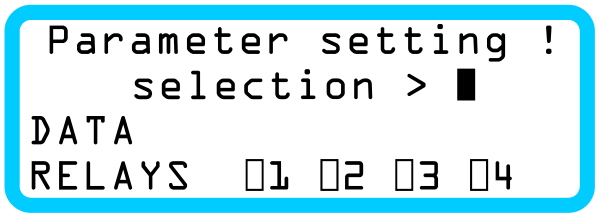


Figure 47. view parameter group choice

For the selection of the parameter group, choose for P120 >1<, for P121 >2<, for P122 >3< and for P123 >4<. The number programmed in the corresponding parameter can then be written down for the supporting sets of pairs.
The use of the supporting sets as well as the test parameters listed below requires extensive knowledge of the channel hydraulics; additional calibration techniques as well as experience in programming of the OCM. Erroneous selections can lead to totally wrong measurement results. Therefore the application of these parameters should be left up to the NIVUS Service Centre staff or by trained specialist staff.

P120	Linearization Level/Height	**(0)** Number of pairs to be programmed for the mode h = f (h). This linearization curve is used for the construction of asymmetrical profile areas (A/h function) or free flow characteristics (Q/h function). It is possible to enter a maximum 31 pairs. These bases are distributed evenly over the range h_{max} (P110).
P121	Linearization Velocity	(0) Number of pairs V to be programmed for the mode v = f (h). With this parameter a level/height dependent velocity curve can be made. The maximum number of pairs are 31.
P122	Linearization Velocity	**(0)** Number of pairs to be programmed for the mode v = f ($v_{measured}$). With this parameter, possible deviations are compensated for the measured partial velocity of flow in sections (non-linearity of the sensor). The velocity is calculated and is corrected with respect to the measured velocity in direct relation to the velocity value.
P123	Linearization Velocity	**(0)** Number of pairs to be programmed for the mode v = f (v_{test}(h)). With this parameter a test characteristic is programmable depending on the flowing height for velocity measurement. E.g. sensor silting. (Only for backwater free applications)
P124	Inactive	Parameter not used this time.
P125	Velocity Test	Within this parameter a check of the measured velocity is made. All possible operating ranges can be carried out. And for control purposes the use of portable velocity measurements compared with measured velocity is required. **(0)** = no check 1 = check for minimum and maximum per height range 2 = check by means of test curve (P123)
P126	Substitute Velocity	This parameter works in coherence with P125. It defines the velocity to be distributed at a checked error. **(0)** = v = 0 1 = v = V_{max}. (P111) 2 = v = V_{min}. Height range (P143, P149, P155) 3 = v = V_{max}. Height range (P144, P150, P156) 4 = v = f (V_{test} (h)).
P127	Relative Deviation	**(0)** The selection is carried out in [%]), for the measured velocity. This parameter only works when programming P125 = 2! The measured velocity is accepted within this defined deviation. A reaction is executed for regression in accordance with P126.
P128	Absolute Deviation	**(0)** This is required for any unstable conditions at very low velocities with a relative deviation in P127 which is small compared to the velocity check permitted.

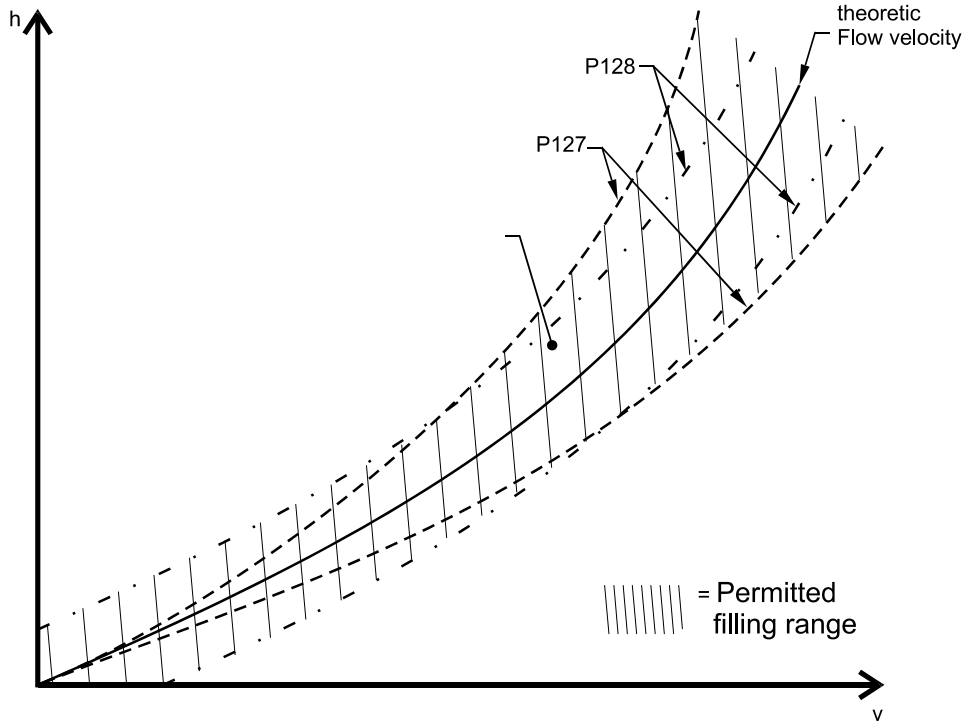


Figure 48.Effect common to Figure of P127 and P128

P129	Scope	In this parameter the scope of the linearization curve is defined for the level/height ranges. **(0)** = all level/height ranges 1 = only level/height range 1 2 = only level/height range 2 3 = only level/height range 3

Datalogging Parameter

P130	Data Storage	With this parameter, the specification of the measurements to be logged are carried out. 0 = no logging 1 = logging of level/height only 2 = logging of velocity only 3 = logging of flow only 4 = logging of velocity and flow **(5)** = logging of level/height, velocity and flow
P131	Logger Supervision	By activating this parameter, an alarm is transmitted via a modem or a relay output (if programmed) if the storage capacity falls under 20%. This activation is only meaningful, if the data logger shall be used for download at regular intervals. **(0)** = not active 1 = active (alarm report at under 20% storage capacity)

With the following parameters, statistical evaluation and reports can be made either through the software “NivuLog” or “NivuDat” as well as wrap-around storage in the OCM EM in hourly, daily and monthly.

P132	Hourly Results	(24) Logged in memory in hour results. Minimum value: 24
P133	Daily Results	(31) Logged in memory in daily results. Minimum value: 31
P134	Monthly Results	(12) Logged in memory in monthly results. Minimum value: 12
P135	Assignment	Release of the statistics and assignment. Only the singles results are logged according to the storage cycle selected in parameters P04. **(0)** = not active 1 = active
P136	Inactive	Parameter not used this time.
P137	Inactive	Parameter not used this time.
P138	Inactive	Parameter not used this time.
P139	Inactive	Parameter not used this time.

Calculation Parameter

P140	Height Range 1	**(3.0)** With parameters P140, 146 and P152, the channel can be subdivided into 3 height ranges. For these 3 parameters always enter the total height in [m] [ft].

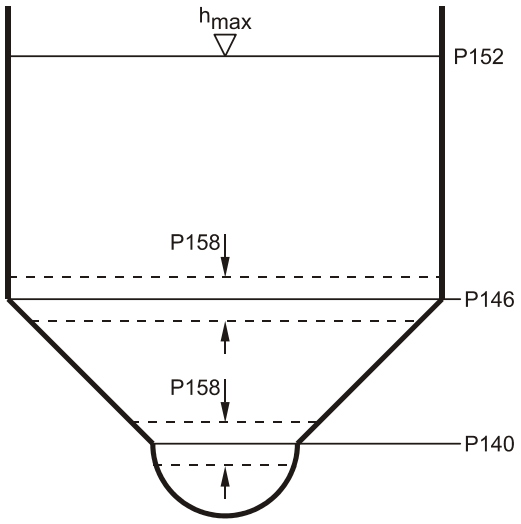


Figure 49. action of the height sphere switchover

Note

If no height sub-division is carried out, then P140 must always be programmed for h_{max} (P110). Without a height range no calculation is possible!

