Instruction Manual for
OCM Pro Measurement Device

(Original Instruction Manual – German)

Software Revision No. 2.60

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

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

1 Contents

1.1 Table of Contents

1 Contents 4
1.1 Table of Contents 4
1.2 Declaration of conformity 7
1.3 Ex-Approval Transmitter 9
1.4 Ex-Approval Sensors 10
2 Overview and use in accordance with the requirements 11
2.1 Overview 11
2.2 Use in accordance with the requirements 12
2.3 Specifications 13
3 General Notes on Safety and Danger 15
3.1 Danger Notes 15
3.1.1 General Danger Signs 15
3.1.2 Special Danger Notes 15
3.2 Device Identification 16
3.3 Installation of Spare Parts and Parts subject to wear and tear 16
3.4 Turn-off Procedure 16
3.5 User's Responsibilities 17
4 Functional Principle 18
4.1 General 18
4.2 Level Measurement 18
4.3 Flow Velocity Capture 19
4.4 Device Variations 22
5 Storing, Delivery and Transport 24
5.1 Receipt 24
5.1.1 Delivery 24
5.2 Storing 24
5.3 Transport 24
5.4 Return 25
6 Installation 25
6.1 General 25
6.2 Transmitter Installation and Connection 25
6.2.1 General 25
6.2.2 Dimensions 26
6.2.3 Transmitter Connection 28
6.3 Sensor Installation and Connection 32
6.3.1 General 32
6.3.2 Sensor Dimensions 32
6.3.3 Sensor Installation 33
6.3.4 Required Distances 36
6.3.5 Sensor Connection 37
6.4 OCM Pro Power Supply 40

6.5 Overvoltage Protection Precautions 42
6.6 Regulator Mode 43
6.6.1 General 43
6.6.2 Construction of the Measurement Distance 44
6.6.3 Connection 46
6.6.4 Control Algorithm 47
7 Initial start-up 48
7.1 General 48
7.2 Keypad 49
7.3 Display 49
7.4 Operation Basics 50
8 Parameter Setting 51
8.1 Quick Guide Parameter Setting (Quick Start) 51
8.2 Parameter Setting Basics 52
8.3 Operation mode (RUN) 53
8.4 Display Menu (EXTRA) 56
8.5 Parameter Menu (PAR) 57
8.5.1 Parameter Menu “Measurement Place“ 58
8.5.2 Parameter menu „Level“ 64
8.5.3 Parameter menu “Velocity“ 67
8.5.4 Parameter Menu “Analog Inputs“ 71
8.5.5 Parameter Menu “Digital Inputs“ 73
8.5.6 Parameter Menu “Analog Outputs“ 74
8.5.7 Parameter Menu “Relay Outputs 76
8.5.8 Parameter Menu “Control Unit“ 78
8.5.9 Parameter Menu “Settings“ 86
8.5.10 Parameter Menu Storage Mode“ 88
8.6 Signal Input-/Output Menu (I/O) 92
8.6.1 I/O Menu “Analog Inputs” 92
8.6.2 I/O Menu “Digital Inputs” 93
8.6.3 I/O Menu “Analog Outputs” 94
8.6.4 I/O Menu “Digital Outputs” 94
8.6.5 I/O Menu “Sensors” 95
8.6.6 I/O Menu “Interfaces” 99
8.6.7 I/O Menu “Control Unit” 99
8.6.8 I/O Menu “MemoryCard” 100
8.7 Calibration Menu (CAL) 102
9 Parameter Tree 104
10 Troubleshooting 110
11 Resistancies 114
12 Maintenance and Cleaning 116
13 Emergency 116
14 Dismantling/Disposal 116
15 Table of Pictures 117

16 Index 120

1.2 Declaration of conformity

EC Declaration of Conformity

pursuant to

- **the EC Low Voltage Directive 73/23/EEC, Annex III (as of 2003)**
- **the EC EMC Directive 89/336/EEC, Annex I and II (as of 2003)**
- **the EC Directive 94/9/EC: Equipment and protective systems intended for use in potentially explosive atmospheres (ATEX)**

We hereby declare that the design of the

Description: Measuring device OCM Pro with sensor

as delivered complies with the above regulations and following EC directives and DIN EN standards:

Directive/ Standard	Title	Edition	Remarks
73/23/ EC	**EC Low Voltage Directive**	**1973**	**As of 06. 2003**
EN 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements	1993	Harmonised standard
89/336/EC	**EC EMC Directive**	**1989**	**As of 06. 2003**
EN 61000-3-2	Electromagnetic compatibility – Limits for harmonic current emissions	2000	Harmonised standard
EN 61000-3-3	Electromagnetic compatibility – Limits – Limitation of voltage fluctuations and flicker in low voltage supply systems	1995	Harmonised standard
EN 55011	Industrial, scientific and medical (ISM) radio-frequency equipment – Radio disturbance characteristics – Limits and methods of measurement	1998	Harmonised standard
EN 61000-6-2	Electromagnetic compatibility – Generic immunity standard – Industrial environment	1994	Harmonised standard

Directive/ Standard	Title	Edition	Remarks
94/9/EC (ATEX 100a)	**EC Directive: Equipment and protective systems intended for use in potentially explosive atmospheres**	**1994**	**As of Feb. 2003**
EN 1127-1	Explosive atmospheres – Explosion prevention and protection – Part 1: Basic concepts and methodology	1997	Harmonised standard
EN 50014	Electrical apparatus for potentially explosive atmospheres – General requirements	1999	Harmonised standard
EN 50020	Electrical apparatus for potentially explosive atmospheres – Intrinsic safety "i"	1994	Harmonised standard

Unauthorised changes to the device invalidate this declaration.

Eppingen, 21 October 2003

.....
Heinz Ritz
Head Quality Management

1.3 Ex-Approval Transmitter

TÜV CERT

(1) **EG-Baumusterprüfbescheinigung**

(2) Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen - **Richtlinie 94/9/EG**

(3) EG Baumusterprüfbescheinigungsnummer

TÜV 00 ATEX 1572

(4) Gerät: Messumformer Typ OCP/...

(5) Hersteller: NIVUS GmbH

(6) Anschrift: D-75031 Eppingen, Im Täle 2

(7) Die Bauart dieses Gerätes sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Baumusterprüfbescheinigung festgelegt.

(8) Der TÜV Hannover/Sachsen-Anhalt e.V., TÜV CERT-Zertifizierungsstelle, bescheinigt als benannte Stelle Nr. 0032 nach Artikel 9 der Richtlinie des Rates der Europäischen Gemeinschaften vom 23. März 1994 (94/9/EG) die Erfüllung der grundlegenden Sicherheits- und Gesundheitsanforderungen für die Konzeption und den Bau von Geräten und Schutzsystemen zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie.

Die Ergebnisse der Prüfung sind in dem vertraulichen Prüfbericht Nr. 00 PX 24000 festgelegt.

(9) Die grundlegenden Sicherheits- und Gesundheitsanforderungen werden erfüllt durch Übereinstimmung mit

EN 50 014:1997 **EN 50 020:1994**

(10) Falls das Zeichen "X" hinter der Bescheinigungsnummer steht, wird auf besondere Bedingungen für die sichere Anwendung des Gerätes in der Anlage zu dieser Bescheinigung hingewiesen.

(11) Diese EG-Baumusterprüfbescheinigung bezieht sich nur auf die Konzeption und den Bau des festgelegten Gerätes gemäß Richtlinie 94/9/EG. Weitere Anforderungen dieser Richtlinie gelten für die Herstellung und das Inverkehrbringen dieses Gerätes.

(12) Die Kennzeichnung des Gerätes muss die folgenden Angaben enthalten:

II (2) G [EEx ib] IIB

TÜV Hannover/Sachsen-Anhalt e.V.
TÜV CERT-Zertifizierungsstelle
Am TÜV 1
D-30519 Hannover

Hannover, 18.12.2000

TÜV NORD

Der Leiter

Diese EG-Baumusterprüfbescheinigung darf nur unverändert weitervorbreitet werden.
Auszüge oder Änderungen bedürfen der Genehmigung des TÜV Hannover/Sachsen-Anhalt e.V.

STOP

The approval is only valid in connection with the respective indication on the transmitter's nameplate.

1.4 Ex-Approval Sensors

TÜV CERT

(1) **EG-Baumusterprüfbescheinigung**

(2) Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen - **Richtlinie 94/9/EG**

(3) EG Baumusterprüfbescheinigungsnummer

TÜV 00 ATEX 1573

(4) Gerät: Sensor Typ OCS/...

(5) Hersteller: NIVUS GmbH

(6) Anschrift: D-75031 Eppingen, Im Täle 2

(7) Die Bauart dieses Gerätes sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Baumusterprüfbescheinigung festgelegt.

(8) Der TÜV Hannover/Sachsen-Anhalt e.V., TÜV CERT-Zertifizierungsstelle, bescheinigt als benannte Stelle Nr. 0032 nach Artikel 9 der Richtlinie des Rates der Europäischen Gemeinschaften vom 23. März 1994 (94/9/EG) die Erfüllung der grundlegenden Sicherheits- und Gesundheitsanforderungen für die Konzeption und den Bau von Geräten und Schutzsystemen zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie.

Die Ergebnisse der Prüfung sind in dem vertraulichen Prüfbericht Nr. 00 PX 24100 festgelegt.

(9) Die grundlegenden Sicherheits- und Gesundheitsanforderungen werden erfüllt durch Übereinstimmung mit

EN 50 014:1997 **EN 50 020:1994**

(10) Falls das Zeichen "X" hinter der Bescheinigungsnummer steht, wird auf besondere Bedingungen für die sichere Anwendung des Gerätes in der Anlage zu dieser Bescheinigung hingewiesen.

(11) Diese EG-Baumusterprüfbescheinigung bezieht sich nur auf die Konzeption und den Bau des festgelegten Gerätes gemäß Richtlinie 94/9/EG. Weitere Anforderungen dieser Richtlinie gelten für die Herstellung und das Inverkehrbringen dieses Gerätes.

(12) Die Kennzeichnung des Gerätes muss die folgenden Angaben enthalten:

Ex II 2 G EEx ib IIB T4

TÜV Hannover/Sachsen-Anhalt e.V.
TÜV CERT-Zertifizierungsstelle
Am TÜV 1
D-30519 Hannover

Hannover, 18.12.2000

TÜV NORD

Der Leiter

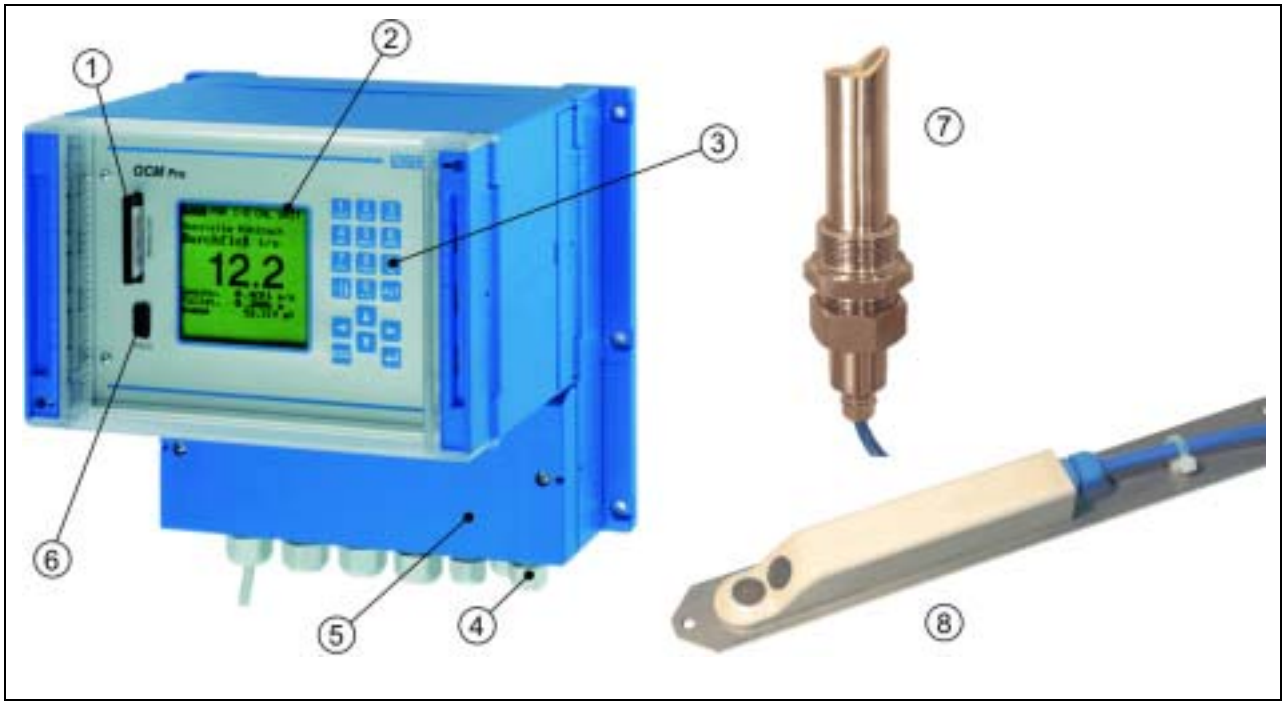
Diese EG-Baumusterprüfbescheinigung darf nur unverändert weiterverbreitet werden.
Auszüge oder Änderungen bedürfen der Genehmigung des TÜV Hannover/Sachsen-Anhalt e.V.

STOP

The approval is only valid in connection with the respective indication on the sensor's nameplate.

2 Overview and use in accordance with the requirements

2.1 Overview



1	MemoryCard Slot
2	Display
3	Keypad
4	PG Gland
5	Clamp Terminal Housing
6	RS232 Interface
7	Pipe Sensor
8	Wedge Sensor

Fig. 2-1 Overview

2.2 Use in accordance with the requirements

The measurement device type OCM Pro including the respective sensor technology supplied by NIVUS is intended to be used for continuous flow measurement of slight to heavy polluted media in partial and fully filled channels, pipes or similar. Here the allowed maximum values, as specified in chapter “Specifications“, must be strictly kept. All cases which vary from these conditions and are not passed by NIVUS GmbH in writing are left at owner’s risk.

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

Ex-Approval

The Ex-version of the OCM Pro sensor is designed to be used in areas with explosive atmospheres (zone 1).

The transmitter always has to be installed outside the Ex-zone!

Approval

Sensor: ⟨Ex⟩ II 2 G EEx ib IIB T4

Transmitter: ⟨Ex⟩ II(2)G [EEx ib] IIB

The approval is only valid in connection with the respective indication on the transmitters or the sensors nameplate.

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

2.3 Specifications

Transmitter

Power Supply	115 to 230V AC, 50 to 60Hz or 24V ± 15%, 5% residual ripple
Power Consumption	max. 20VA
Enclosure	- Material: Polycarbonate - Weight: - wall mount: ca. 2900g, IP 65 - panel mount: ca. 2800g, IP 54 (front side) - 19“ rack mount: ca. 2500g, IP 20
Ex-Approval (optional)	II(2)G [EEx ib] IIB
Operating Temperature	-20°C to +50°C (-6°F to +120°F)
Storage Temperature	-30°C to +70°C (-22°F to +158°F)
max. Air Humidity	80%, non condensing
Display	backlit graphic display, 128 x 128 pixel
Operation	18 keys, conversation mode in German, English and French
Inputs	- 1 x 4 - 20mA for external level (2-wire probe) - 2 (4) x 0/4 - 20mA with 12 bit resolution for external level, external set point values and data storage (S1/M0) - 4 x digital input (MO type only) - 1 (2/3) sensors connectable (2/3 – type MO)
Outputs	- 2 (4) x 0/4 – 20mA (4 - type MO), load 500 Ohm, 12 bit resolution, accuracy better than 0,1% - 2 (S1) / 5 (M0) center-zero relays, capacity up to 230V AC / 2 A (cos φ 0,9)
Data Storage	on plug-in Flash Card up to 32MB (option)
Data Transmission	via Flash Card, internal phone or radio modem (option)

Sensor

Measurement Principle	- Ultrasonic sound travel time (level measurement) - Correlation with digital pattern recognition (flow velocity)
Measurement Frequency	1MHz
Protection	IP 68
Ex-Approval (optional)	II 2 G EEx ib IIB T4
Operating Temperature	-20°C to +50°C (-6°F to +120°F)
Storage Temperature	-30°C to +70°C (-22°F to +158°F)
Operating Pressure	max. 4bar (58psi)
Cable Length	10/30/50m (33/66/165ft), max. cable length 100m (330ft)
Cable Type	2/RG 179 PE/PE + 2x 0,34mm² + 1x 0,75mm²
Outer Cable Diameter	8mm (0.31in)
Sensor Types	- Combination sensor with level and flow velocity measurement plus temperature measurement to compensate the temperature effect on the sound velocity - Flow velocity sensor without level measurement, but with temperature measurement to compensate the temperature effect on the sound velocity
Types of Construction	- wedge shaped sensor to be fixed on the channel ground - Pipe sensor for installation in pipes using cutting ring and nozzles
Medium contacting Materials	Polyurethane, stainless steel 1.4571, PPO GF30, PMMA, PA (wedge sensor only) option: chemically resistant sensor made of PEEK

Level Measurement	
Measurement Range	0 to 200cm (0 to 6.56ft) , lowest measurable absolute level 4cm (1.57in), option: 0 to 500cm (0 to 16.5ft) with external air-ultrasonic-sensor
Zero Point Drift	absolute stable zero point
Accuracy	better than ± 2mm (0.08in)
Flow velocity Measurement	
Measurement Range	-100cm/s to +400cm/s (-3.28fps to 13.12fps)
Number of Scan Layers	16
Zero Point Drift	absolute stable zero point
Accuracy	± 1% of measurement value or +/- 5mm/s (0.01fps) (whichever is higher) per scan layer
Number of Sensors	1 to 3 per transmitter
Emerging Sound Beam	± 3 degrees
Temperature Measurement	
Measurement Range	-20°C to +60°C (-6°F to 140°F)
Accuracy	± 1K

Accessories (Option)	
MemoryCard:	Type: CompactFlash Card, Capacity: 16 or 32 MB
Reading Adapter:	Adapter for PCMCIA interface, primarily for reading with Laptop or Notebook
Reading Device:	optional with parallel or USB interface for PC connection
Pipe Mounting System:	for temporary, non-permanent clamping installation of wedge sensors in pipes DN200 - 800 (~ 6 – 32in)

3 General Notes on Safety and Danger

3.1 Danger Notes

3.1.1 General Danger Signs

Cautions
are framed and labelled with a warning triangle.