P141	Calculation Method	Select here which calculation method is to be used for flow within height range 1 0 = Q = f (h) The determined flow is a function of the level/height. The velocity of flow isn't used for the calculation. This method requires the entries of Q/H characteristics. P142 must be programmed for 1, 2 or 3. **(1)** = Q = f (h, v) The determined flow is a function of the level/height and the measured velocity. P142 must be programmed for 4, 5, 6, 7 or 8. 2 = Q = f (h, v-AI2) The determined flow is a function of the level/height and the velocity of flow over analog input 2. This method is used only for calculation methods of flow from pressurized channels. (also see parameter P86 to P89)

P142	Channel Profile	Selection of the channel profile for height range 1. 1 = Flume or Weir (P160 and P162 must be programmed!) 2 = Pipe with free flow (P161 must be programmed!) 3 = Q/h Relationship (P162 must be programmed) **(4)** = Pipe with velocity measurement (P163 must be programmed!) 5 = Rectangular channel with velocity measurement (P164 must be programmed!) 6 = Trapezium with rectangle on top and velocity measurement (P165 – P167 must be programmed) 7 = U-channel profile with velocity measurement (P168 must be programmed!) 8 = Custom cross-section with velocity measurement (P169 must be programmed!)

Note

Only 1 channel profile is usable. The same channel profiles cannot be used for two height ranges

P143	Minimum Velocity	**(1)** in [m] [ft] Here the entry of the theoretical min. velocity v_{min} is made for height range 1 This is only required, if P125 = >1< and P126 = >2< was programmed. No check is carried out for selecting >0<.
P144	Maximum Velocity	**(0)** in [m] [ft] Here the entry of the theoretical max. velocity v_{max} is made for height range 1. This is only required, if P125 = >1< and P126 = >2< was programmed. No check is carried out for selecting >0<.
P145	Inactive	Parameter not used this time.
P146	Height Range 2	Switching height range 2 in [m] [ft]. An entry is only required, if the height range is subdivided (shared). (also see Figure 48)
P147	Calculation Method	An entry is only required, if P146 is programmed. This entry defines the calculation method for the height range 2. 0 = Q = f (H) This selection of dividing the height ranges isn't meaningful for hydraulic reasons **(1)** = Q = f (h, v) The determined flow is a function of the level/height **and** the measured velocity. P148 must be programmed for 4, 5, 6, 7 or 8.
P148	Channel Profile	Selection of the channel profile for height range 2. For programming technical reasons [1], [2] and [3] are also available. A selection of these choices however do not make any hydraulic sense. 1 = Flume or Weir (P160 and P162 must be programmed!) 2 = Pipe with free flow (P161 must be programmed!) 3 = Q/h Relationship (P162 must be programmed) **(4)** = Pipe with velocity measurement (P163 must be programmed!) 5 = Rectangular channel with velocity measurement (P164 must be programmed!) 6 = Trapezium with rectangle on top and velocity measurement (P165 – P167 must be programmed) 7 = U-channel profile with velocity measurement (P168 must be programmed!) 8 = Custom cross-section with velocity measurement (P169 must be programmed!)

Note

Only 1 channel profile is usable. The same channel profiles cannot be used for two height ranges

P149	Minimum Velocity	**(0)** in [m] [ft] Here the entry of the theoretical minimum velocity v_{min} is made for height range 1. This is only required, if P125 = >1< and P126 = >2< was programmed. No check is carried out for selecting >0<.
P150	Maximum Velocity	**(0)** in [m] [ft] Here the entry of the theoretical maximum velocity v_{max} is made for height range 1. This is only required, if P125 = >1< and P126 = >2< was programmed. No check is carried out for selecting >0<.
P151	Inactive	Parameter not used this time.
P152	Height Range 3	Switching height range 3 in [m] [ft]. An entry is only required, if the height range is subdivided (shared). (also see Figure 48)
P153	Calculation Method	An entry is only required, if P152 is programmed. This entry defines the calculation method for the height range 3. 0 = Q = f (h) This attitude of dividing the height ranges isn't meaningful for hydraulic reasons **(1)** = Q = f (h, v) The determined flow is a function of the level/height and the measured velocity. P154 must be programmed for 4, 5, 6, 7 or 8.
P154	Channel Profile	Selection of the channel profile for height range 3. For programming technical reasons [1], [2] and [3] are also available. A selection of these choices however do not make any hydraulic sense. 1 = Flume or Weir (P160 and P162 must be programmed!) 2 = Pipe with free flow (P161 must be programmed!) 3 = Q/h Relationship (P162 must be programmed) **(4)** = Pipe with velocity measurement (P163 must be programmed!) 5 = Rectangular channel with velocity measurement (P164 must be programmed!) 6 = Trapezium with rectangle on top and velocity measurement (P165 – P167 must be programmed) 7 = U-channel profile with velocity measurement (P168 must be programmed!) 8 = Custom cross-section with velocity measurement (P169 must be programmed!)

Only 1 channel profile is usable. The same channel profiles cannot be used for two height ranges

P155	Minimum Velocity	in [m] [ft] Here the entry of the theoretical min. velocity v_{min} is made for height range 1. This is only required, if P125 = >1< and P126 = >2< was programmed. No check is carried out for selecting >0<.
P156	Maximum Velocity	**(0)** in [m] [ft] Here the entry of the theoretical max. velocity v_{max} is made for height range 1. This is only required, if P125 = >1< and P126 = >2< was programmed. No check is carried out for selecting >0<.
P157	Inactive	Parameter not used this time.
P158	Switching Hysteresis	in [m] [ft] This value prevents a "fluttering" of the shifting of harmonic waves in the limits of the switching points. Depending on channel measurement, it should be a few centimetres (inches).
P159	Sludge/Silt Height	**(0.0)** in [m] [ft]. This value is used for the calculation of the wetted cross-sectional area. It is used in applications only for relatively constant silt deposits.

Channel Parameter

Depending on programming of the selected channel profile in parameters P142, P140 and P154, the corresponding, channel tolerances or end points of the linearization curves must be written down for the accompanying parameters.

P160	Exponent	**(0.0)** An entry is required, if in the 3 height ranges, a channel profile = 1 is selected. This is the value for exponent of a Flume.
P161	Full Pipe	**(0.0)** in [m ³/s] [cfs] An entry is required if in the 3 height ranges, a channel profile = 2 is selected. This value is obtained from corresponding tables or books containing Prantl-Colebrook equation and accounting for roughness and slope.

Condition for this measurement procedure: backwater free flow over the complete measurement range!

P162	Flow at h_{max} (P111)	**(0.0)** in [m ³/s] [cfs] An entry is required, if in the 3 height ranges, a channel profile = 3 is selected. It depends on selected channels and calculated for the corresponding formulae.

Condition for this measurement procedure: backwater free flow over the complete measurement range!

P163	Pipe Radius	**(0.5)** An entry is required, if in the 3 height ranges, a channel profile = 4 is selected
P164	Channel Width	**(0.0)** in [m] [ft] An entry is required, if in the 3 height ranges, a channel profile = 5 is selected
P165	Lower Channel Width	**(0.0)** in [m] [ft] An entry is required, if in the 3 height ranges, a channel profile = 6 is selected
P166	Upper Channel Width	**(0.0)** in [m] [ft] An entry is required, if in the 3 height ranges, a channel profile = 6 is selected
P167	Trapezium Height	**(0.0)** in [m] [ft] An entry is required, if in the 3 height ranges, a channel profile = 6 is selected
P168	Profile Radius	**(0.0)** in [m] [ft] An entry is required, if in the 3 height ranges, a channel profile = 7 is selected
P169	Area A at h_{max} (P111)	**(0.0)** in [m ²] [ft ²] An entry is required, if in the 3 height ranges, a channel profile = 8 is selected

Modem Parameters*

P170 *	Communication	In this parameter the adjustment of the baud rate is made for the modem for data transmission rate. 0 = 2400 bauds **(1)** = 9600 bauds
P171 *	Measurement Authority Code Number	The registered measurement authority code number is assigned to the modem for alarm controller type “DSC 1” and allowed for attached printer for receiving the alarms from the measurement sites.
P172 *	Calling Method	This parameter refers to analog modem only. It is dependent on the modem type used. 0 = Pulse dialing **(1)** = Tone dialing 2 = Tone dialing ISDN

P173 *	PIN Number	This parameter is used for GSM modem. It allows a maximum 60 ASCII characters. The PIN is individually assigned and is different for different modems. It is as per the courier contract.
P174	Inactive	Parameter not used this time.
P175	Inactive	Parameter not used this time.
P176 *	Rt/CTS	This parameter serves for modem data flow control. Depending on modem type used, it may be required to switch this off under some circumstances. 0 = Off **(1)** = On
P177 *	Meter Handicap	**(0)** The parameter P14 is taken into account for the selected totalizer value. This parameter is normally used, for errors and therefore replaces with the same grand total value of the meter to be reinstalled.
P178 *	Timeout Block Assignment	**(10)** Break-off criterion for data transmission
P179 *	Timeout Union End	**(30)** Break-off criterion for data transmission

Active Slide Gate/Controller Parameter

For the use of the regulator function the OCM EM must be activated. For this, enter the password >NIVUS< in parameter P180.
For the drive of the moving slide, the two relay outputs 3 (open) and 4 (closed) are used. These functions are strictly assigned for the two relays for regulator mode and are not interchangeable.

For the regulator mode relay 3 is programmed strictly for the function >open< and relay 4 for the function >close<. An interchange isn't possible. These two relays also cannot be used for other modes or functions in the regulator mode.

The OCM EM has a classic three point step regulator for PID characteristics and are adjustable. For the characteristic of the meter available for the controlled system, basic knowledge of the regulator parameter setting and its optimization after Ziegler-Nichols is assumed. For this reason the single parameters are not described in details.
If you do not have a knowledge of the interpretation, calculation and optimization of controlled systems, contact the NIVUS Service Centre.

P180	Password	**(NIVUS)** Required for regulator mode, available with only the correct password
P181	Mode	**(0)** = Not active 1 = Active (for regulator closed) 2 = Active (inverse function, open)
P182	Set Point Function	**(0)** = internal set point 1 = external set point (set point input)
P183	Flush Time	**(10)** [seconds] Selection possibility between 0 to 255
P184	Measurement Range External Set Point	**(0)** = 0 -20mA 1 = 4 -20mA
P185	Measurement Span External Set Point	**(0.0)** in [m ³/s] [cfs]
P186	Set Point Supervision	**(0)** = not active 1 = active A supervision is possible only for 4 -20mA. In case of fault (cable disruption, failure of the set point generator or short-circuit) the OCM EM gets an internal set point adjustment automatically.

P187	Zero Set Point	**(0.0)** in [m ³/s] [cfs] set point at 0/4mA
P188	Internal Set Point	**(0.0)** in [m ³/s] [cfs]
P189	Minimum Regulation Difference	**(0.0)** in [m ³/s] [cfs] Regulator inactivity range
P190	Sensing Time	**(0)** in [s], variable >T<. Selection possibility between 1-240 seconds
P191	Minimum Control Pulse Time	**(0)** in [s] Selection possibility between 1-240 seconds
P192	Maximum Control Pulse Time	**(0)** in [s] Selection possibility between 1-240 seconds
P193	Transmission Coefficient	**(0)** in [%] P-share. Selection possibility between 0-1000 %
P194	Reset time	**(0)** in number [of T] I-share. Selection possibility between 0-16 t
P195	Derivative time	**(0)** in number [of T] D-share. Selection possibility between 0-16 t
P196	Level/Height Limit Value	**(0.0)** in [m] [ft] Limit value for fast end settlement during flood events. Functions also with P197.
P197	Flow Limit Value	**(0.0)** in [m ³/s] [cfs] Limit value for fast end settlement during flood events. Functions also with P197.
P198	End Duration	**(0.0)** in [s] Selection possibility between 0-240 seconds. The fast end time defines for flood events.
P199	Opening Time	**(0)** in [s]. "slide control pulse time at ending position". Selection possibility between 0-240 seconds.
P200	Time Delay	**(0)** in [s]. Time delay for position settlement in case of error during function steps. Selection possibility between 0-240 seconds.

6.5 Calibration

6.5.1 Calibration Level/Height

When using a 2-wire sensor or a 4-20mA input from an external sensor, the measurement range of the sensor must be entered in parameter P83.
An offset can be entered for hydrostatic pressure sensors if mounted over the channel bottom or if there is a drift from zero in parameter P85
Negative zero shifts can be displayed only through the mA display since the OCM EM doesn't show any negative level/height. The offset is calculated as follows:

$$4\text{mA} - \frac{\text{difference mA input}}{16} \times \text{measuring range}$$

When using a separate ultrasonic gauge, the measurement range should be selected such that it is the same as the highest level/height expected (the measurement distance in an open channel as h_{max} or inside pipe diameters in a closed channel).
An exact comparison of the display on the ultrasonic gauge and the OCM EM has to be matched.

6.5.2 Calibration Velocity

The hydraulic conditions for accurate velocity measurements are mentioned in chapters 2.5.3 and 4.3.4. If no suitable measurement place is available in accordance with the stated conditions, then they can be partially compensated for with on-site hydraulic calibrations.

For the on-site calibration of the velocity the OCM EM has three different possibilities:

1. Multiplication of the measured velocity by an absolute solid calibration factor (P92). Measurement errors (e.g. another sound velocity, different beam angle or detection range of the measured velocity) can be proportionally compensated over the complete measurement range.
   Example: $v_{Measured}$ = 1.28 fps; $v_{Reference}$ 1.35 fps ➔ P82 = 1.35/1.28 = 1.055
2. Level/height dependant multiplication (linearization) of the measured velocity by a variable calibration factor (P121 and corresponding parameters in parameter group of 2). Influences arising with the level/height is compensated by the variable calibration factor. For very large channel geometries the detection range of the velocity sensor is only a part of the complete wetted cross-section. A calibration with this method is therefore very important.
   Prerequisite: different level/height can be simulated.
3. Calculation of the flow with substitute velocities (P123, P126 and P129 and corresponding parameters in parameter group of 3).
   A reliable measurement isn't possible for velocity for very low level/height and fast velocities, especially because of the sensor size. The flow can in this case be calculated with substitute velocities. (free flow conditions)

To be able to carry out a calibration, reference values must be known. These can be determined by the following methods:

1. Measurement of the surface velocity with a suitable floating object. The time needed for the object to travel between points A and B gives the surface velocity of flow. This method is accurate within +/-20% from the average velocity.
   With this method only a plausibility check can be carried out
2. Multiplying the maximum velocity by 0.86. This method has an accuracy of approx. ± 5% of the measured value.
3. Reference flow measurement with other calibrated flow devices (e.g. magmeter). The temporal correlation of the two flows must be referenced.
4. Reference measurements according to VDE/VDI 2640 specifications. Fluctuating flow values must be avoided during the measurement period.
5. Volumetric reference value of the total flow over a measurement time period, e.g. filling of basin of known volume.
   With changing flow values only an average calibration factor can be determined.

Gauges suitable for measurements of selective reference velocities are:

- Mechanical propellers
- Magnetic velocity probes
- Pulse ultrasonic velocity probes (e.g. PVM-PD of NIVUS)

7. Data Transmission

7.1.1 General

It is possible to log data depending on memory cycle and number of channels for up to 2 years on the OCM. An internal wrap-around memory of approx. 64 kb is available.
The following table is a general guide based on the memory cycle and statistics made (P132 - P134) Data logging

Memory Cycle	**1 Min.**	**3 Min.**	**5 Min.**	**10 Min.**	**15 Min.**	**30 Min.**	**60 Min.**
	Memory Cycle Duration						
1 Value : h , v or Q							
Hours	375.2	1125.6	1875.9	3751.8	5627.8	11255.5	22511.0
^ = Days	15.6	46.9	78.2	156.3	234.5	469.0	938.0
2 Values: h + v							
Hours	87.6	562.8	938.0	1875.9	2813.9	5627.8	11255.5
^ = Days	7.8	23.4	39.1	78.2	117.2	234.5	469.0
3 Values: h + v + Q							
Hours	25.1	375.2	625.3	1250.6	1875.9	3751.8	7503.7
^ = Days	5.2	15.6	26.1	52.14	78.2	156.3	312.7

Figure 50. maximum date carrier storage times

Depending on selected memory cycle, the average value of the measurement included over this time period is stored.