Notes
are framed and labelled with a "hand".

Danger by electric voltage
is framed and labelled with the Symbol on the left.

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

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

3.1.2 Special Danger Notes

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

3.2 Device Identification

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

- Name and address of manufacturer
- CE label
- Type and serial number
- Year of manufacture
- Ex-label (on Ex-version devices only) as mentioned in chapter 2.2.
- It is important for queries and replacement part orders to specify type, year of manufacture and order number. This ensures correct and quick processing.

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

The safety instructions contained within must be followed.

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

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

We herewith particularly emphasize that replacement parts or accessories, which are not supplied by us, are not certified by us, too. Hence, the installation and/or the use of such products may possibly be detrimental to the device's ability to work.
Damages caused by using non-original parts and non-original accessories are left at user's risk.

3.4 Turn-off Procedure

For maintenance, cleaning and repairs (authorized staff personnel only) the device has to be disconnected from mains.

3.5 User's Responsibilities

In the EEA (European Economic Area) national implementation of the framework directive 89/391/EEC and corresponding individual directives, in particular the directive 89/655/EEC concerning the minimum safety and health requirements for the use of work equipment by workers at work, as amended, are to be observed and adhered to.
In Germany the Industrial Safety Ordinance of October 2002 must be observed.

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

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

environmental protection.

Connections:

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

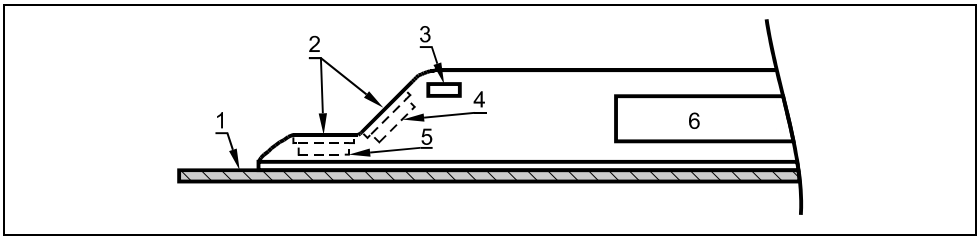
4 Functional Principle

4.1 General

The OCM Pro is a stationary measurement system for flow measurement, data storage and flow control of slight to heavy polluted media with various compositions. It can be operated in partial and fully filled channels and pipes with various geometries and dimensions.

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

The OCM Pro uses a totally new multi-purpose sensor, which simultaneously determines flow velocity and flow level. For that, 2 particular piezo crystals are used which, independent from each other, operate as transmitter as well as receiver.



1 Ground Plate
2 acoustic coupling Layer
3 Temperature Sensor
4 Flow Velocity Sensor
5 Level Sensor
6 Electronics

Fig. 4-1 Combination sensor type “Pro“ for ground installation

4.2 Level Measurement

The horizontal sensor crystal operates as level measurement according to the ultrasound travel time method. The time between transmitting and receiving an impulse reflected from the water surface is measured.

$$h_l = \frac{c \bullet t_l}{2}$$

h = Filling Level
c = Sound Travel Time
t_1 = Time between Transmission and Receiving Signal

The sound travel time within water is 1480m/s (4.85fps) at 20°C (68°F). The divergence depending on the temperature is 0,23% per Kelvin.
To ensure a level measurement which is accurate to the millimetre the medium temperature is constantly investigated and the sound travel time is corrected respectively.
The fixed level, which is determined by the sensor crystal position, is added to the determined value h_1. This results in the total level h.

4.3 Flow Velocity Capture

The piezo crystal which has a slope to the flow direction operates as a flow velocity sensor. Here an ultrasonic burst with a defined angle is sent into the medium. All the particles in the measurement path (air, dirt) reflect a small amount of the ultrasonic signal. Depending on shape and size of the particle a particular signal results. Hence, the multitude of the reflected signals results in a reflection pattern (see Fig. 4-2). This signal pattern is saved in a digital signal processor (DSP).

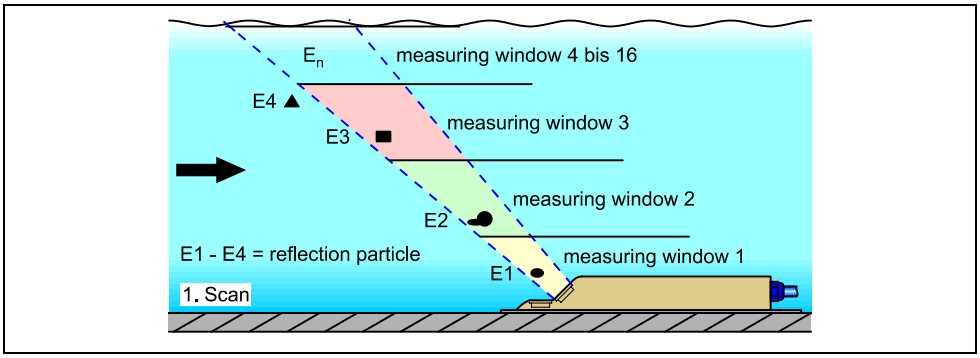


Fig. 4-2 Situation on first signal detection

After a certain period a second ultrasonic burst is sent into the medium. The newly generated reflection signal is saved in the DSP too.
In various flow levels there are different flow velocities (flow velocity profile). Depending on the level, the reflecting particles' movement away from the first measurement point therefore varies. Hence, a distorted reflection pattern results (see Fig. 4-3). At the same time slightly different reflections occur: some particles have been turning around and thus have another shape of reflection; some particles are no longer within the measurement range and others have now moved into the measurement range.

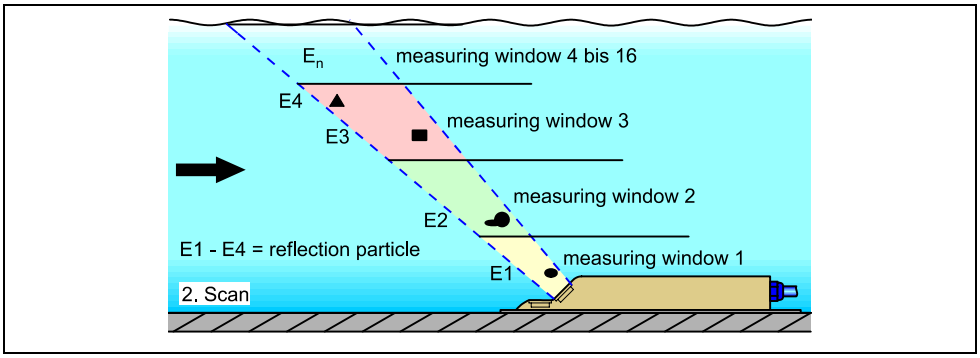


Fig. 4-3 Situation on second signal detection

The DSP checks both the received reflection patterns for similarities using the cross correlation method. All existing signal differences are rejected so that two similar but temporarily offset signal patterns are left for velocity evaluation. Depending on the flow levels both patterns are subdivided into 16 measurement windows. Then, in each measurement window the lag Δt of the signal pattern is investigated (see Fig. 4-4).

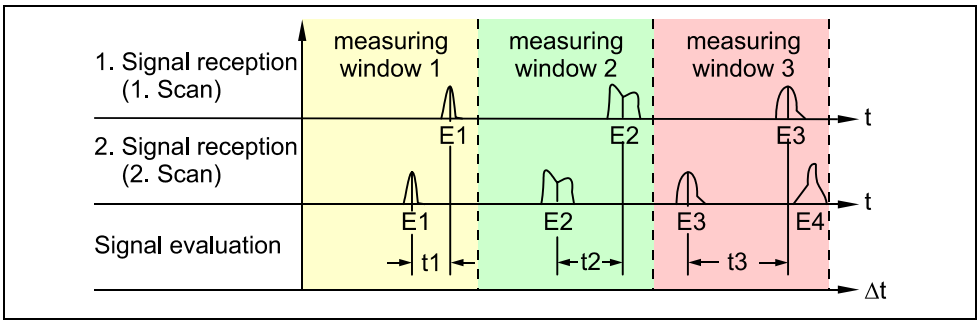


Fig. 4-4 Echo signal images and evaluation

Based on the beam angle, the interval between both transmitted signals and the lag of the signal pattern therefore in each single measurement window the flow velocity can be determined.
Mathematically stringing together the single flow velocities results in the flow profile which is indicated on the display .

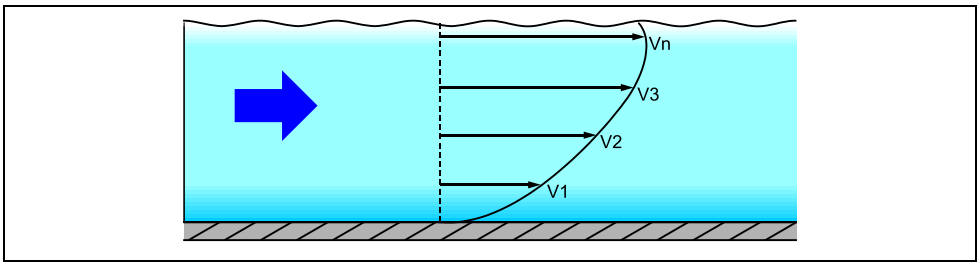


Fig. 4-5 evaluated flow profile

If there are appropriate banking distances on the measurement place available, based on the known channel geometry and the velocity distribution a 3-dimensional flow distribution can be rendered (see Fig. 4-6).

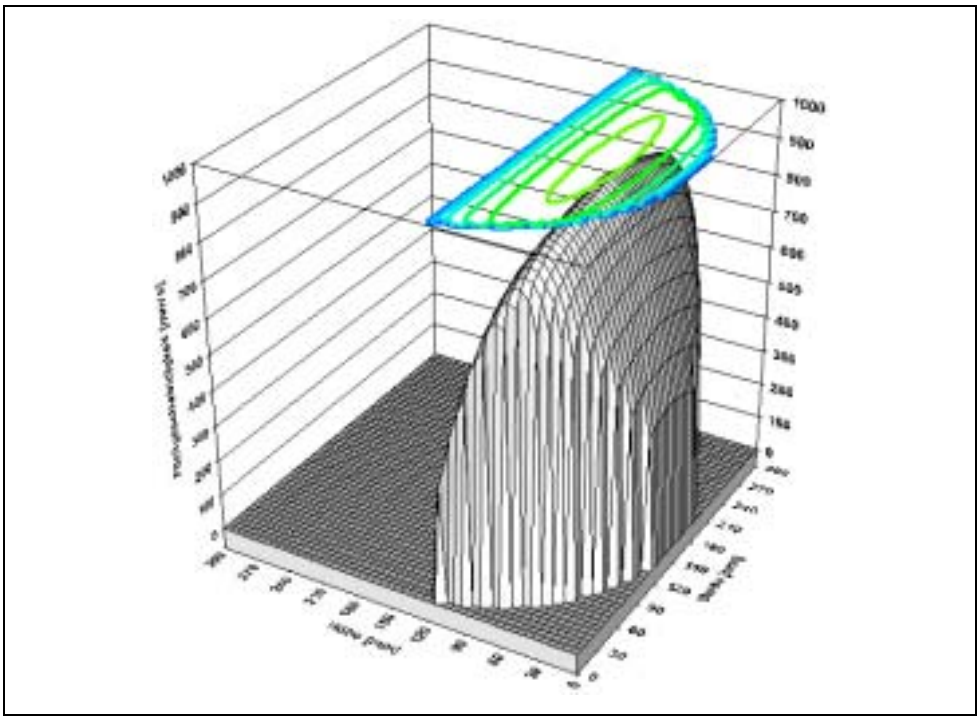


Fig. 4-6 calculated 3-dimensional flow profile

From this flow velocity distribution and the channel shape, the channel dimensions and the filling level the flow volume is calculated and displayed. The device supplies analog signals as well as impulse signals.

4.4 Device Variations

The OCM Pro transmitter as well as the respective flow velocity and combination sensors are available in different variations.

Transmitter

The transmitters primarily vary in terms of power supply, Ex-protection and enclosure construction. The current type of device is indicated by the article number, which can be found on a weatherproof label on the bottom of the enclosure.
From this article key the type of device can be specified.

OCM Pro	**Flow Monitor for Open Channels and Partially-Filled Pipes. Spatially allocated Ultrasonic Pulse Velocity Signal Evaluation by Time-Domain Cross-Correlation with Digital Signal Processor. Level Measurement with Air-Ultrasonic Sensor; or Water-Ultrasonic Sensor including mA-Input for External Level Measurement. Membrane Keypad and 128 x 128 Pixel Graphic Display. Data logging functionality with slot now included !**					
OCP/	**Typ**					
	S1 Standard Version with with 2 Relays, 2 mA-Outputs (Isolated), 1 mA-Input (Isolated for use with 2-Wire Sensors) or external level measurement					
	M0 Multifunctional Version with 5 Relays, 4 mA-Outputs; 3 Digital Inputs; 4 Analog Inputs (including 1 Isolated for use with 2-Wire Sensors). Integrated 3-Point PID Control; Connection for up to 3 Sensors					
		Data Transfer				
		00 No Data transfer				
		M0 1 MB Internal Data Logger with Data Transfer via internal Telephone-Modem				
		MF 1 MB Internal Data Logger with Data Transfer via internal Radio Modem (D-Net)				
			Power Supply			
			AC 110V AC / 60 Hz to 230V AC / 50Hz			
			DC 24V DC regulated			
				Enclosure		
				W0 Wall Mount (IP65, NEMA 4)		
				F0 Panel Mount IP54 (Front); IP20 (Rear)		
				19 19" slot (30TE); Clamp Terminal Board for Installation into 19" Rack, Type R20		
					Approvals	
					0 None	
					E Surge Arrestor for Sensors in Ex Zone1	
OCP/						**00**

Fig. 4-7 Type keys for OCM Pro transmitters

Ultrasonic Sensors for OCM Pro

The sensors are available as various models (wedge and pipe sensors) and additionally vary in terms of Ex-protection, cable length and special constructions. The article number can be found at the end of the cable (on the cable shield).

Ultrasonic Sensors for Connection to OCM Pro

OCS/ Typ

V1H Spatially allocated Velocity Measurement by max. 16 Scan Layers and Level Measurement by Ultrasonic Echos.

V10 Spatially allocated Velocity Measurement by max. 16 Scan Layers; no level Measurement

Construction

K Wedge Sensor for Mounting on Channel Bottom or Walls

R Insertion Sensor for pipes with Threads 1½"

Transmission Frequency of Velocity

1 1MHz

Transmission Frequency of Level

0 without level Measurement

1 1MHz

Approvals

0 None

E Ex Zone 1

Cable Length

10 10m (33 ft)

20 20m (66 ft)

30 30m (100 ft)

50 50m (165 ft)

99 100m (330 ft)

Insertion sensor length

0 (only Wedge Sesor order)

2 20 cm (8 in.) (Standard)

3 30 cm (12 in.) (min. length for Sensors with Exchange fitting)

X length in dm, Preis per 10 cm (4 in.)