The data logger memory is wrap-around. If the data isn't retrieved on schedule, then the oldest data is over-written and lost

There are 3 possibilities for data transmission and retrieval:

- Direct serial connection (RS232) by means of laptop computer or PC and >NIVULOG< Software.
- Use of one analog modem over telephone network. Additional use of an external modem as well as PC/laptop computer with software >NIVUDAT< and central office is required.
- Use of a GSM module over D net. Additional use of an external modem as well as PC/laptop computer with installed end judging software >NIVUDAT< in the data center required.

For a data transmission the parameter 109 may not be activated in the OCM EM.

The transmission rates in the OCM EM (P170) and in the PC/laptop computer (menu item in NivuLog or NivuDat: Transmission Interface Initialization) must be programmed!
The transmission baud rate for a serial connection can differ from the initialization rate and can be higher or lower. (e.g.: Initialization: 95600; Transmission: 19200)

For the transmission of data, a measurement place must be set up on the PC/laptop computer which has the same name as the remote station. It is set as follows:

Create Measurement Place

If a measurement place is to be included in the data evaluation of the program, this must be created first. Select the sub-menu item "create". The following dialogue window appears:

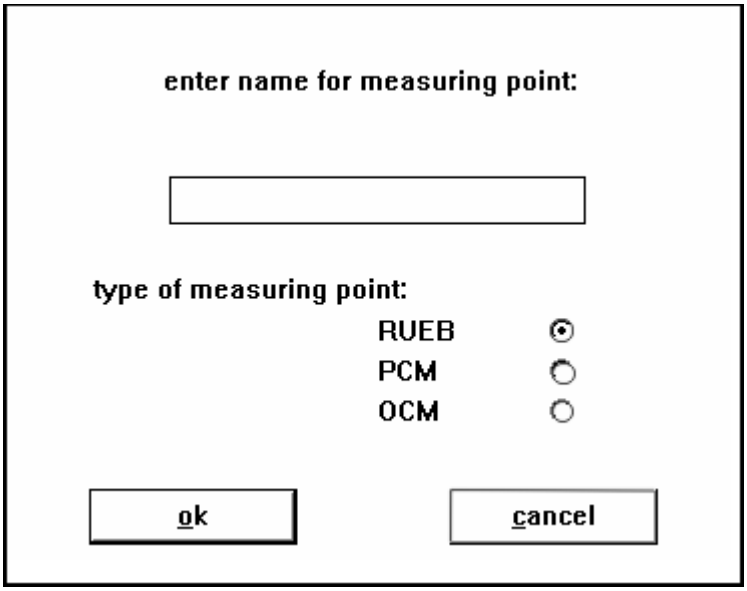


Figure 51. dialog petition for "create measurement place"

The name of the new measurement place must be written down on the text entry field of the dialog box. Additionally, identify the equipment, in this case, >OCM<.
Entering the measurement place is by the >Enter< button, and selection confirmed the button "OK". The >Esc< button or the button "Break" ends the dialog without accepting the new measurement place.

If a measurement place cannot be created, a corresponding error message appears. The following reasons for this are possible:

- A measurement place already exists with this name.
- No storage is available for the new measurement place on the hard disk.
- Other internal fault of the PC for access to the hard disk.
- More than 64 measurement places exist ➔ delete or rename some measurement places.

A newly created measurement place is selected automatically after a successful creation. The measurement place name appears in the title bar of the main window.

Note

Creating a new measurement place must always be carried out after the first program start on a PC (re-initialization) since no measurement places have been created.

Or else the sub-menu items "select" and "delete" will be grey and not available for selection

Caution

It is forbidden to create a measurement place with the name "NIVUS" (destruction of the program structure will occur).

If data shall be transmitted, then the corresponding measurement place has to be selected on the PC/laptop computer.

Select Measurement Point

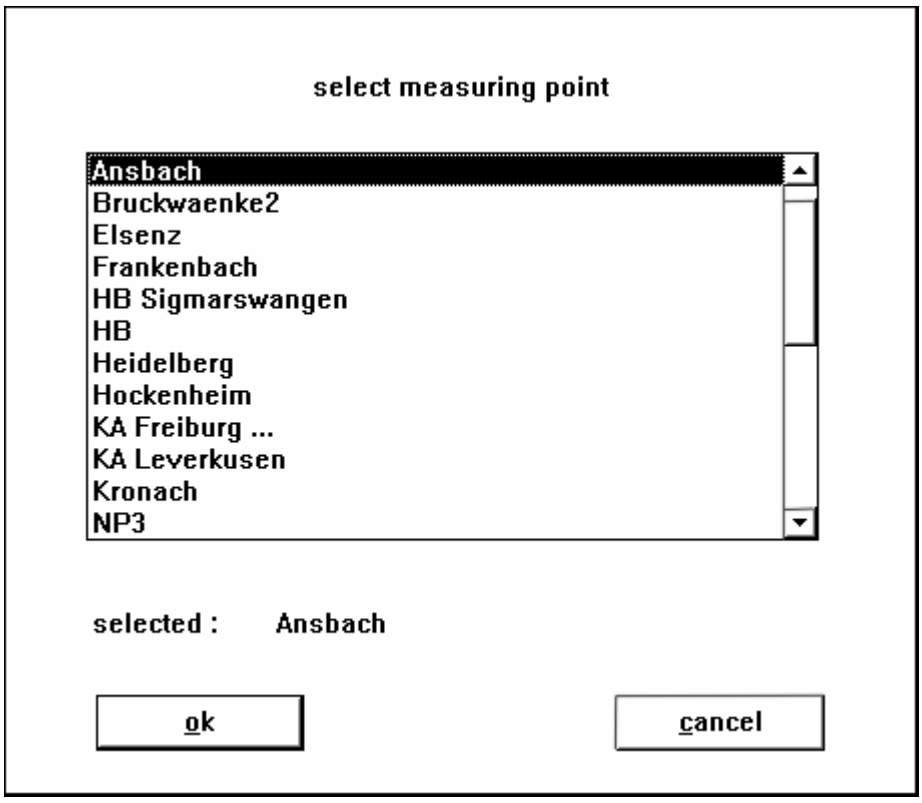


Figure 52. "select measurement point" dialog for Figure

After the selection of the desired measurement place a connection to the measurement place can be made for the execution of data transmission.

The selection of a measurement place can be carried out through the list by the up and down cursor buttons and selection confirmed with >Enter< button. The dialog will can be exited with the >Esc< button without any selection.
With help of the mouse, a measurement place can be selected from the list directly. The confirmation of the selection is by the button named "OK".
The non-acceptance of the selection is made by the „cancel“ button. For faster operation, a measurement place can be accessed by "double-clicking" on the name of the measurement place. "OK" is then no longer required for confirmation.
The name of the selected measurement place appears in addition to the program name in the title strip of the main window and is always visible.

If the measurement point is not selected, no additional menu items of the main window are available. The corresponding sub-menu items are grey and cannot be accessed.