G 20 cm (8 in.) + extention thread

OCS/							0	

Fig. 4-8 Type keys for ultrasonic sensors

5 Storing, Delivery and Transport

5.1 Receipt

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

Mistakes cannot be rectified later!

5.1.1 Delivery

The standard delivery of the OCM Pro measurement system contains:

- the instruction manual with the certificate of conformity. Here, all necessary steps to correctly install and to operate the measurement system are listed.
- an OCM Pro, type S1 or M0
- an ultrasonic sensor, construction:
  wedge sensor or
  pipe sensor with cutting ring screwing (consists of spigot nut, cutting ring and pipe double nipple)

Additional accessories depending on order. Please check by using the delivery note.

5.2 Storing

The following storing conditions must be strictly kept:

Transmitter:	max. temperature:	+ 70°C (158°F)
	min. temperature:	- 30°C (-22°F)
	max. humidity:	80 %, non-condensing
Sensor:	max. temperature:	+70°C (158°F)
	min. temperature:	- 30°C (-22°F)
	max. humidity:	100 %

The devices must be protected from corrosive or organic solvent vapors, radioactive radiation as well as strong electromagnetic radiation.

5.3 Transport

Sensor and Transmitter are conceived for harsh industrial conditions. Despite this do not expose them to heavy shocks or vibrations.
Transportation must be carried out in the original packaging.

5.4 Return

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

6 Installation

6.1 General

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

The OCM Pro power supply must be separately protected by a 6 A slow-blow fuse and has to be isolated from other facility parts (separate turn-off, e.g. by using an automatic cut-out with >B< characteristics).

Before feeding the rated voltage the transmitter and sensor installation must be correctly completed. The installation should be carried out by qualified personnel only. Further statutory standards, regulations and technical rulings have to be taken into account.
All outer circuits, wires and lines connected to the device must have a minimum isolation resistance of 250 V. If the voltage exceeds 42 V DC an isolation resistance with 500 kOhm min. is necessary.
The section dimension of the power supply wires must be 0,75 mm^2 (0.03 in^2) and must be in accordance to IEC 227 or IEC 245.
The maximum switching voltage on the relay contacts must not exceed 250V.
According to Ex-protection it must be checked if the devices power supplies must be integrated into the facility's emergency shutdown conception.

6.2 Transmitter Installation and Connection

6.2.1 General

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

- direct sunlight (use weatherproof cover if necessary)
- heat emitting objects (max. ambient temperature: +40°C (104°F))
- objects with strong electromagnetic fields (e.g. frequency converters)
- corrosive chemicals or gas
- mechanical shocks
- vibrations
- radioactive radiation
- installation close to footpaths or travel ways

For fastening the wall mount enclosure, depending on place of mounting, use 4 machine screws size M5 in suitable length as well as the necessary nuts and shims. Or use 4 wood screws, min. diameter 4.5mm (0.1772 in). These screws must penetrate min. 40 mm (1.575 in) into the wall. The fastening of the panel mount must be carried out via 4 snap-in connections inside of the enclosure. The rack has to be fastened in a standard rotating frame (machine screw size M6 or M8).
The clear view door of the measurement transmitter is provided with a protection foil for protection during transport and from scratches during assembly. This protection foil has to be removed immediately after the assembly.

If the view door with protection foil has long direct solar radiation, the foil cannot be easily 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 GmbH or your local representative.

6.2.2 Dimensions

The transmitter is available in 3 enclosure variations:
wall mount, panel mount or 19“-unit in a special rack type R20 by NIVUS.
The rack, in addition to the OCM Pro, can be equipped with measurement, control and protocol technology of various manufacturers. This installation must be carried out by authorized NIVUS staff.

If a 19“-OCM Pro should be installed by non-authorized staff or companies in unsuitable racks, any guarantee claims on device functions and CE conformity expire.

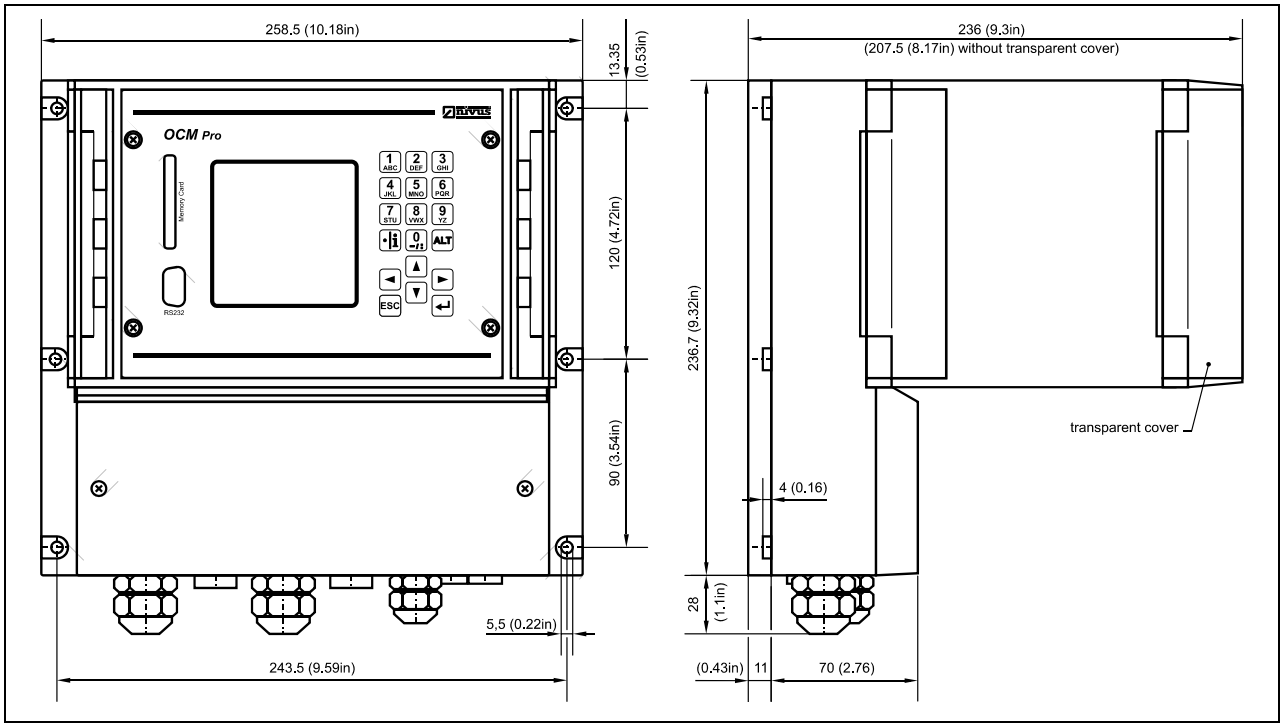


Fig. 6-1 Wall Mount Enclosure

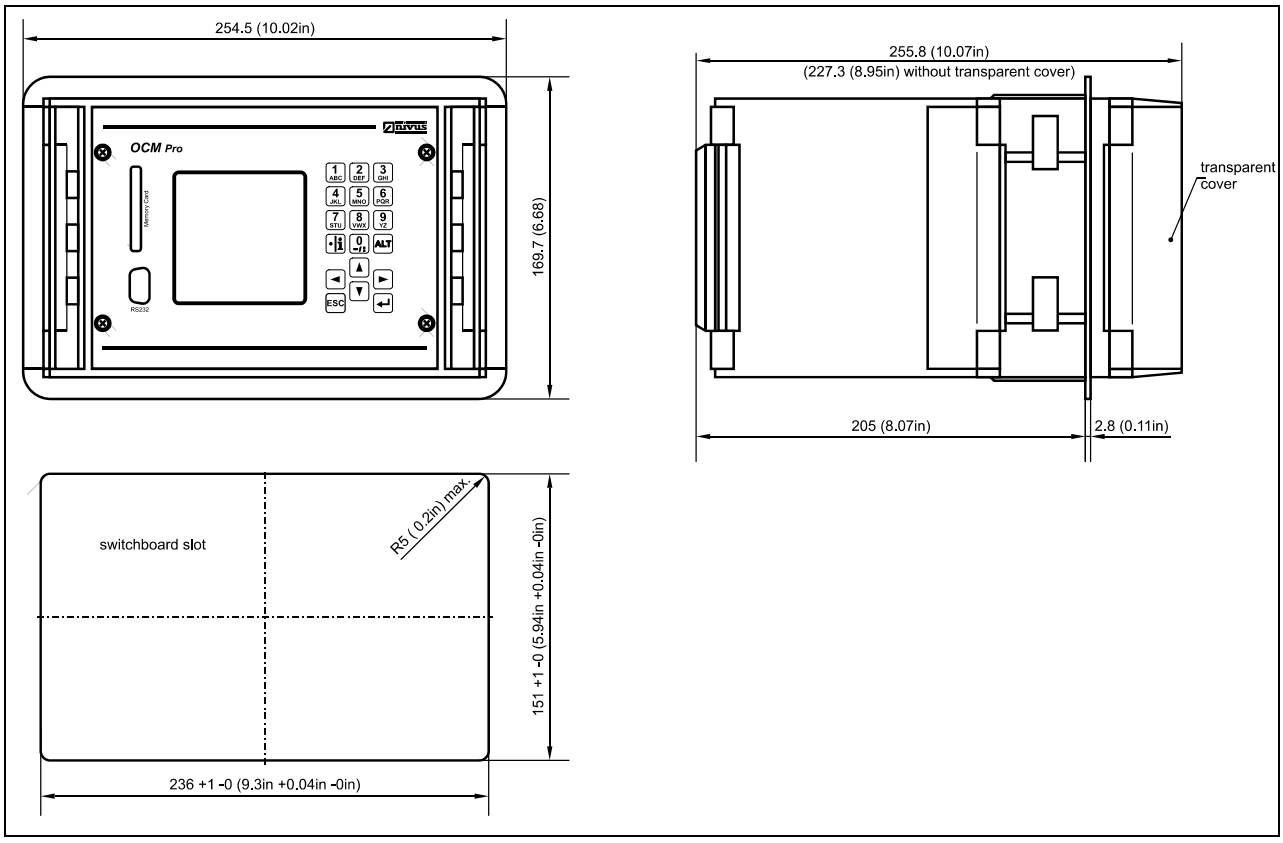


Fig. 6-2 Panel Mount Enclosure

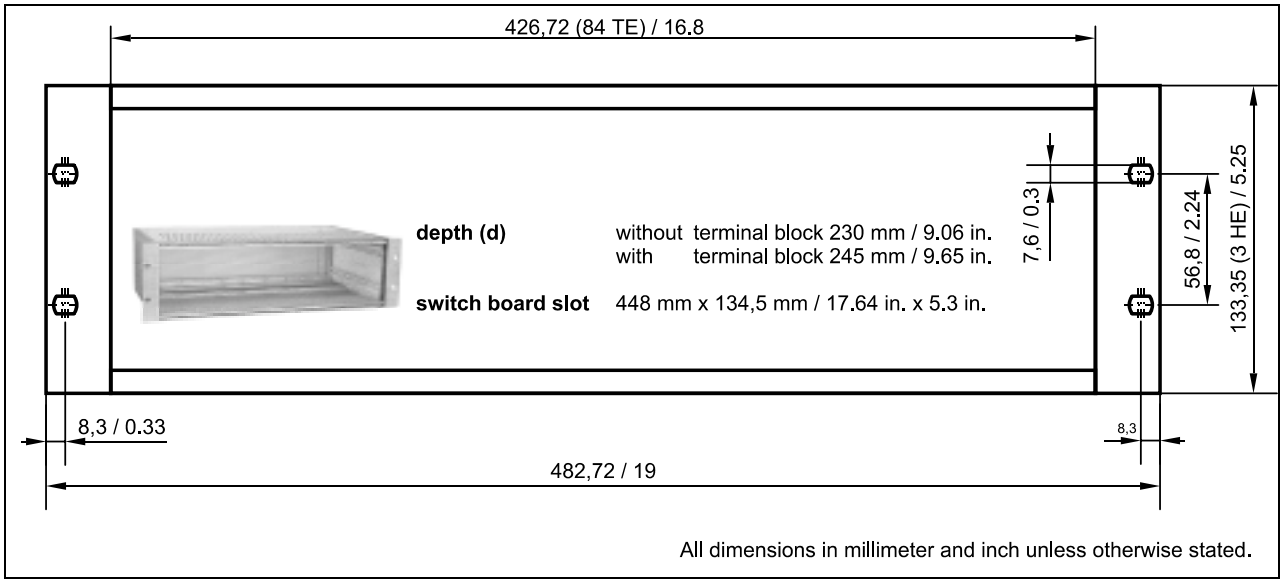


Fig. 6-3 Rack Model

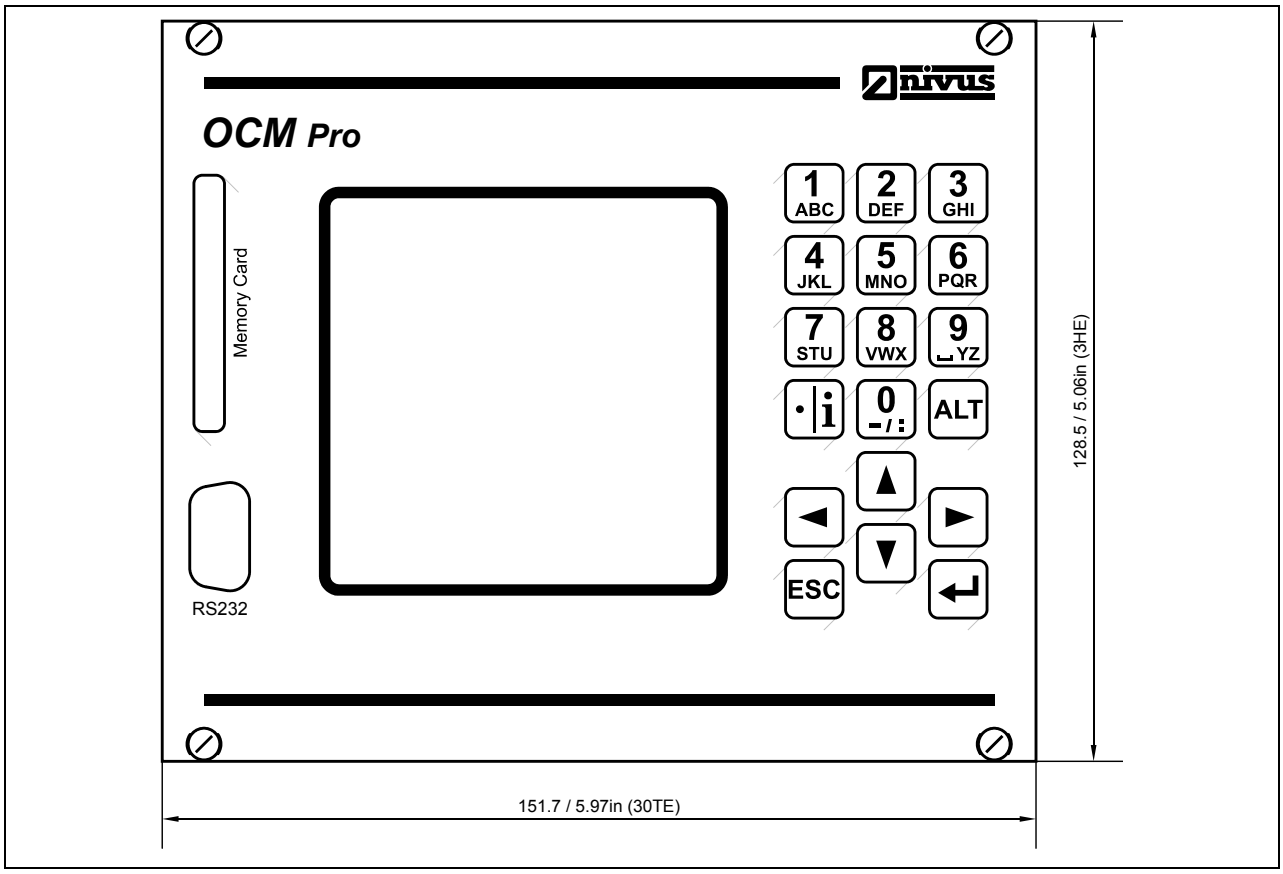


Fig. 6-4 19“ Slide slide valve-in Unit

6.2.3 Transmitter Connection

General

The transmitter OCM Pro is available in 2 different models.

- Standard type >S1<
- Type >M0< with extended connections for 3 sensors, additional analog inputs and outputs plus control function.