Select Interface

After selecting the measurement place, the interface and transmission rates are now adjusted. After selecting the interface menu the following appears:

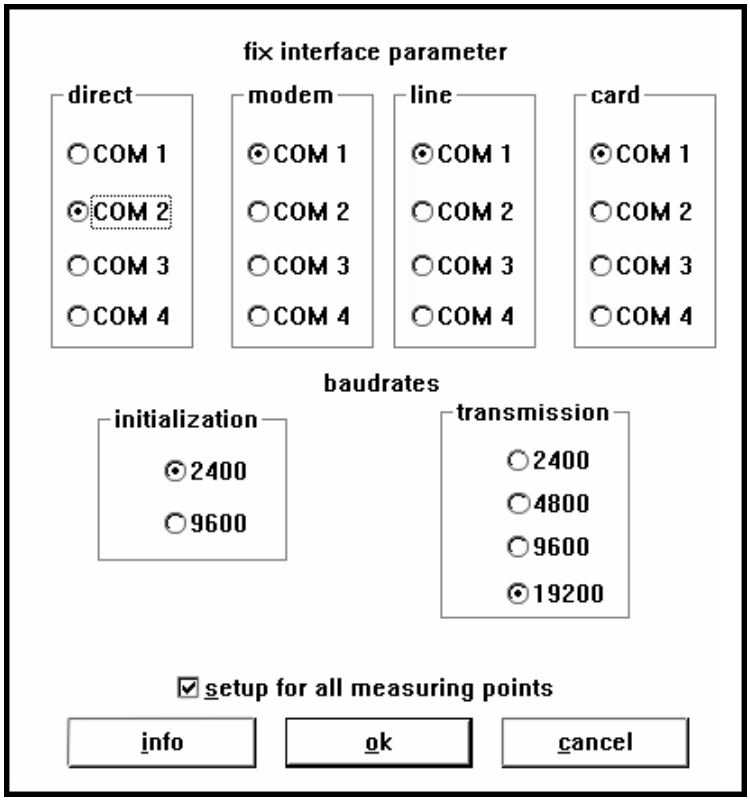


Figure 53. Select "Interface Parameter"

The corresponding interfaces COM 1 to COM 4 on the PC/laptop computer can be defined for the respective transmission mode. The selection must agree with the hardware allocation!
The initialization baud rate is used for the connection and set-up with the OCM EM. It must be adjusted only for RS232 direct connection.
The transmission baud rate is used for data interchange with the OCM EM. It is adjusted for modem connections for RS232.

The choice of the transmission mode is then carried out. The following appears:

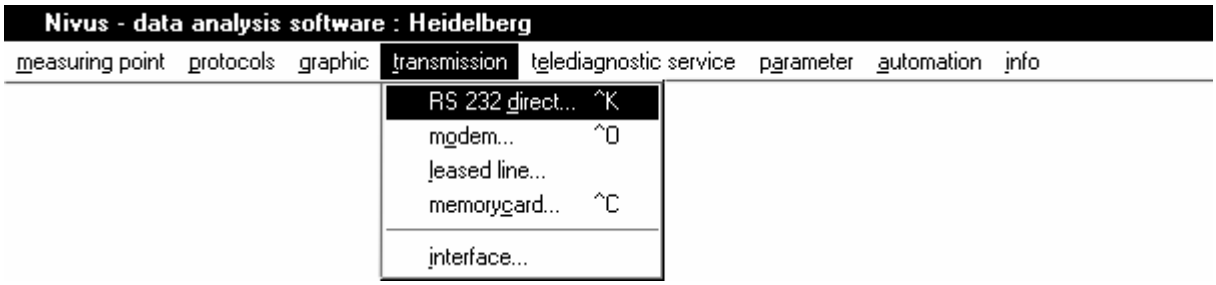


Figure 54. menu of the data transmission

7.1.2 Data Transmission via RS-232 Interface

The direct transmission of data over RS232 is made on the spot via an interconnecting cable between the RS-232 interface of the OCM EM and the laptop computer. For this, the software NivuLog or NivuDat must be installed on the laptop computer.

The transmission is started via the corresponding menu item of the data evaluation software after the connection is established. For this, the correct measurement place selected in the PC must match the OCM EM parametered measurement name. (See chapter 7.1.1). The match must also be for the small case letters as well as blank spaces else data transmission will not be possible).

After selecting the menu item >RS232 direct< the transmission will not any additional parameters immediately, and have to be adjusted. The connection and transmission progress are represented in special message windows on the screen/display.

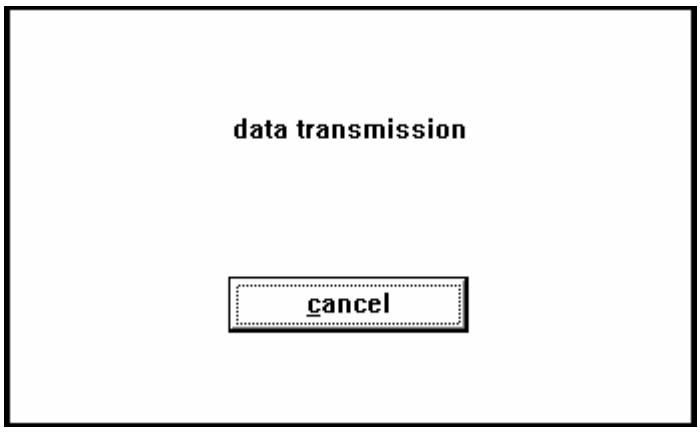


Figure 55. report connection set-up

The end and status of the transmission can be followed in a message window, during the transmission where a status bar shows the percent of data transmitted.

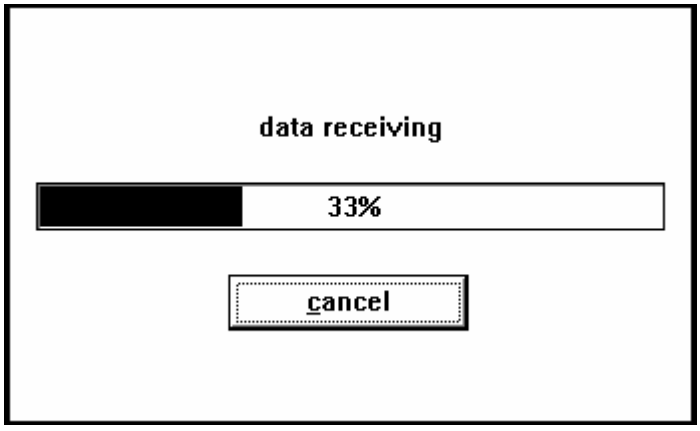


Figure 56. data transmission progress indication

The transmission can be stopped by the button "cancel". The data transmission is then interrupted and must be repeated. The data of the OCM EM are indicated as not transferred. The transmission can be easily repeated.
A transmission error appears upon cancellation, with the current status, the cancellation reason and a corresponding error number on the message window.

Figure 57. report at transmission errors

The error message must be confirmed with "OK". A list of the possible error numbers is in the appendix of the software manual.

The successful and error-free transmission appears as follows:

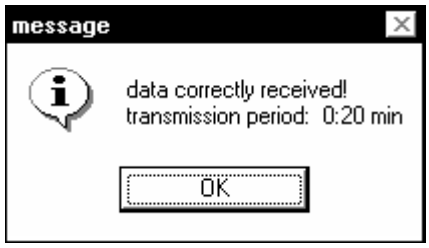


Figure 58. Receiving report data correctly received

This report must be confirmed with "OK".

7.1.3 Data Transmission via Modem or Radio Modem

For the transmission of data or alarms from the OCM EM, both - the OCM EM and the PC at a central office - must be equipped with a modem.
A GSM module data transmission is possible via the D-net by use of a module. The module is installed as an internal module.
The basis for data transmission by means of a radio modem requires an adequate field strength and constant mobile radio communications at the field. The antenna (aerial) location has to be optimized for inadequate field strength. To guarantee an error-free data transmission, a sufficiently strong signal level must be available. If this doesn't suffice, then use of a special directional a real remedies the situation.
If encountering any difficulties, call the NIVUS Service Centre.

At insufficient reception strength the built-in GSM module cannot initialize itself.

The software >NivuDat< installed on the PC is needed for the two transmission paths to the central office. If alarms shall also be transferred, then the alarm reporting controller, type DSC1 is additionally required together with a report printer attached via the serial interface.
The transmission mode >modem< is selected in the OCM EM by the parameter P9 = 1; GSM modem P9 = 2. The controller is then initialized through the internal modem/GSM modem automatically and responds to call or alarms to/from the central centre.
The successful initialization is displayed on the screen as "modem initialization o.k.". The error message "modem not found" appears if the modem is not found or initialized. The OCM EM in this case repeats the event cyclically until it is successful.

If a GSM module is used, then this must be logged in by means of a personal identification number (PIN) into the net. This PIN is entered in parameter P171. For this, a correct entry must be made.

Caution

A wrong entry of the PIN, the module balks after the 3rd initialization tests and an initialization after the correct entry of the PIN is no longer possible!