Both models have the same clamp terminal marking. The M0-transmitter merely has additional connections.
The different enclosure constructions (panel mount, wall mount or rack) do not affect the clamp terminal marking, simply the positions of the clamp terminals are not the same.
Unlike the other enclosure constructions, the wall mount enclosure is additionally equipped with screw-type conduit fittings and dummy plugs. These are either screwed in or attached as replenishment or for replacement purposes. Number and size depend on the transmitter type.

Transmitter type S1:

2 glands M20 x 1,5
1 gland M16 x 1,5
2 dummy plugs M20 x 1,5
2 dummy plugs M16 x 1,5

Transmitter type M0:

2 glands M20 x 1,5
3 glands M16 x 1,5
2 dummy plugs M20 x 1,5
2 dummy plugs M16 x 1,5

With the supplied glands the following outer cable dimensions can be connected:

M16 x 1,5 3,5mm – 10,5mm (0.138 – 0.413in)
M20 x 1,5 6,0mm – 14,0mm (0.236 – 0.591in)

To be able to use cable diameters outside of the tolerance, glands must be used which ensure IP 65 minimum protection.
Unused wire lead-ins have to be locked with an appropriate dummy plug before the initial start-up.

The transmitters clamp terminals ensure a safe connection of single- and multi-wired cables with a cross-sectional dimension of 0,18 – 2,5mm².
For connecting you need a screwdriver with a 3,0mm or 3,5mm (0.118 – 0.138in) blade. The terminal clamps are normally unscrewed on delivery. Nevertheless this must be checked before connecting the power supply or the signal wires.

Before the first connection it is necessary to have a slight pressure on the screw of the clamping connection to ensure its safe opening and a correct connection.

Water or dirt must not leak into the terminal housing. Please seal the housing with the supplied lid and both screws respectively. Especially note the non-reversed (bevelled side up) lid position. An incorrect or faulty sealing does not ensure the indicated protection.

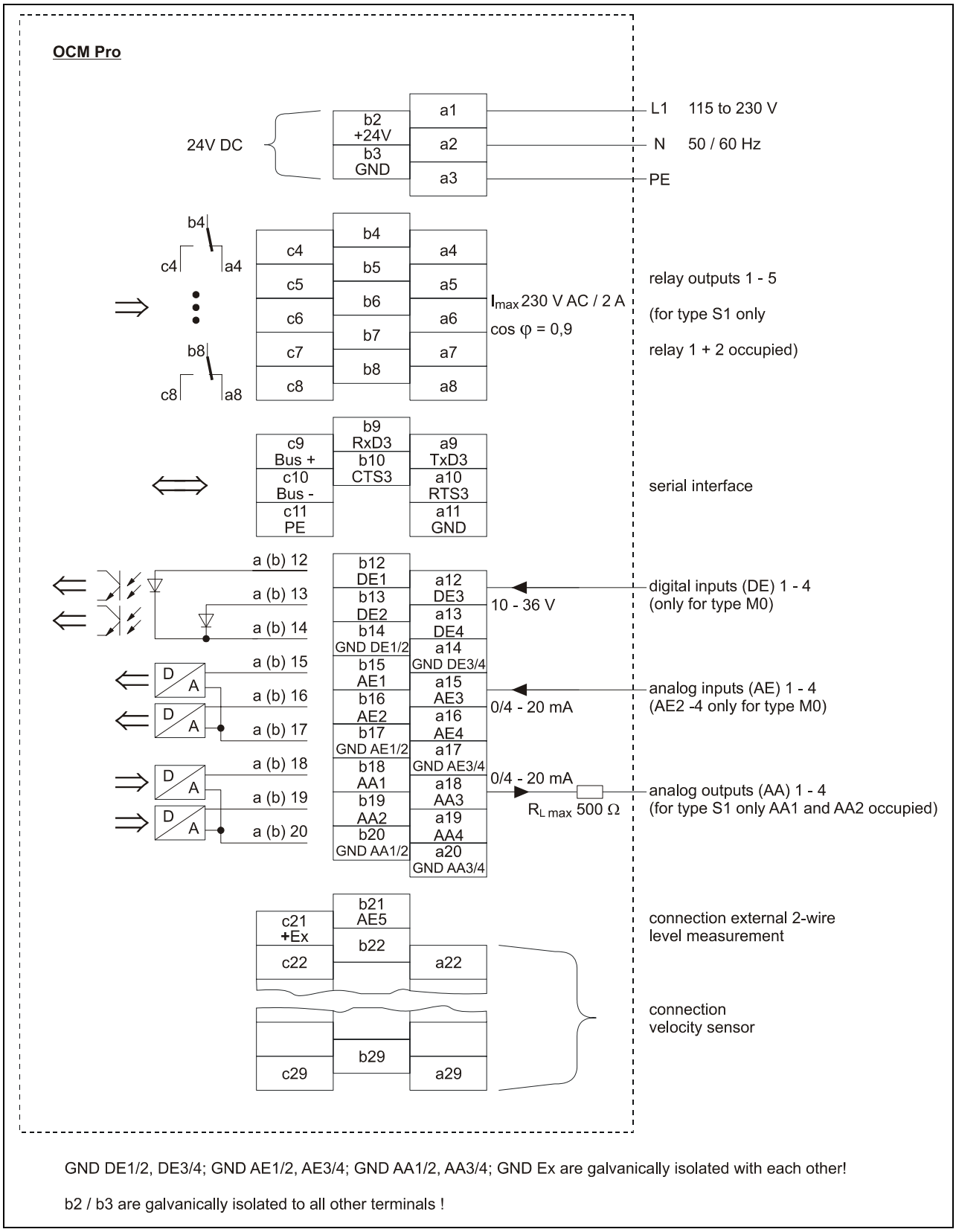


Fig. 6-5 Wiring diagram OCM Pro wall mount

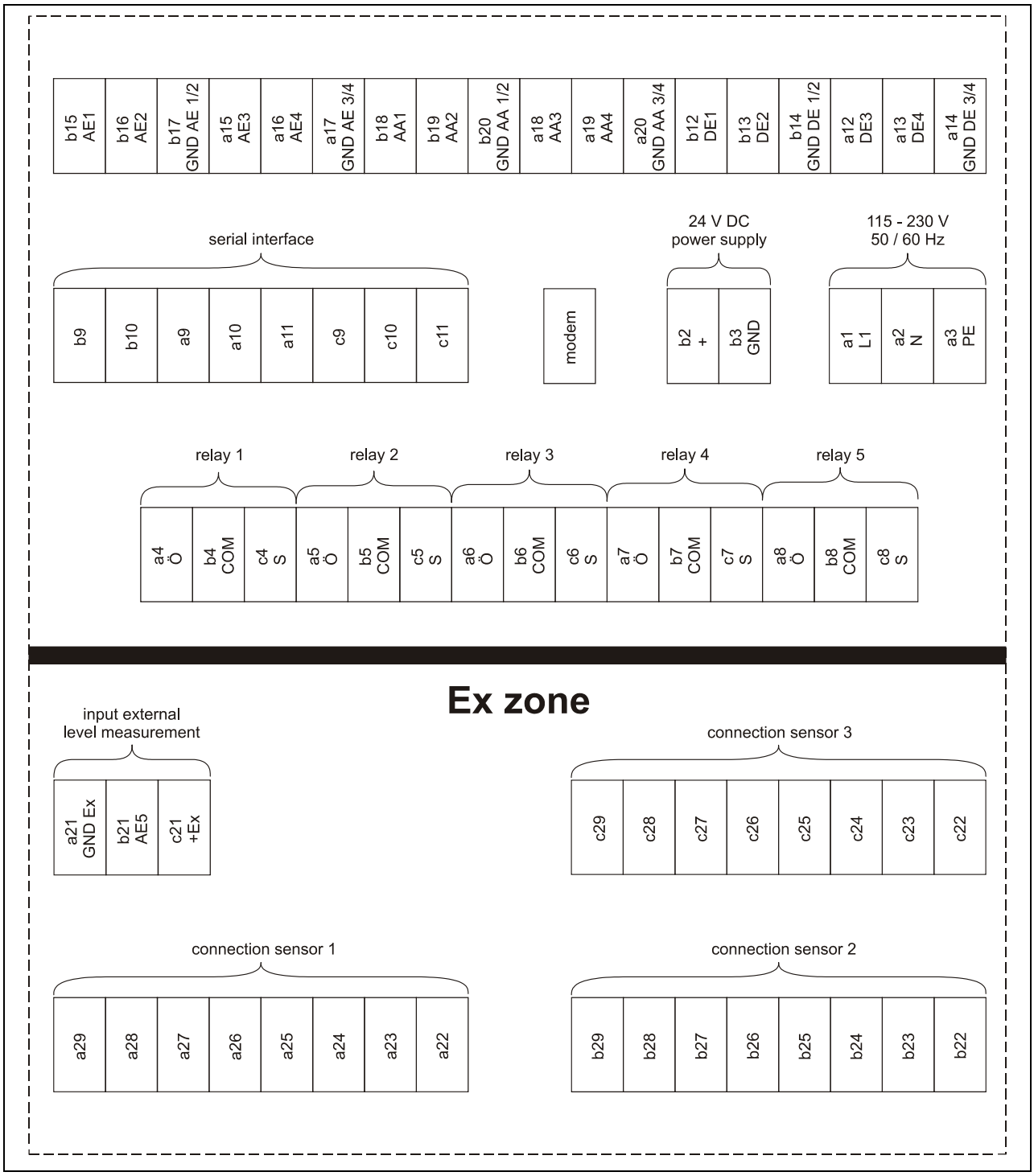


Fig. 6-6 Wiring diagram panel and rack mount

6.3 Sensor Installation and Connection

6.3.1 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 cutting 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 GmbH / NIVUS America Inc.

Removing or loosening of the sensor ground plate or cable thread joint leads to leakage and causes a failure in the measurement / the sensor.

On principle, no parts of the sensor must be removed!

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

6.3.2 Sensor Dimensions

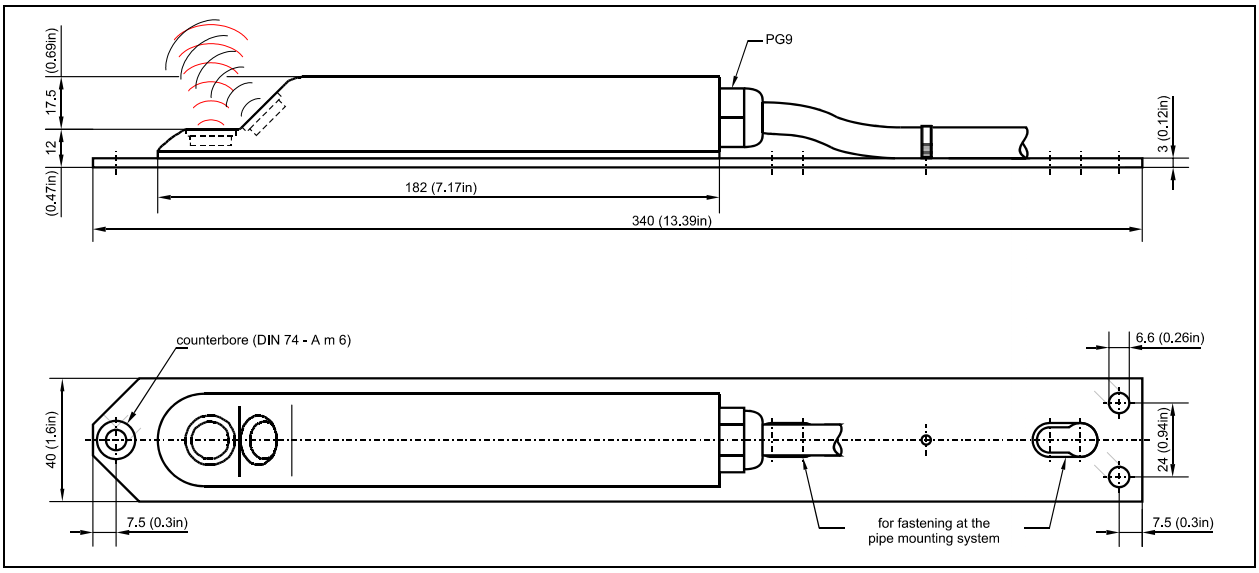


Fig. 6-7 Dimensions wedge sensor

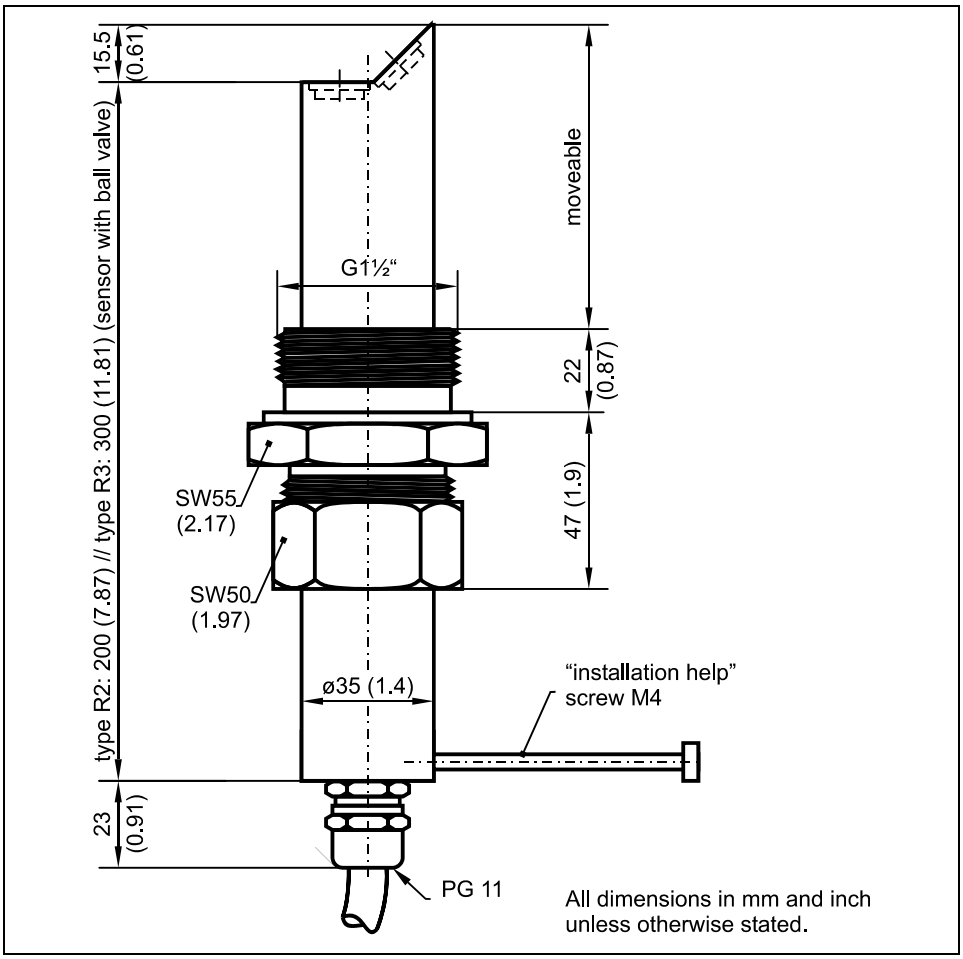


Fig. 6-8 Dimensions pipe sensor

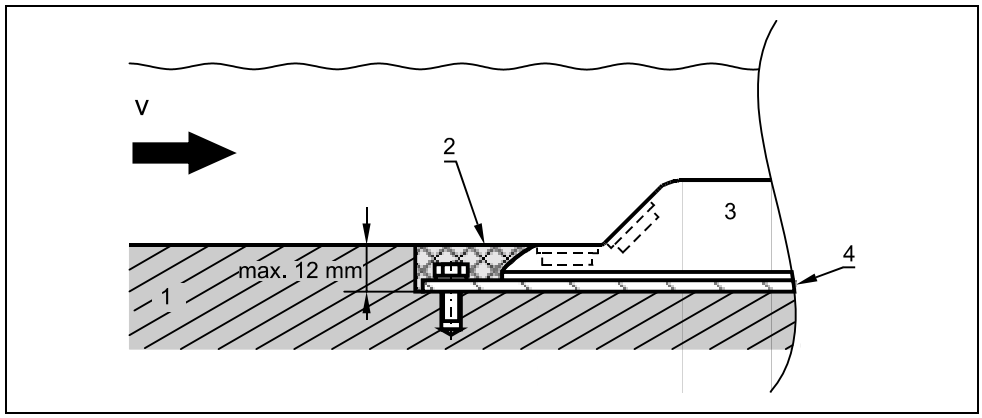
6.3.3 Sensor Installation

Wedge 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) is 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 °).
Non-compliance may lead (at greater heights (depths) or higher velocities) to errors in height (depth) measurement!
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 bottom of channel, it must be flat (plane surface). Otherwise the sensor may break and leak!