The OCM EM must in this case be sent to NIVUS to perform the necessary PUK (Personnel Unblocking Key) to NIVUS.
A secure alarm transmission is ensured by a modem or GSM modem with integrated backup battery. The transmission of the last alarm is therefore possible even at power failure (black-out) period for up to an hour.

Note

The backup battery is for modem only. The OCM EM neither powers itself nor save any data at power failure (black-out).

For central office data transmission, the call control is carried out via the measurement place name (P1) as well as the password (P11). The password must consist of at least 2 characters.
Block (capital) and small case letters as well as any special sign or blank spaces used must match exactly for the measurement place created as well as the password!

The connections of the modem, the cables shipped with the unit must be used. The COM port interface and the phone number of the OCM EM must be selected in the program >NivuDat<. These selections must be saved in the PC.
For further details, refer to the NivuDat software manual.

Entry of the Initialization String

The internal modem of the OCM EM is supplied with the right Init-string automatically, so no additional changes are required. If they have to be carried out, proceed as follows:
Take block (capital) into account, space leave out!
Since it is possible also without hardware hand shake for OCM EM and PC to communicate with the attached modem, it can result in a data overflow in rare cases if activated for error correction during transmission. In this case, choose the modem string without error correction.
In both cases, always put the transmission link (PC/DSC-> modem <-> modem <-OCM EM) equivalent initialization strings (with or without error correction) for the attached modem.

Caution

If possible please, don't change the registered entries. The entries put into the modem are already coordinated.

For problems in the modem entries, please, contact the NIVUS Service Centre.

Data transmission via the PC is by selecting the menu item „modem“ (see chapter 7.1.1) and in addition requires an entry of a password and a phone number required.

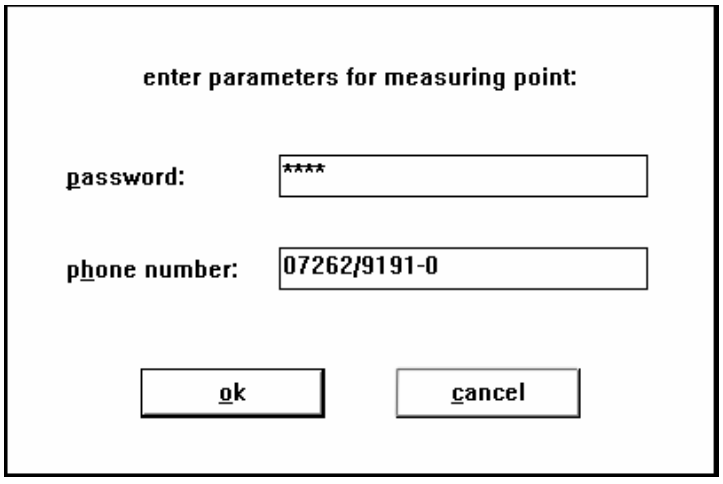


Figure 59. dialogue window - modem parameter

The password protects the OCM EM from being selected via unauthorized access from the telephone network and the on site modem. The entry and storage of the password are made on the OCM EM and must be identically entered for data retrieval on the PC.

The sign "*" appears for entry of the password for every letter in the text entry field of the dialogue window. The password cannot be read in plaintext.
The password isn't saved in the PC and must be entered once more for every data retrieval. If no password is registered in the OCM EM, the entry field of the dialogue window must remain empty. There is no password protection.
The required phone number is the number of the main extension of the telephone network to which the modem of the OCM EM is attached.
The phone number and all permitted control characters of the modem for dialling and/or selection for breaks (see the manual of the modem provided by the manufacturer) are to be inserted for the PC modem at the central office or switch-board and its extensions.

If using tone dialling, "T" must be entered in front of the phone number
(e.g. T07262/9191-0).
The phone number entered for the measurement place stays saved in the program. For carrying out transmission, this registered phone number is put down for every measurement place. This is alterable any time.

After confirmation with the entry "OK", it is similar to transmission of the direct connection via RS232 interface. (Also see chapter 7.1.2.)
The choice of the modem on the OCM EM is carried out automatically.

7.1.4 Remote Diagnosis with NivuDat

The remote diagnosis offers the possibility to control an OCM EM via modem or direct RS232 connection, to verify the parameters and check the current status of the input signals and the readings. For this, data transmission must be carried out with an on-line connection.
All other functions on the PC for the NivuDat software are not available while there is this connection to the OCM EM.
The remote diagnosis is completed by selecting 'end connection'.
After the remote parameter setting the connection to the OCM EM is disconnected automatically since this carries out a system restart.

For more functional descriptions, refer to the software manual.

Remote parameter setting via modem in the OCM EM can be erroneously configured such that a connection is not possible! In case of doubt for remote parameter setting via the PC-contact the NIVUS staff for training regarding the software first.

8. Error/Fault Description

Error/Fault	Possible error/fault cause	Error/Fault elimination
No parameter setting by means of program >PARAMET< possible	Wrong interface cable	Using interface cables from NIVUS
	No Connection	Check both ends of cables for connectivity
		Check for correct choice of communications ports: COM 1 or 2. (Other interface port not supported by PARAMET !)
		Check for selected baud rate
	Connection Break	Faulty or inadmissible data input
		No data input was carried out during the last 3 minutes
		The Esc button was pressed
No flow indication	Connection	Check connection of sensor cable to termination strip
	Velocity sensor	Check sensor for correct installation - horizontal and against flow direction
		Check sensor for fouling (clean and/or remove) or check for damage/destruction (sensor must be exchanged). The sensor signal can be checked on the display. (see Chapter 5.4.1)
	Level/Height Measurement	Check external level sensor for its function and signal transmission (broken cables, termination connections, short-circuits, load). Check hydrostatic level sensor for correct mounting and fouling. The level signal from the transmitter can be checked on the display. (see Chapter 5.4.1)
	Transmitter	Check for broken cables and termination connection
	Programming	Check all parameters entered on the transmitter. Perform a general reset if necessary and reprogram the parameters
No display (dark)	Connection	Check connection of power supply
	Power Supply	Check type of power supply
		Check switch position on power supply board
		Check power supply (AC or DC) with transmitter type (item number)
Wrong date is displayed	Power outage (blackout), back-up battery dead	Re-enter new date. Contact NIVUS service department for wrong data storage and thus wrong date stamps or send the unit for installation of new back-up battery
Wrong time is displayed	Summer-/ wintertime reset	When required correct time. However, this causes a gap of an hour for data logging depending on resetting in the data set. It is advisable to stay with the standard time
	Power outage (blackout), back-up battery dead	Re-enter time. Contact NIVUS America service department for wrong data storage and thus wrong date stamps or send the unit for installation of new back-up battery

Measurement unstable	Measuring place hydraulically unfavourable	Check of the measurement profile quality by means of software program (V-Diag) from NIVUS. Transfer of the sensor to hydraulically suitable place (increasing the required distance)
		Eliminate fouling, deposits or silt in front of the sensor.
		Improve the flow profile by installation of suitable baffling elements, flow rectifier or similar before the measurement place.
	Sensor	Check mounting of sensor opposite the flow direction and for horizontal installation.
		Check sensor for fouling and removing it if necessary.
Measurement not possible	Measurement place hydraulically unsuitable	See fault description " measurement unstable "
	External Level Measurement	Check for correct connection and signal cable
		Check for correct connection to unit
		Check for cable breaks from corrosion or connection on termination strip, short-circuits, inadmissible loads or use without isolation .
		Control of the level signal in this mode by means of the corresponding button (see Chapter 5.4.1)
		Control and compare measurement range of the level sensor and that input in OCM EM (P82 – P85)
	Velocity sensor	Check for correct connection
		Check for cable breaks from corrosion or connection on termination strip, short-circuits, inadmissible loads or use without isolation .
		Control of the velocity signal in this mode by means of the corresponding button (see Chapter 5.4.1)
		Check mounting of sensor opposite the flow direction and for horizontal installation
		False Doppler frequency entered for other sensor types in P93 to P95
	Programming	Check channel geometry, dimensions (measurement units), calculation method, input ranges etc. Perform a general reset and reprogram the unit.
Faulty relay output	Connection	Check connection on terminal strip.
		Check external control relays for available power supply.
	Programming	Check relay outputs are activated.
		Check additional or supplementary values, such as function, pulse parameter, boundary values etc. Perform a general reset and reprogram the unit.