It makes sense to install the sensor in a depth of max. 12 mm (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 spaces with permanently elastic material (cement…).

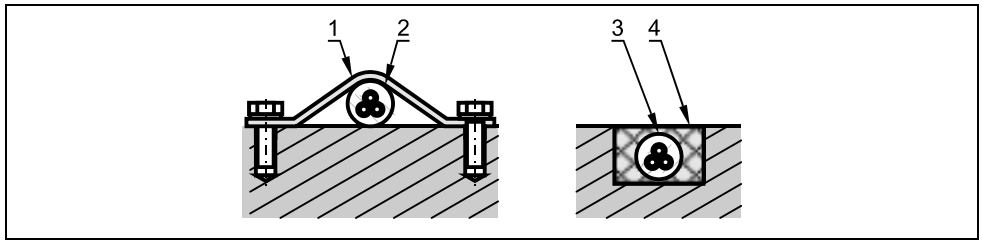


1 Channel Ground
2 Putty or similar
3 Sensor
4 Ground Plate

Fig. 6-9 Installation suggestion for lowered wedge sensors

The horizontal level sensor must not be covered or deposited with the filling material. This may result in measurement failure.

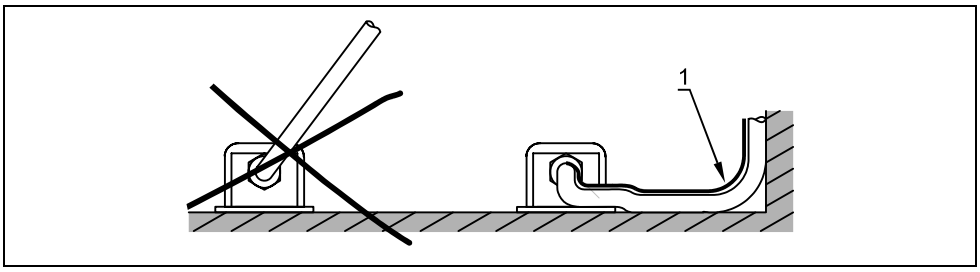
The sensor cable must be laid out on the channel ground from behind the sensor to the channel wall. To avoid building -up the cable must be covered with a thin stainless steel sheet or laid in a slot which then is to be sealed with a permanently elastic material.
Appropriate covers are available from NIVUS.



1 Stainless Steel Sheet
2 Cable
3 Cable
4 permanently elastic Material

Fig. 6-10 Cable layout suggestion

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



1 Protective cover

Fig. 6-11 Notes for cable layout

The minimum bending radius of the signal cable is 10cm (3.94in). Disregarding this may result in cable break!

Pipe Sensor

The pipe sensor is screwed in tightly by cutting ring and pipe nut (additional option: ball slide valve for removal under operational conditions) in the 1½" socket.
Important for mounting is that the horizontal part of the sensor must be installed flush with the pipe wall (Fig. 6-12, left).

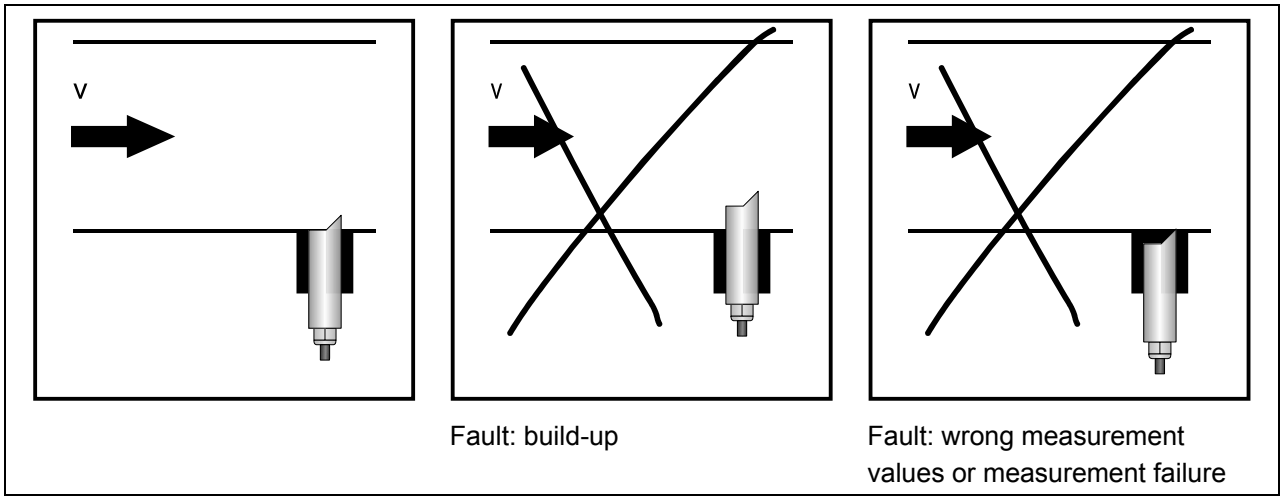
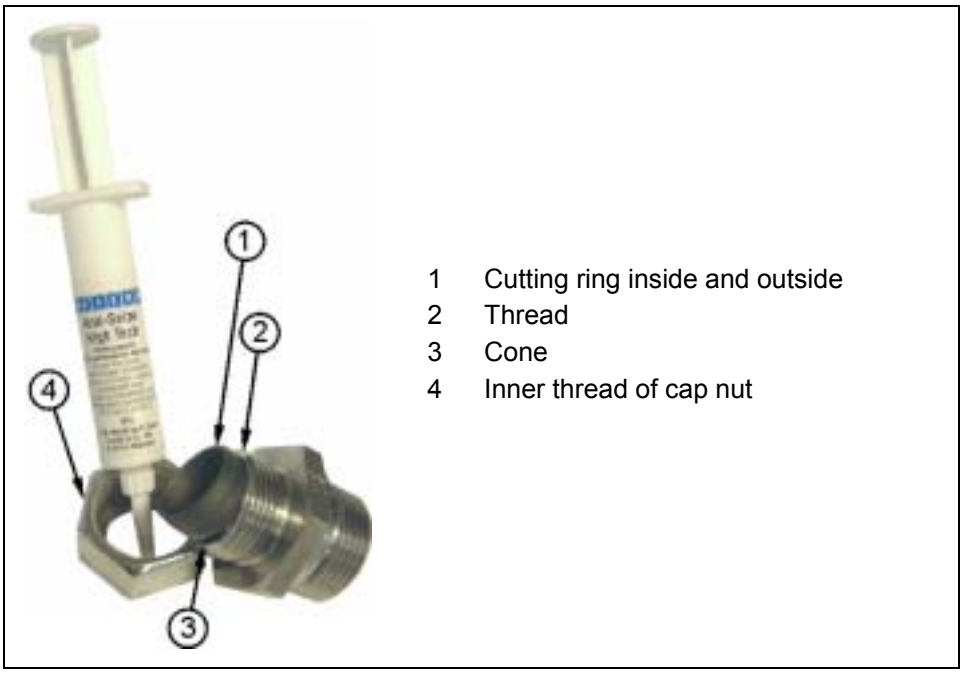


Fig. 6-12 Notes for Pipe Sensor Installation

For sensor installation the bevelled side must be installed against the flow direction. The "installation help" (see Fig. 6-8) supports positioning.
When using a combination sensor with level measurement, the sensor must be installed absolutely parallel to the ground (±2 °). Otherwise the level measurement will be faulty or even fail!

When assembling the insertion sensor, a special grease paste must be used for the stainless steel couplings, specified to DIN 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 slightly greased when pre-assembling the insertion sensor!



1 Cutting ring inside and outside
2 Thread
3 Cone
4 Inner thread of cap nut

Fig. 6-13 Using the grease

6.3.4 Required Distances

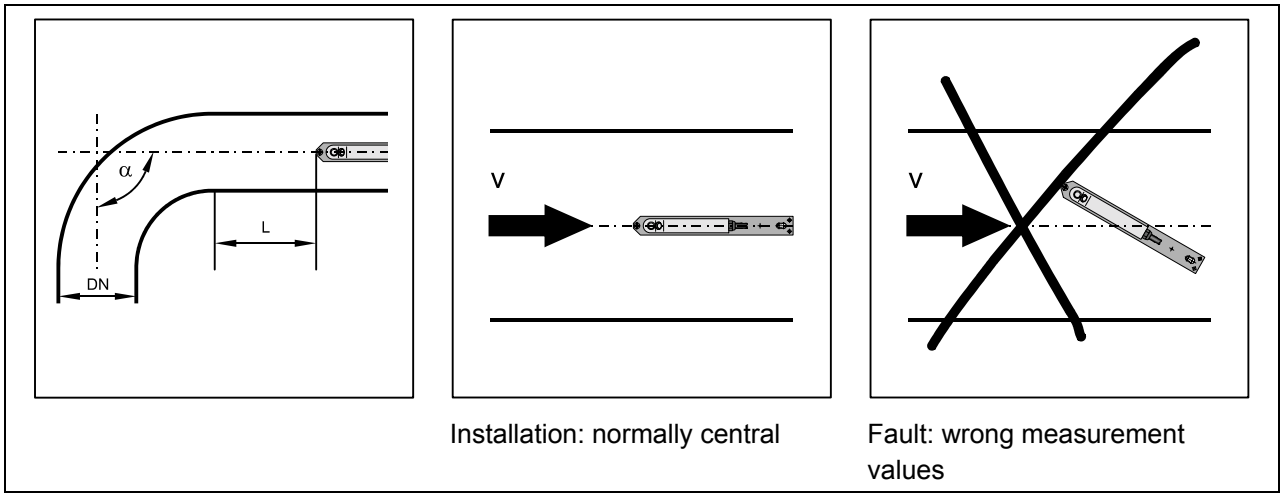
Clearly defined, hydraulic conditions are absolutely necessary for an accurate measurement.
For this you need to take into account the information regarding hydraulics and their required distances.

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

Curves / Bends:

	v ≤1m/s (3.28fps)	v >1m/s (3.28fps)	
a ≤	15°	L ≥ min. 3x DN	L ≥ min. 5x DN
a ≤	45°	L ≥ min. 5x DN	L ≥ min. 10x DN
a ≤	90°	L ≥ min. 10x DN	L ≥ min. 15-20x DN

DN = internal diameter



Installation: normally central

Fault: wrong measurement values

Fig. 6-14 Installation Notes for Flow Velocity Sensors

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

6.3.5 Sensor Connection

The sensors (wedge sensor or insertion sensor) must be connected via a special constructed cable type 2/RG 179 PE/PE + 2 x 0.34mm² + 1 x 0.75mm². The maximum length between sensor and transmitter is 100m (330ft).
The ends of the cables must not be connected directly to the transmitter, they have to be crimped with suitable wire-end sleeves. These wire-end sleeves are supplied with the delivery.
The sensor connection cables are not allowed to be lengthened. This will disturb sensitive HF-Signals which are transmitted via the coaxial wires. Please order the exact cable length when ordering OCM Pro.

Improper connections or use of other cables may lead to disturbance and errors in the measurement.

The connection to the transmitter has to be effected at the termination block.

Connection plan for the combination sensor:

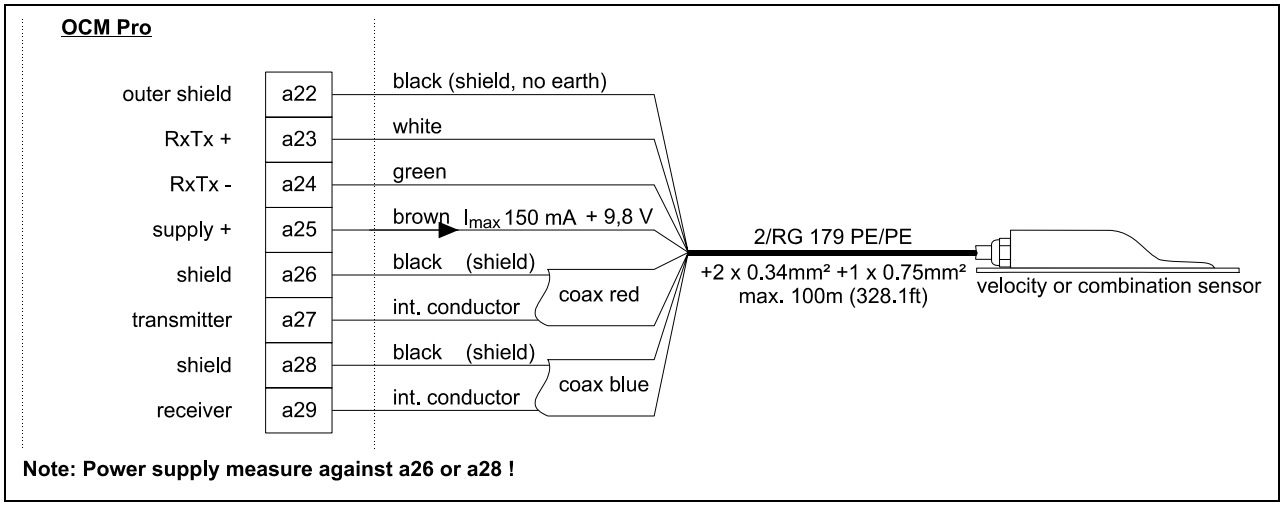


Fig. 6-15 Connecting a flow velocity- or combination sensor

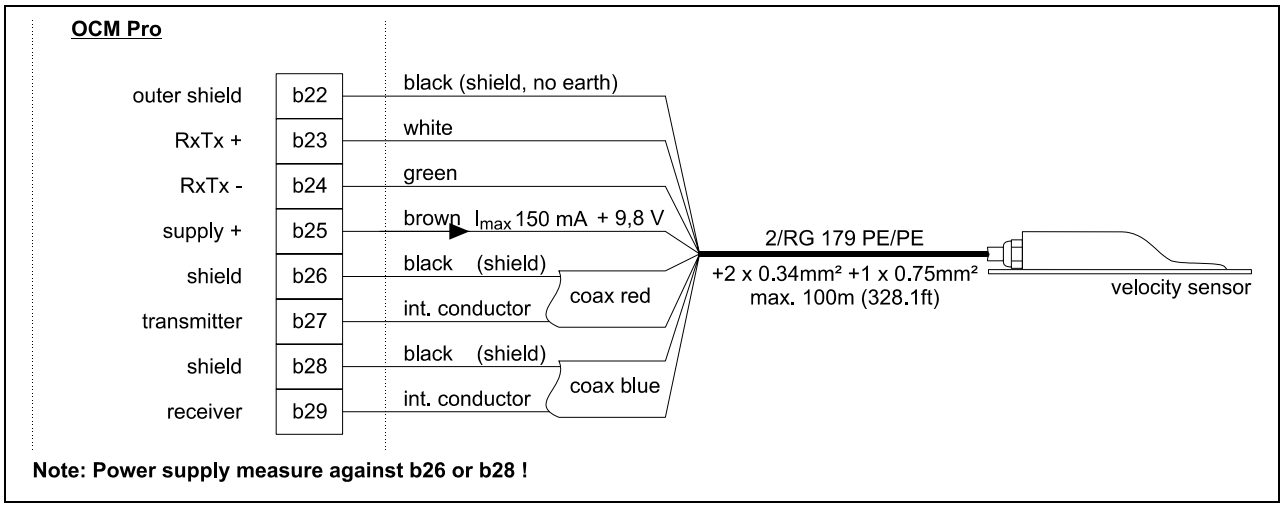


Fig. 6-16 Connecting a second flow velocity sensor to OCM Pro type M0

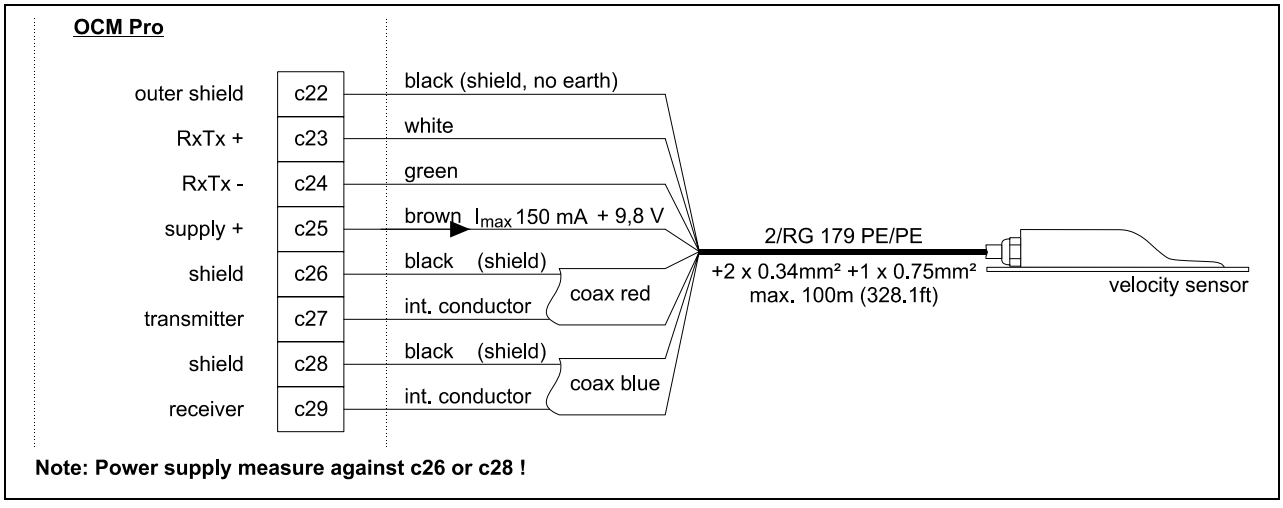


Fig. 6-17 Connecting a third flow velocity sensor to OCM Pro type M0

If the level measurement is by a 2-wire probe (NivuBar, 2-wire ultrasonic), which is supplied with the OCM Pro, please use following connection plan:

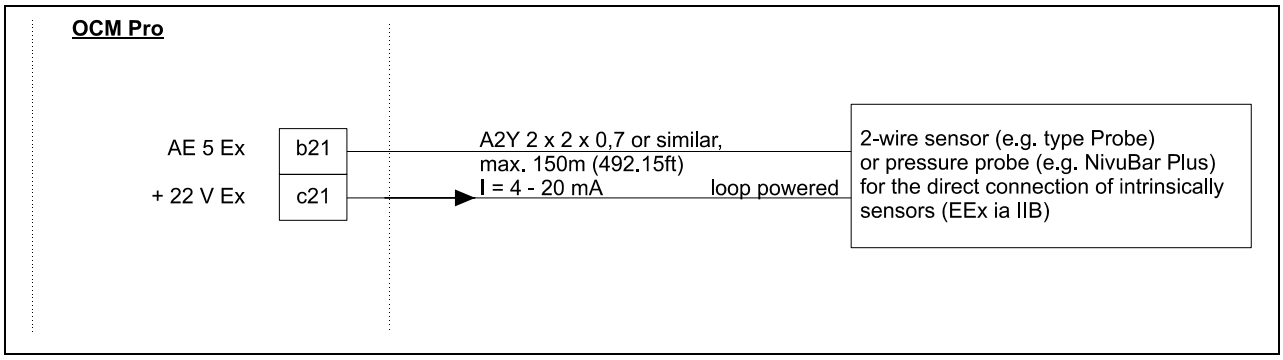


Fig. 6-18 Connecting a 2-wire sensor for flow level measurement

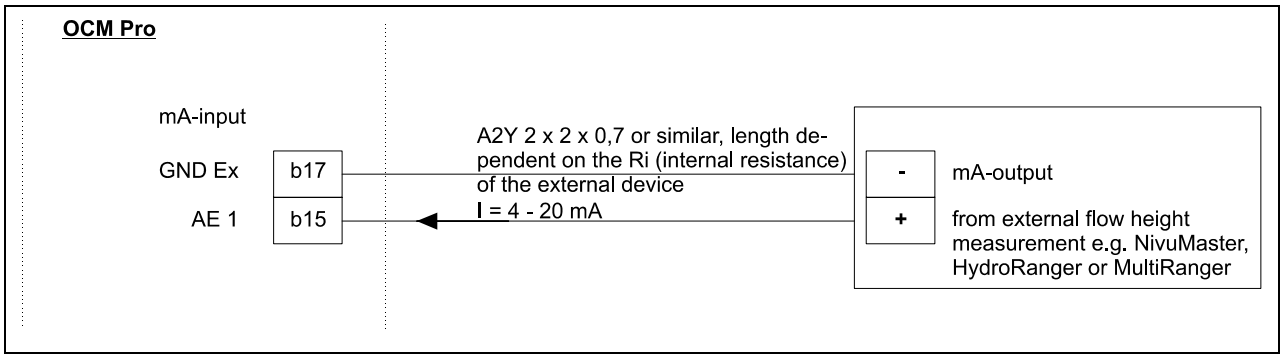


Fig. 6-19 Connecting an external flow level measurement via NivuMaster

For use of the sensors in the Ex-area, the sensor cables must not be directed past the mechanical shield between the termination blocks. Only the 3 cable connections of the sensor connection block have to be used!

6.4 OCM Pro Power Supply

Depending on the type of OCM Pro, it can be supplied with 85 – 260V AC. Also possible is a 24V DC supply. There are 2 slide valve switches above the power supply. The two slide valve switches situated above the terminals serve as additional power switch.

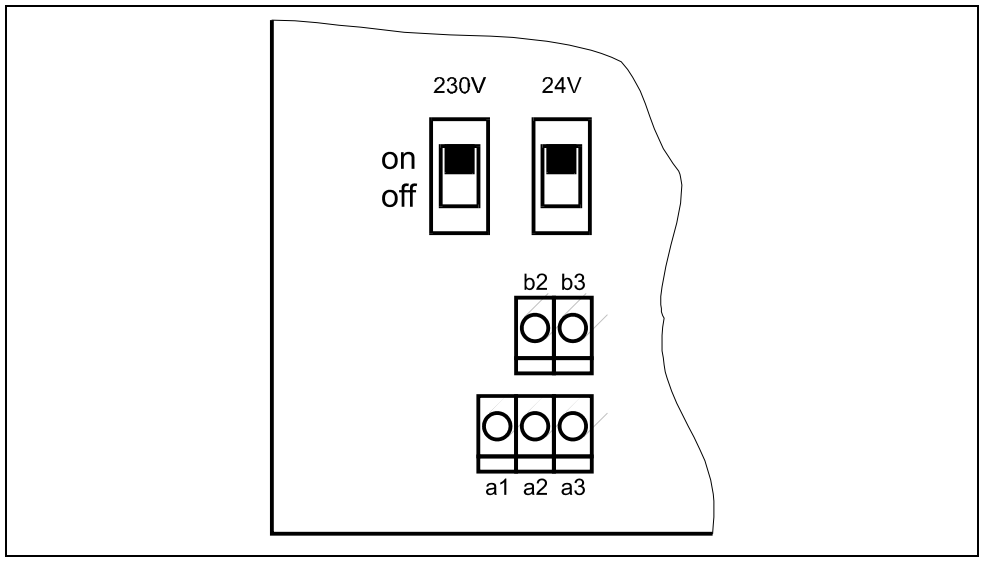


Fig. 6-20 Slide valve switch position on the bus board

A transmitter with 24 V DC can not be operated with alternating current, just as it is not possible to operate a 230 V AC transmitter with direct current.

When operating with an alternating current voltage, the direct current voltage supply clamps b2 and b3 provides a voltage of 24 V and max. capacity of 100 mA (turn on 24 V!).
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.

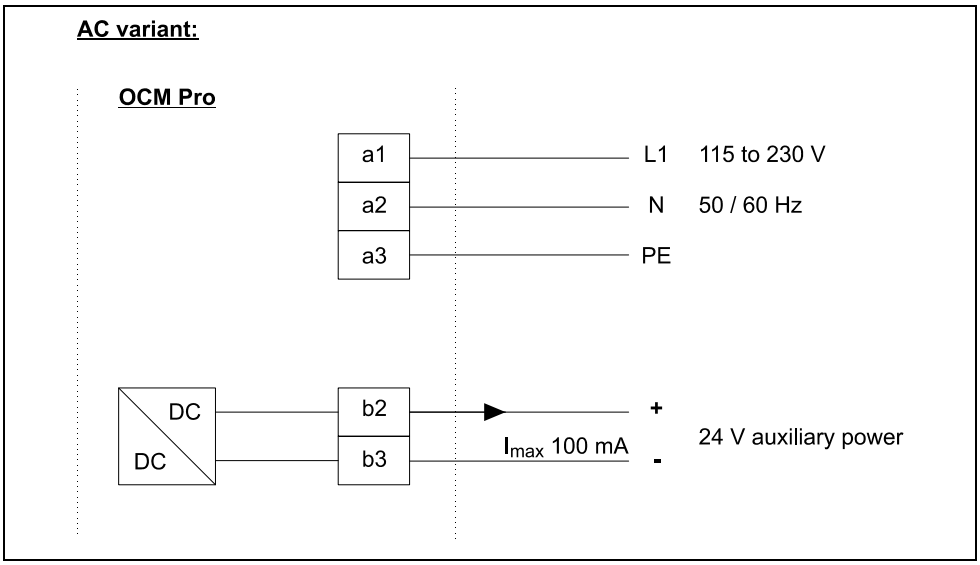


Fig. 6-21 AC-model power supply

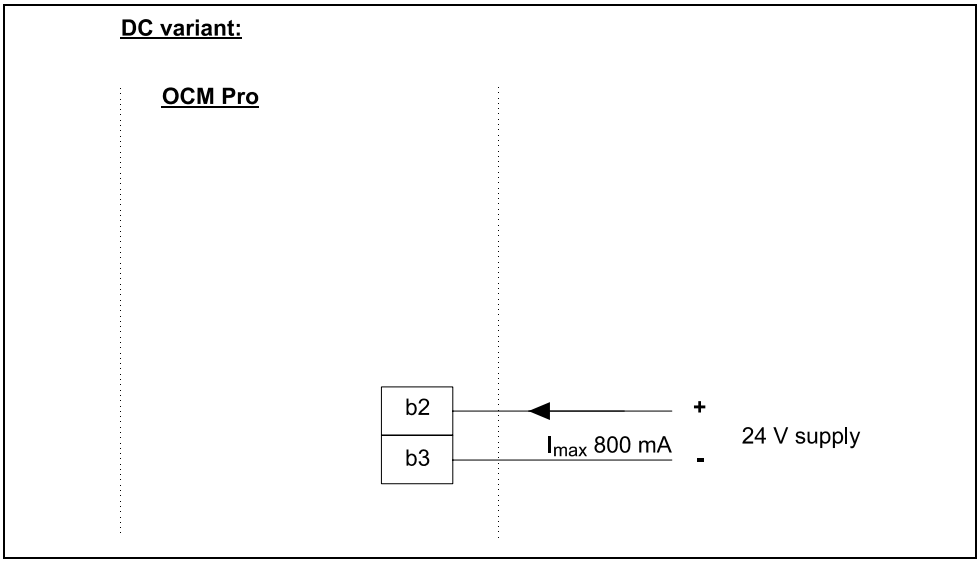


Fig. 6-22 DC-model power supply

6.5 Overvoltage Protection Precautions

For the effective protection of the OCM Pro transmitter it is necessary to protect power supply and mA-output.
NIVUS recommends surge arrestors types EnerPro 220Tr, EnerPro 24Tr (for 24 V DC) for the mains supply, as well type DataPro 2x1 24/24Tr for mA-outputs.
Additional use of external protection devices is not possible because of transmission frequencies.

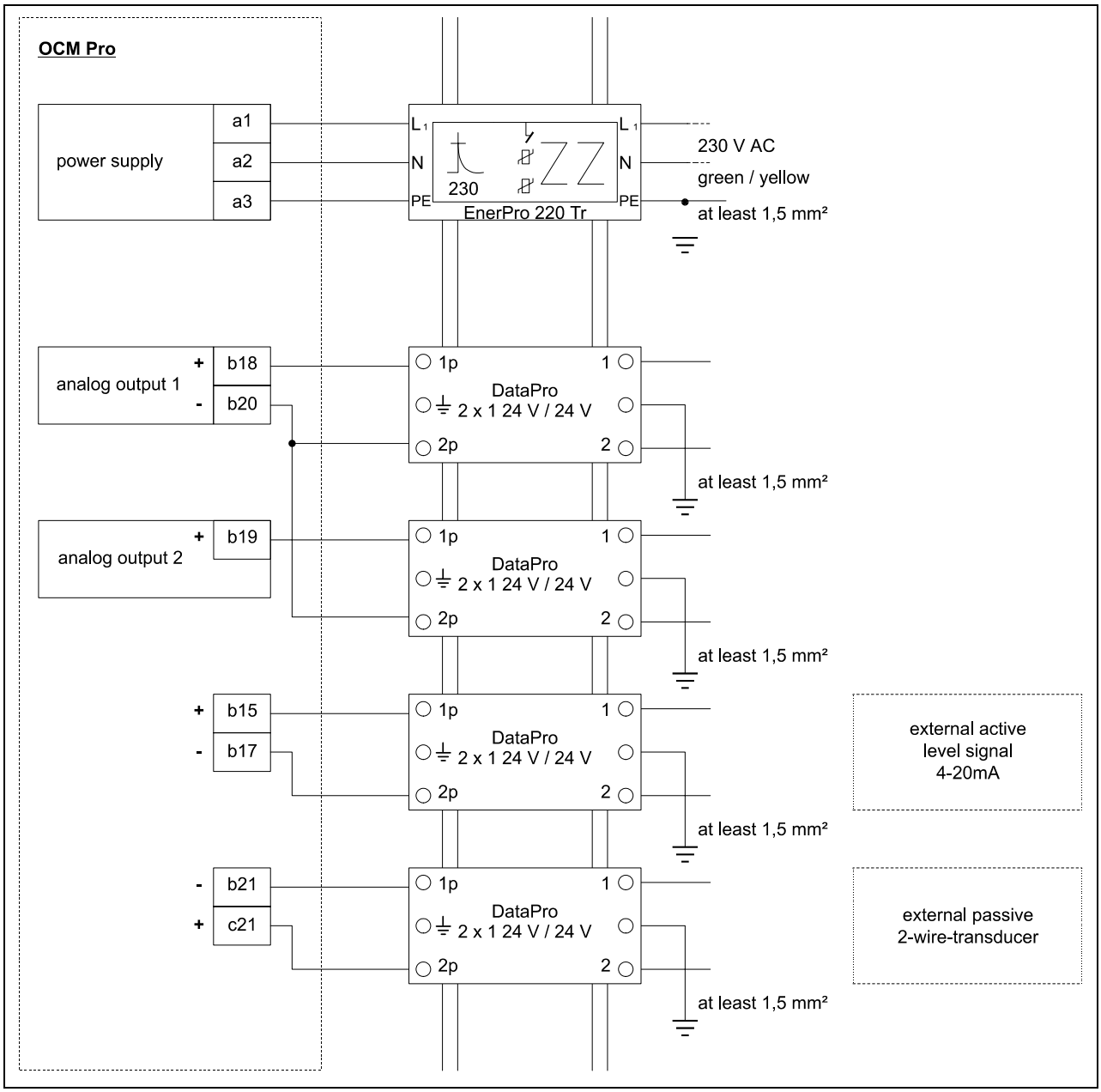


Fig. 6-23 Connecting the overvoltage protection

Please, note the non-reversed connection of the DataPro (p-side to transmitter) as well as a correct, straight wiring supply.
Ground (earth) must lead to the unprotected side.

6.6 Regulator Mode

6.6.1 General

For the quantity control, an OCM Pro Type >M0< is required. Type >S1< has neither an external set point input nor the two digital outputs to drive the regulator slide valve or digital inputs for the slide valve supervision.
For a regulating unit, normally there is a disk slide valve or it uses a blank faceplate settling slide valves with 3-point step drive.
Slide valves with analog drive cannot be driven.
For the correct drive as well as error monitoring of the slide valve, the Way-End-Switches “OFF“ and “ON“ as well as the torque switches “ON“ are a mandatory requirement. These signals are established on the digital inputs of the OCM Pro.
The repatriation of an analog position indication on the OCM Pro is not assigned.
The OCM Pro operates as a 3-point-step controller with flooding signal, quick close control, slide valve control and automatic flush functions. For the drive of the regulating unit, the digital inputs 4 and 5 are strictly assigned. Hence, digital output 4 as “slide valve closed“ and digital output 5 as “slide valve open“ are defined.

The assignment of the digital outputs for the regulator cannot be changed..

For entering an external set point the analog input 4 is specified.

6.6.2 Construction of the Measurement Distance

Unlike usual conditions, installation of the measurement point in front of the regulating unit (not behind) must be done if possible on technical principles. With this, the time response of the controlled system is included and taken into account, and hydraulic problems are reduced or avoided.