No function of the regulator	Connection	Check terminals. Relays must be >open< 3 and >closed< for 4.
		Check external control relays for available power supply
		Check connection of the input signal from the boundary contact and external input value (when programmed)
		Check function of the outputs in this mode by means of the buttons provided
	Programming	Check Programming. Regulator activated? Regulator quantity characteristics set? Analog input and initial value activated and set? Relays output activated?
		Perform a general reset and reprogram the unit.
Erroneous/Faulty mA Output	Connection	Check terminals for correct connection and polarity
		Using one or several outputs: Check subordinate systems/display for potential free inputs
	Programming	Output activated?
		Check the correctness of the assignment function to output channel
		Check output range (0 or 4-20mA)
		Check output span
		Check offset
	Subordinate Systems	Check cable connection/cable breaks as well as in- and output connection to termination strip
		Check input range (0 or 4-20mA) of subordinate systems
		Check input span of subordinate systems
		Subordinate inputs switched in several rows: Check for galvanic isolation
No Data in the Internal Data Logger	Programming	Check offset of the subordinate system
		Data logging not activated. Set P130 .
Data Gaps in the Internal Data Logger	Memory cycle	Period since the last date end reading too short. (P04) wait for cycle or reduce cycle time
	Power failure	Oldest data in the wrap-around memory were overwritten. Increase memory cycle or transmit data over a shorter time rhythm. (No data can be logged if mains power failed)!

9. Resistance Lists

The parts of the OCM EM sensor in contact with the measurement media consist of:

- High-grade steel 1.4571 (bottom plate or insertion sensor cover)
- Polyamide PA6 (cable gland)
- Polyurethane (sensor body and cable sheath)

The sensor technology is resistant to usual domestic sewages, dirt and rain water as well as combined waters from municipalities and industries. Also in many industrial plants (e.g. Hüls, BASF etc.) the resistance do not present any problems. The sensor technology nevertheless is not resistant to all substances and substance mixtures.

In principle, there are dangers of the sensor being damaged in chloride media (bottom plate or sensor cover) as well as various organic solvents.

It has to be taken into account that, for combined (simultaneous existence of several substances) there is a possibility of occurrence of catalytic effects under certain conditions. These catalytic effects cannot be checked completely due to the infinitely high possibility of variation.
Please, contact in the case of doubt your responsible NIVUS representative and request a free material test for a long term test.

Chemical resistance polyurethane at 21°C (70 F) Medium temperature, Contact time: 6 months
The material is constant:

- 5 to 36 % hydrochloric acid
- 5 to 36 %sulfuric acid
- 5 to 20 %acetic acid
- 1 to 10 %nitric acid
- 5 %phosphoric acid
- 5 to 10 %ammonia solution
- 1 % soda or potash lye
- 100% methanol

Chemical Resistance of V4A at Various Temperatures:

Substance	Concentration	Temperature	resistant	not resistant
Ammonium chloride	10%	100 C (212 F)	x	
Methanol	100%	20°C (68 F)	x	
Nitric acid	20%	20°C (68 F)	x	
Hydrochloric acid	1%	20°C (68 F)		x
Phosphoric acid	10%	20°C (68 F)	x	
Ammonia	Gas	20°C (68 F)	x	
Ammonia	Gas	70°C (158 F)		x
Copper Chloride	5%	20°C (68 F)		x
Ferric sulfate	5%	100 C (212 F)	x	
Soda lye	20%	100 C (212 F)	x	
Sulfuric acid	10%	20°C (68 F)	x	

Chemical Resistance of PA at 20 C (68 F):

Substance	Concentration	resistant	Conditionally resistant	not resistant
Ammonia	10%, liquid	x		
Gasoline, super	100%	x		
Aluminium chloride	10%		x	
Acetic acid	10%	x		
Formaldehyde	20%		x	
Ethanol	96%	x		
Soda lye	10%	x		
Potash lye	10%	x		
Phosphoric acid	10%			x
Hydrochloric acid	10%			x
Carbon disulfide	100%	x		
Sulfuric acid	10%			x
Sea water	100%	x		

More extensive resistance lists can be requested from NIVUS America Inc.

10. Maintenance and Cleaning

The OCM EM is manufactured on the concept that it should be calibration-, maintenance-, and wear- and tear-free. Regular maintenance and cleaning however may be required in conditions where external dirt may accumulate.

10.1 General

It may be necessary or required in different countries for special metrological applications to perform regular maintenance and calibration to comply with official regulations. When required NIVUS as well as its authorized representatives will perform all required regular checks, hydraulic and metrological checks, calibrations, fault eliminations and repairs in the context of a maintenance contract made. These are according to the DIN 19559 or equivalent standards set by the federal, state/provincial and local authorities.

10.2 Sensors

10.2.1 Level/Height Measurement

If an ultrasonic sensor is used, wear and tear appearances and curve changes don't have to be expected. Because these sensors are non-contact, it becomes only necessary to check them after they been flooded and to clean off any contamination or encrustation that may occur to the sensor face. Also, it should be made sure that the acoustic beam part is clean of contamination.

For hydrostatic pressure sensor, a long term ageing can cause drift. Checking the sensor at intervals (at least every 6 months) and calibrating for zero and the measurement range may be required.
E.g. grease, oil, slime etc. present in the measurement media may be deposited on the pressure diaphragm, and must be removed, otherwise measurement errors may occur.
For this, the manufacturer's instructions must be followed. If a pressure sensor is supplied by NIVUS, then carefully cleaning the membrane with a brush, clean water and cleaning agent suffices.

The pressure sensor membrane is highly sensitively and must be cleaned with utmost caution. Pointed, sharp or hard objects, pressure, blow, jet of water or similar principles that are mechanical rough must be avoided since they lead to the destruction of the sensor face.

10.2.2 Velocity Measurement

Wear and tear may effect the ultrasonic Doppler method sensors by drifting from a zero.
Sluice slime, grease and films of oil don't change or affect the measurement. Heavier coatings or complete embedding of the sensor into sludge, silt, mud, fibrous substances or sand, however, muffles the measurement signals such, that this can lead to a measurement errors or failure. Therefore it is necessary to clean the velocity sensor at regular intervals in very dirty media with tendency towards the sedimentation. For this, a brush with synthetic material bristles or street brooms or similar can be used.

No hard objects, like wire brushes, bars, or similar objects should be used for cleaning of the sensor. Use of cleaning by jet of water is (e.g. spray with water hose) (see production data of the sensor) permitted only up to pressure of 4 bar. (use of high pressure cleaners can lead to the damage of the sensor and to failure and therefore is forbidden .

If there are abrasive materials in the media (e.g. glass, stones, sand, etc), it can lead to abrasion of the sensor in high velocities of flow and can lead to erroneous signals from the sensor. Also, in extreme conditions, the sensor may get completely damaged, and has to be replaced. No significant abrasion take place in most applications, however, after several years of use, normal wear and tear may take place.

10.3 Measurement Transmitter

When required the system-unit cover of the transmitter has to be cleaned with a dry fluffy cloth. For stickier grime and dirt, a netting material can be used.
Use of scouring or aggressive cleaning agents is not allowed.

Before cleaning with a damp cloth, the power to the OCM EM must be switched off.

11. Parameter List

This parameter list helps in storing your programmed parameters and also helps the Technical Support Staff when any support is needed from them. In case of support, please send this list together with a detailed drawing of the application.

Serial number: ... ... Item number: ... ... Software version: ... .