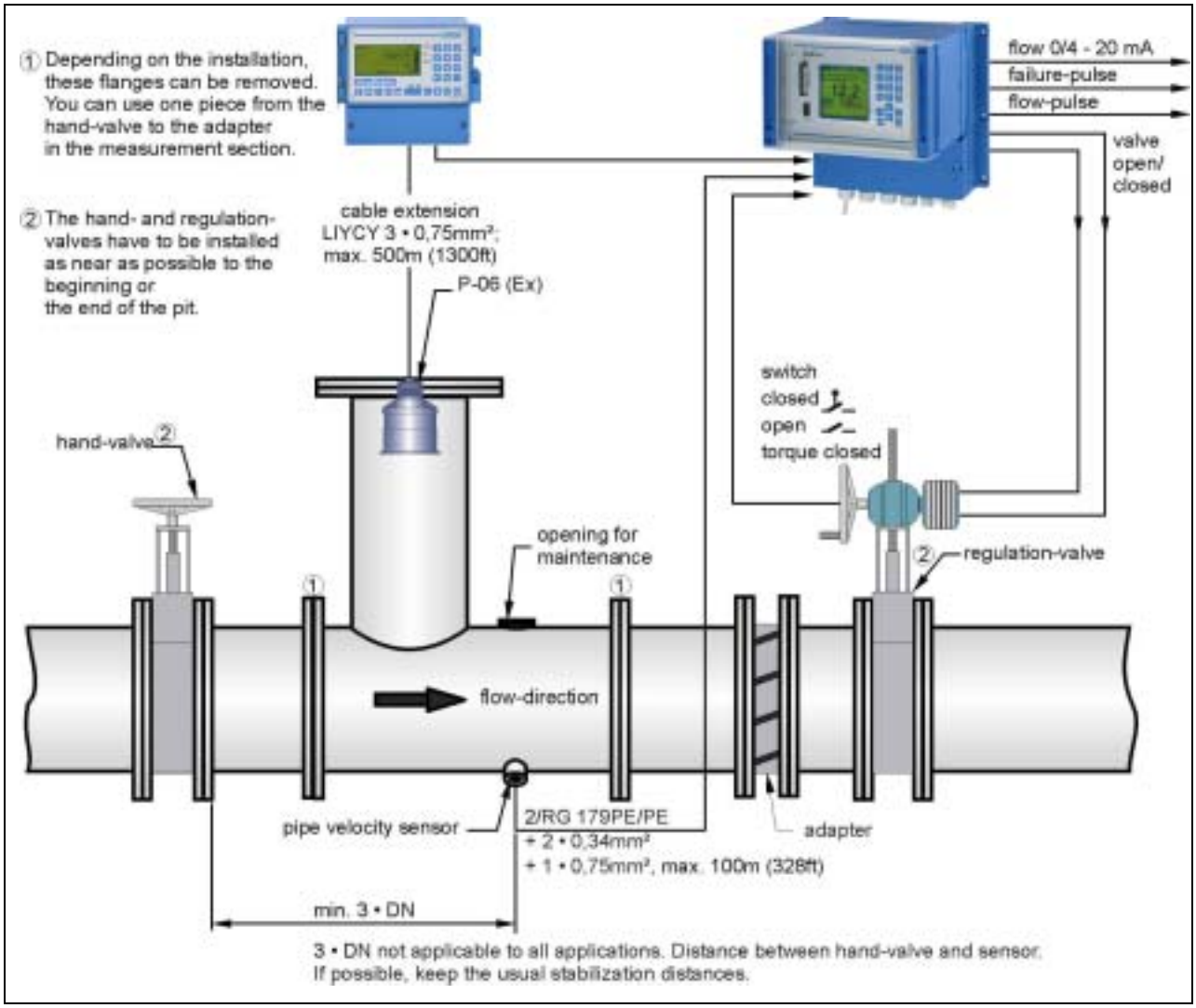


Fig. 6-24 Construction of a controlled system such as an effluent control

The reason for this positioning is the strong hydraulic disturbance of the medium by the regulating unit draining away

If this installation cannot be carried out, the measurement must be installed at least in a distance of 12 times the maximum height behind the slide valve slide valve (see Fig. 6-24).

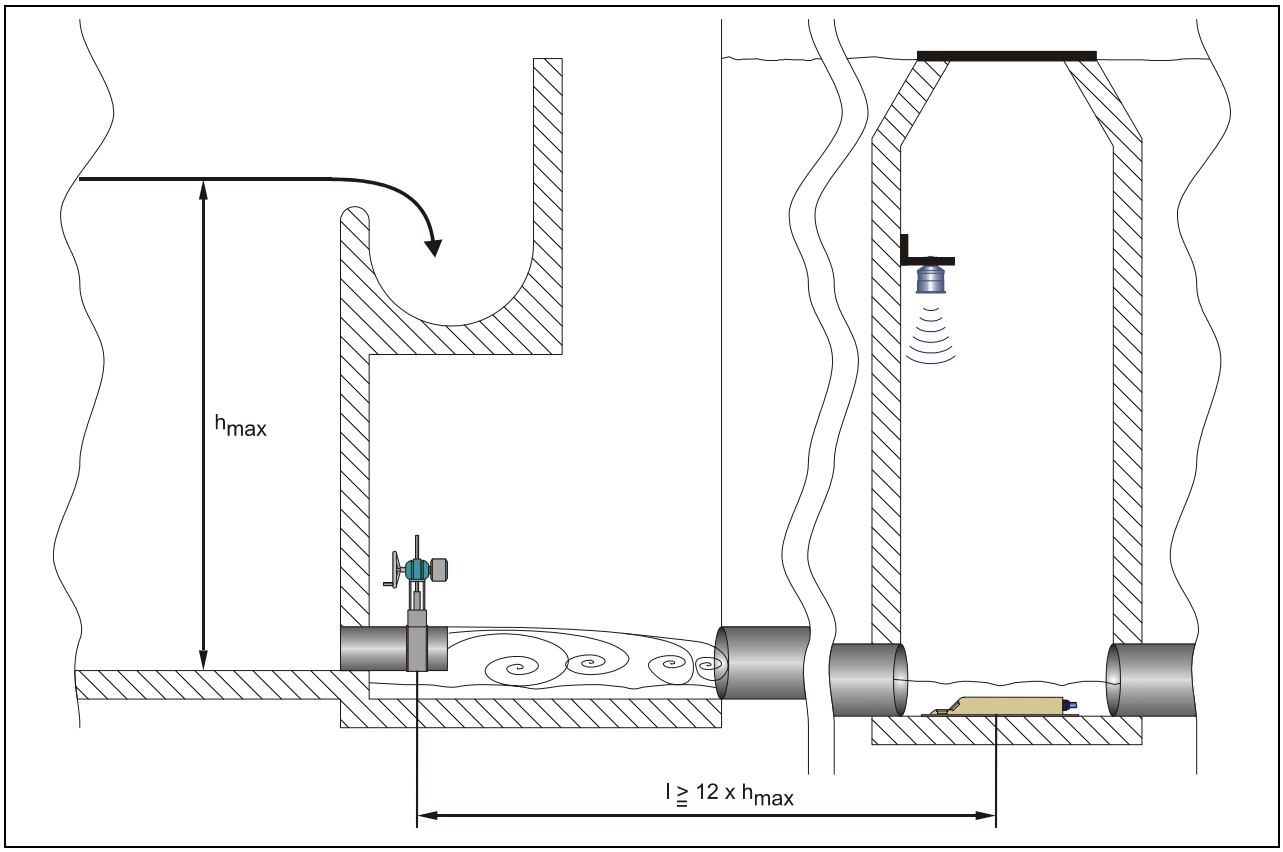


Fig. 6-25 Measurement position behind the slide valve

Please note that extended run times cause measurement and control delayed reaction. Hence, the control must be programmed to react very sluggish.
If these distances cannot be kept, power-breaking elements like rebounding surfaces, returns or similar must be installed. These installations must be designed according to the application.

Further hints:

The gap between flow velocity sensor and the following control slide valve should be according to default flow value, nominal diameter and preliminary pressure at least 2 – 3 x DN, better are up to 5 x DN (DN = internal diameter).
Flow velocities in the control distance normally should not fall below 30cm/s (0.98fps) to ensure sufficient selectivity.
If an air-ultrasonic sensor is used the necessary dome height must be calculated according to the maximum preliminary pressure.
Please not when using NIVUS P06-sensors:

min. dome height [mm] =	450mm + **x** • 45mm (17.72in + **x** • 1.77in)
x =	max. impound pressure in [m] before control slide valve

The pipe measuring distance used and the slide valve must exactly be the same for inside diameters for the incoming and outgoing pipe. Hydraulic jumps, ledges, weld seams, rising flange densities and the like must always be avoided. Insertion pipe sensors have to be slightly offset from the centre in case of sludge/silt deposits.

If the combination insertion pipe sensors is assembled off-centre, it is not possible to measure height with the water ultrasonic sensor.

6.6.3 Connection

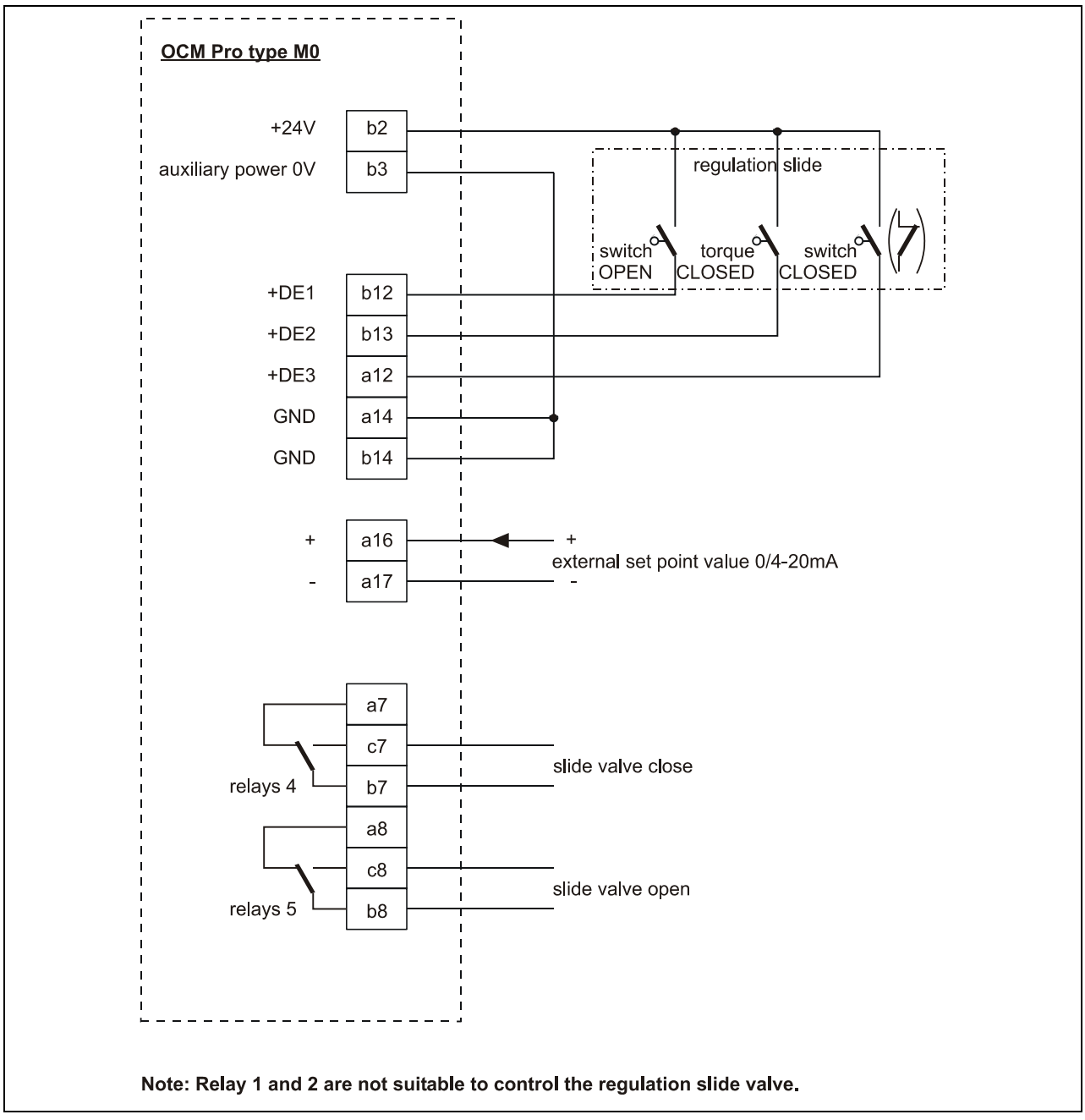


Fig.6-26 Wiring diagram for controller operation

6.6.4 Control Algorithm

If the regulator function is selected (see also Chap. 8.5.8), relay 4 turns itself for the function “SLIDE VALVE CLOSED“ and Relay 5 for “SLIDE VALVE OPEN“ active. This assignment isn't changeable.
The digital inputs are freely programmable. For correct and fault monitored slide valve control the reports are “PATH OFF“, “PATH ON“ and “TORQUE OFF“ for use of the slide valve drive.

*All 3 reports **always** have to be used at slide valve drive over the digital inputs. Activating one report only may cause disturbances in the control mode.*

The regulator can alternatively be operated with external or internal set point. For external set point, this always has to be established as analog input 4.
If using a 4-20mA signal as external set point, this signal can be used for supervision for cable disruption and short-circuit. The OCM Pro in this case accesses the internal set point.

The following equation applies for the internal calculation of the slide valve control time:

$$\text{control time} = (\text{set point} - \text{flow}_{\text{actal value)}} \bullet \text{P\_factor} \bullet \frac{\text{max. slide valve run time}}{\text{max. flow}}$$

7 Initial start-up

7.1 General

Notes to the user

Before you connect and operate the OCM Pro you should strictly follow the notes below!
This instruction manual contains all necessary information to program and to operate the device.
It is addressed to qualified technical staff who have appropriate knowledge about measurement technology, automation technology, information technology and waste water hydraulics.
To ensure a correct function of the OCM Pro this instruction manual must be read thoroughly!
The OCM Pro must be wired in accordance with the wiring diagram, see chap. 6.2.3.
If any problems regarding installation, connection or programming should occur please contact our technical division or our service center.

General Principles

The initial start-up is not allowed until the installation is finished and checked. To exclude faulty programming this instruction manual must be read before the initial start-up.
Please get used to the OCM Pro programming via display and keyboard by reading the instruction manual before you begin to program the device.
After transmitter and sensors are connected (see chapter 6.2.3 and 6.3.5) the parameters must be set. In the most cases all you need is:

- enter the geometry of the measurement place
- sensors used
- display
- analog and digital outputs

The operation of OCM Pro is such that unfamiliar users (without any instructions or manuals) can carry out all fundamental tasks for easy and safe operation of the OCM Pro
For extensive programming, difficult hydraulic conditions, special channel shapes or absence of expert staff, please contact the NIVUS Service Center.

7.2 Keypad

For input of required data, a comfortable 18-button keypad is available.

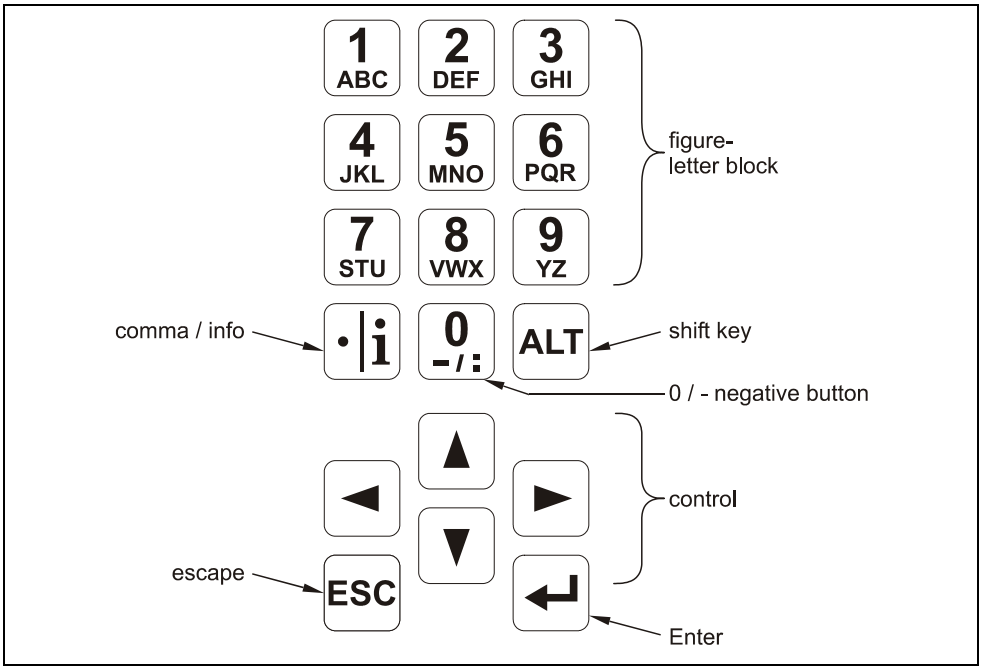


Fig. 7-1 Keypad

7.3 Display

OCM Pro has a large back-lit graphic display with a resolution of 128 x 128 Pixel. This ensures a comfortable communication mode for the user.