Parameter	Work-petition	Description:	Customer petition:
		General and system parameter	
P0	**(67)**	Password key	
P1	**(OCM)**	Measurement place name	
P2	**(..)**	Date	
P3	**(..)**	Time	
P4	**(15)**	Memory cycle for readings	
P5		Not used	
P6		Not used	
P7		Not used	
P8	**(0)**	Power failure supervision	
P9	**(0)**	Communication	
P10	**(3)**	Alarm delay	
		Modem (option)	
P11	**(NIVUS)**	Password	
P12	**( )**	Phone number 1	
P13	**( )**	Phone number 2	
		System parameter	
P14	**( )**	Reset Totalizer for value in (P177)	
P15	**( )**	Data loggers delete	
P16	**( )**	All parameters delete	
P17	**( )**	Alarm buffers delete	
P18	**( )**	Complete System Reset	
P19	**( )**	Modem initialization string	

		LCD	
P20	**(1)**	LCD display mode	
P21	**(2)**	Display measurement	
P22		Not used	
P23	**(20)**	Damping display	
P24	**(0)**	Dimension level/height	
P25	**(1)**	Decimal places level/height	
P26	**(1)**	Dimension velocity	
P27	**(2)**	Decimal places velocity	
P28	**(0)**	Dimension flow	
P29	**(1)**	Decimal places flow	
P30	**(1)**	Dimension total	
P31	**(0)**	Decimal places total	
P32		Not used	
		Analog outputs	
P33	**(0)**	Analog output 1 – mode	
P34	**(2)**	AA 1 – function	
P35	**(1)**	AA 1 – output range	
P36	**(0)**	Analog output 2 – mode	
P37	**(1)**	AA 2 – function	
P38	**(1)**	AA 2 – output range	
P39	**(20)**	Output damping	
P40	**(3.0)**	Output range of level/height, value at 20mA	
P41	**(0.0)**	Output range of level/height, value at 0/4mA	
P42	**(3.0)**	Output range of velocity, value at 20mA	
P43	**(0.0)**	Output range of velocity, value at 0/4mA	
P44	**(1.0)**	Output range of flow, value at 20mA	
P45	**(0.0)**	Output range of flow, value at 0/4mA	
P46	**(12)**	Simulation value AA 1	
P47	**(12)**	Simulation value AA 2	
P48		Not used	
P49		Not used	

		Relay/Digital Outputs	
P50	**(0)**	Relay/Digital output 1 – mode	
P51	**(0)**	Function	
P52	**(0,0)**	One switching point	
P53	**(0,0)**	From switching period	
P54	**(0,0)**	Total per pulse	
P55	**(0)**	Time delay alarm report	
P56	**(4)**	Pulse/break duration quantity pulse	
P57		Not used	
P58	**(0)**	Relay/Digital output 2 – mode	
P59	**(0)**	Function	
P60	**(0,0)**	One switching point	
P61	**(0,0)**	From switching period	
P62	**(0,0)**	Total per pulse	
P63	**(0)**	Time delay alarm report	
P64	**(4)**	Pulse/break duration quantity pulse	
P65		Not used	
P66	**(0)**	Relay/Digital output 3 – mode	
P67	**(0)**	Function	
P68	**(0,0)**	One switching point	
P69	**(0,0)**	From switching period	
P70	**(0,0)**	Total per pulse	
P71	**(0)**	Time delay alarm report	
P72	**(4)**	Pulse/break duration quantity pulse	
P73		Not used	
P74	**(0)**	Relay/Digital output 4 – mode	
P75	**(0)**	Function	
P76	**(0,0)**	One switching point	
P77	**(0,0)**	From switching period	
P78	**(0,0)**	Total per pulse	
P79	**(0)**	Time delay alarm report	
P80	**(4)**	Pulse/break duration quantity pulse	
P81		Not used	
		Level/Height measurement	
P82	**(1)**	Measurement range	
P83	**(3.0)**	Measurement range, value at 20mA	
P84	**(0)**	Measurement supervision	
P85	**(0.0)**	Measurement offset	

		Velocity measurement	
P86		Not used	
P87		Not used	
P88		Not used	
P89		Not used	
P90		Not used	
P91	**(0)**	Flow direction recognition	
P92	**(1.0)**	Calibration factor	
P93	**(728)**	Doppler frequency	
P94		Not used	
P95		Not used	
P96		Not used	
P97		Not used	
P98		Not used	
P99		Not used	
P100		Not used	
P101	**(100)**	Number measurements/measurement cycle	
P102	**(3)**	Maximum measurement time/measurement cycle	
P103	**(5)**	Measurement signal damping	
P104	**(8)**	Maximum number of measurement errors	
P105	**(1)**	Frequency groups of ± to the H. Peak	
P106	**(15)**	lower limiting value signal quality 1	
P107	**(5)**	lower limiting value signal quality 2	
P108		Not used	
P109	**(0)**	Diagnosis data transmission	
		Signal evaluations	
P110	**(3,0)**	Maximum value level/height (h_{max})	
P111	**(3,0)**	Maximum value velocity (v_{max})	
P112	**(1.0)**	Maximum value flow (Q_{max})	
P113	**(0.0)**	Minimum value level/height (h_{min})	
P114	**(0.0)**	Minimum value velocity (v_{min})	
P115	**(0.0)**	Minimum value flow (Q_{min})	
P116	**(999999)**	Overflow value totalizer	
P117		Not used	
P118		Not used	
P119		Not used	
P120	**(0)**	Number of pairs h = f(h) function	
P121	**(0)**	Number of pairs v = f(h) function	
P122	**(0)**	Number of pairs v = f($v_{measured}$) function	
P123	**(0)**	Number of pairs v = f$v_{_test}$ (h) function	
P124		Not used	

P125	(0)	Check velocity measurement	
P126	(0)	Substitute velocity for checked error	
P127	(0)	Maximum relative deviation velocity V/v_{test}	
P128	(0)	Minimum absolute deviation velocity $V/v_{test}t$	
P129	(0)	Scope of the check curve	
		Data storage	
P130	(5)	Mode data storage	
P131	(0)	Logger supervision	
P132	(24)	Number statistics hourly results	
P133	(31)	Number statistics daily results	
P134	(12)	Number statistics monthly results	
P135	(0)	Statistics assignment	
P136		Not used	
P137		Not used	
P138		Not used	
P139		Not used	
		Flow calculation	
P140	**(1.0)**	Height range limit 1	
P141	**(1)**	Velocity measurement procedure	
P142	**(4)**	Channel profile	
P143	**(0.0)**	Minimum velocity (vh1_min)	
P144	**(0.0)**	Maximum velocity (vh1_max)	
P145		Not used	
P146	**(0.0)**	Height range limit 2	
P147		Velocity measurement procedure	
P148		Channel profile	
P149		Minimum velocity (vh2_min)	
P150		Maximum velocity (vh2_max)	
P151		Not used	
P152	**(0.0)**	Height range limit 3	
P153		Velocity measurement procedure	
P154		Channel profile	
P155		Minimum velocity (vh3_min)	
P156		Maximum velocity (vh3_max)	
P157		Not used	
P158	**(0.0)**	Switching hysteresis height range limits	
P159	**(0.0)**	Sludge/silt height	
P160	**(0.0)**	Exponent x	
P161	**(0.0)**	Flow Qr Max at full pipe	
P162	**(0.0)**	Flow Qh Max at height hmax	

P163	**(0,5)**	Pipe radius of R	
P164	**(0.0)**	Channel width B	
P165	**(0.0)**	lower channel width trapezium b0	
P166	**(0.0)**	Upper channel width trapezium b1	
P167	**(0.0)**	Height trapezium h0	
P168	**(0.0)**	U-Profile radius of R	
P169	**(0.0)**	Area Ah_max at height hmax	
		Modem (option)	
P170	**(1)**	Communication speed (baud rate)	
P171	**(0)**	Measuring authority code number	
P172	**(0)**	Calling method	
P173		PIN no. for GSM radio modem	
P174		Not used	
P175		Not used	
P176	**(0)**	Modem data flow control (rt/CTS)	
P177	**(0.0)**	P14 -- totalizer	
P178	**(10)**	Timeout, time for block assignment	
P179	**(30)**	Timeout, time for disconnection	
		Regulator (option)	
P180	**(NIVUS)**	Password regulator operation	
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P190	**(0)**	Scan time (T)	
P191	**(0)**	Minimum control pulse time	
P192	**(0)**	Maximum control pulse time	
P193	**(0)**	Transmission coefficient (K)	
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P199	**(0)**	Control pulse time at end position for fast end	
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