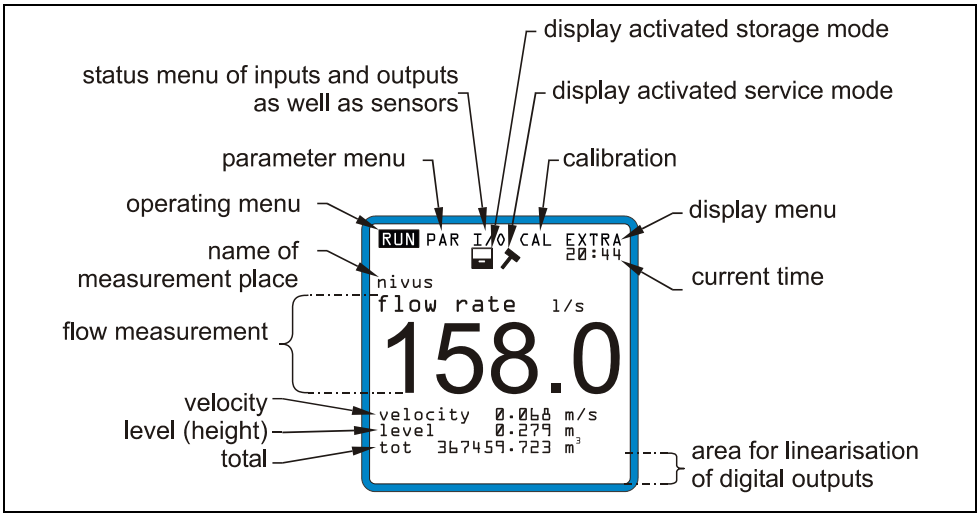


Fig. 7-2 Display

5 basic menus can be selected, visible in the headline of the display. They are individually selectable.

RUN The standard operation mode. Selection is possible for standard uses (name of measurement place, time, flow quantity, level…), optionally displayed: velocity distribution, totalizer, error messages, height (depth) and mean (average) velocity.

PAR This menu is the most extensive of the OCM Pro. It is for the complete parameter setting of dimensions of the measurement place, sensors, analog and digital inputs and outputs, storage and regulator function.

I/O This menu includes information about internal operation of the OCM Pro. All current values can be displayed, as well as the values of analog and digital outputs and relays. Additionally, echoes of the sensors, single velocities and quality of transmissions are displayed. It is also possible to see the available storage of the memory cards.

CAL A calibration of height (depth) and flow velocity can be made here.

EXTRA This sub-menu includes basic settings of the display: contrast, lighting, language, units, system times and totalizer.

7.4 Operation Basics

The entire operation is menu driven and supported by explanatory graphics. To navigate within the menu structure use the 4 control keys (see chapter 7.2).

◄ ► Use these buttons for selecting the main menus

▲ ▼ Buttons for scrolling within the menus

↵ Selected sub menus can be entered, inputs can be opened. The “Enter“ key further serves as data entry confirmation.

ESC Escape submenus step by step. Cancels entered data.

1 ABC – 9 YZ These buttons are used for parameter setting, to enter digits. In some sub menus the buttons are for letter input (name of measuring point). Function compares with mobile phone or cell phone buttons: multiple quick pressing switches over to the next letter.

•|i The key “dot/i“ serves for entering digits. It also recalls internal information about device, software versions and used modules. Further it starts the communication between transmitter and flow velocity sensor.

ALT This button is for switching between uppercase and lowercase letters. Further it is for delete and insert functions, as well as SHIFT-key between various programming options.

8 Parameter Setting

8.1 Quick Guide Parameter Setting (Quick Start)

For standard applications it is necessary to have only a few fundamental settings (partially-filled standard channels, height (depth) and velocity measurement with combination sensor from submerged sensor. Minimum and maximum specified height (depth) range of the combination sensor will not exceed or drop, no secondary level sensor, no sludge deposits, 1 mA output for flow quantity, 1 pulse output).

1. Install and connect transmitter and sensor as described in chapter 6
2. Connect power supply
3. Menu: EXTRA – Units: select units for flow (l/s), velocity (m/s), level (m) and total (m³) . (units in brackets = default settings)
4. Menu: PAR – Measurement place – Channel profile: select profile
5. Menu: PAR – Measurement place – Channel dimensions: enter the channel dimensions

Additional Settings

6. Menu: EXTRA – Display: adjust lighting and contrast if necessary
7. Menu: EXTRA – System time: adjust time if necessary
8. Menu: PAR – Measurement place – Name of measurement place: enter the name of the measurement place
9. Menu: PAR – analog outputs – Function: activate analog output 1 (flow)
10. Menu: PAR – analog outputs – output span: select output span
11. Menu: PAR – analog outputs – measurement span: select measurement span
12. Menu: PAR – analog outputs – error mode: enter, what level the analog output should take in case of error
13. Menu: PAR –Relay outputs – Function: activate relay 1 (select pos-total impulse)
14. Menu: PAR –Relay outputs – Pulse parameter: set pulse value and duration
15. Exit parameter setting. Save values by entering code number 2718

8.2 Parameter Setting Basics

The transmitter operates (in the background) with the same settings, as has been entered at beginning of the parameter setting. Just after you finish the new entries, the system asks for accepting the new values.
If “yes”, it requires the code number.

2718 Type in this number when asked by the OCM Pro.

Never give the code number to any unauthorized persons. Even do not leave the code next to the equipment or write it down on it. The code number protects against unauthorized access.

Wrong entry of the service code three times results in abortion of the parameter mode. The equipment goes on with the “old“ values.
If you entered the correct code, the changed parameters are accepted and the system resets.
It needs approx. 20-30sec. for the reset.

This instruction manual describes all programming options of the OCM Pro. Depending on the device type various inputs and outputs may not be available. They may be programmable, but may not be available to be used as outputs or to be connected (see also Specifications transmitter). This applies for the OCM Pro transmitter type S1, which has only 2 analog outputs, 2 relay outputs, 1 analog input and no digital input. This device cannot be operated as a controller. It can be operated with 2 analog outputs and 2 relay outputs only. Please use transmitter type M0 for the additional functions described above.

After mounting and installing sensor and transmitter (see previous chapters) activate the power supply.
The initial start-up dialog is the language selection:

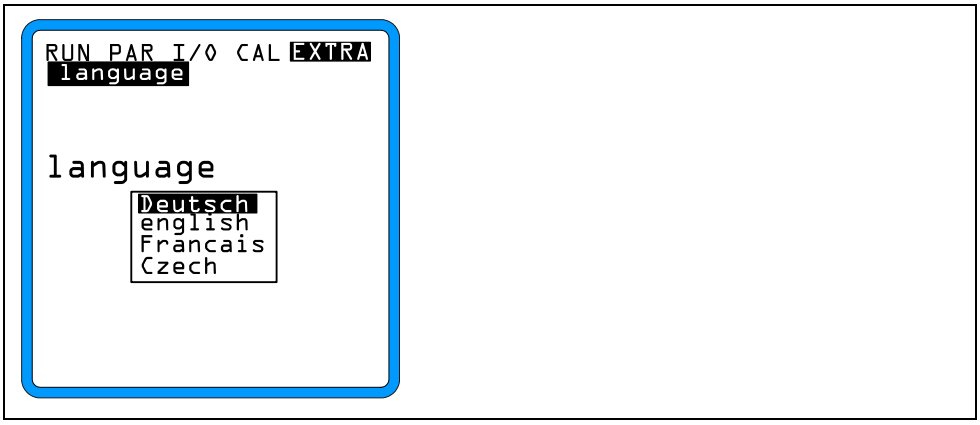


Fig. 8-1 Language selection

Select the desired language by using the arrow keys and press enter to confirm.

 Please, press this button 1 x briefly

The transmitter begins the communication with the sensor and coordinates both processor programs.
At the same time, you see the software version number on the display. This is needed if problems arise during programming.

This procedure is necessary after each sensor change.

Due to safety reasons please reset the system afterwards (menu PAR / submenu “setup parameter“)
Now you are ready to begin setting your parameters.

The system reset may be carried out only for a new piece of equipment. Custom-designed parameters are lost through this. The equipment will reset to factory defaults.

8.3 Operation mode (RUN)

This menu is a display menu for standard operation mode. It is not needed for parameter setting. It contains the following sub menus:

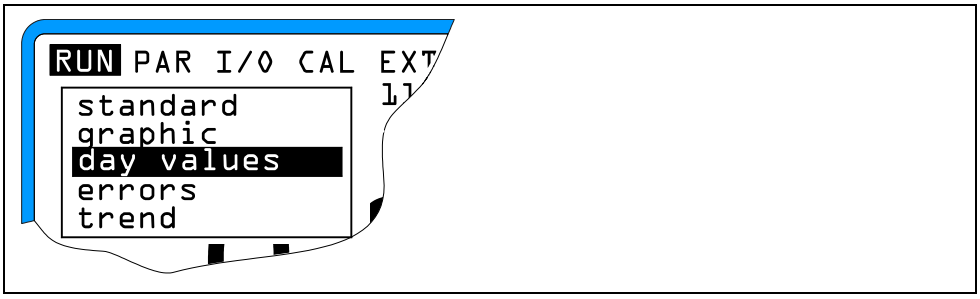


Fig. 8-2 Operation mode

Standard Display with information about the name of measurement place, time, flow quantity, level and velocity.

Graphic Display of velocity distribution in a vertical measurement path. Pressing the buttons “PgUp” or PgDn”, the indication stroke can be scrolled up or down. The selected height as well as the current velocity is displayed in the lower line of the display (see Fig. 8-3).
This graphic indication makes it possible to understand the current flow conditions at the chosen measurement place. The velocity profile should be evenly distributed and not have any errors (see Fig. 8-4).
For very unfavorable conditions, the mounting position of the sensor should be changed.

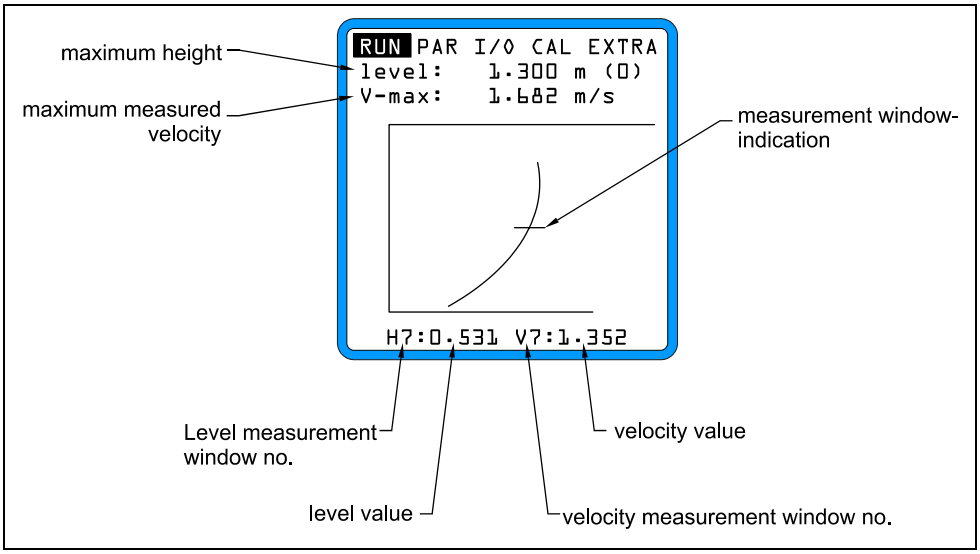


Fig. 8-3 Flow velocity distribution

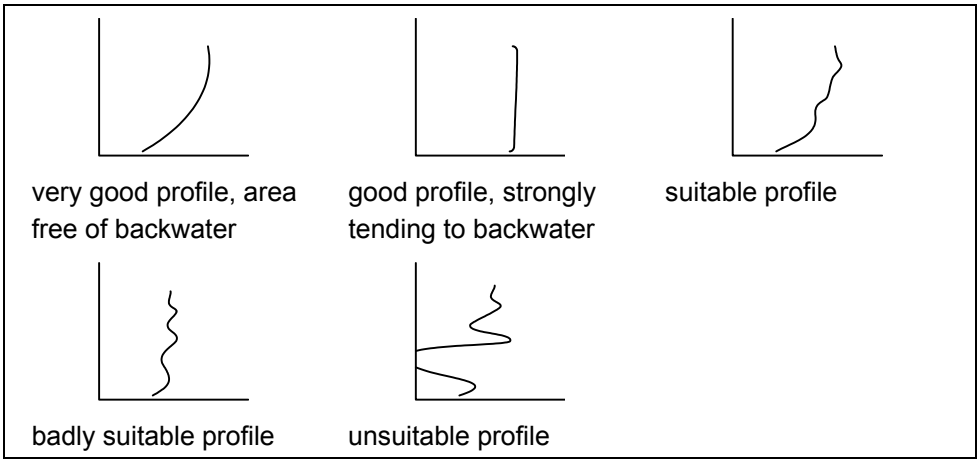


Fig. 8-4 Flow velocity profiles

Day Values

Select submenu INFO (see Fig. 8-5). It contains the total value of flow for the last 7 days (see Fig. 8-6) (prerequisite: the transmitter was in operation the last 7 days. Otherwise it shows the total for the uninterrupted days of operation). Totalization is normally carried out at 0.00h. If necessary this can be changed under RUN-day values-interval (see Fig. 8-7).
Additionally, you can get information about partial total value since the last reset (comparable with tachometer of cars).This value will be reset by using the >ALT<-key. The reset does not influence the totalizer!

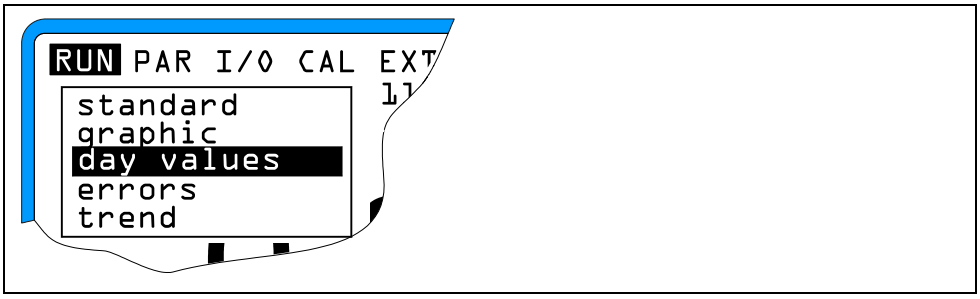


Fig. 8-5 Info menu

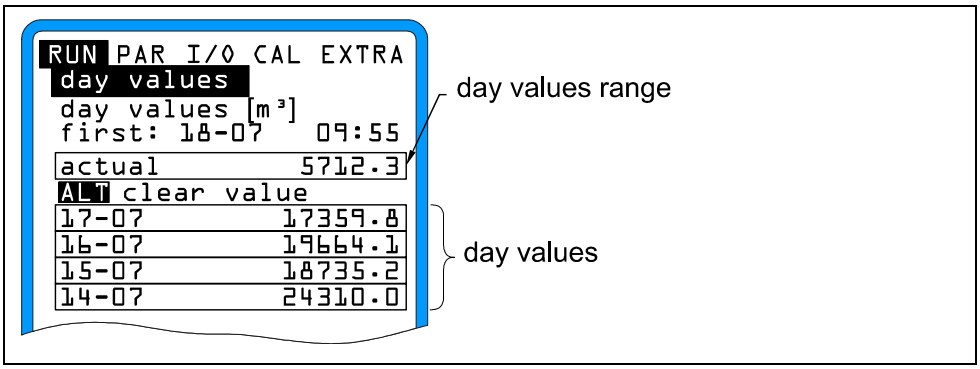


Fig. 8-6 Day values

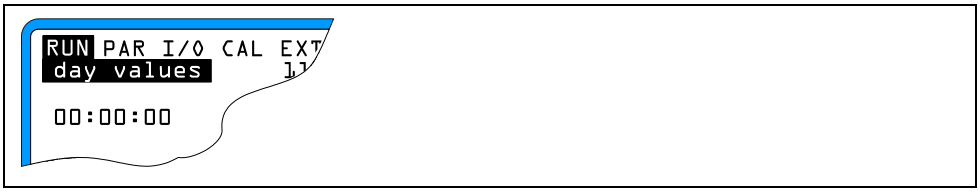


Fig. 8-7 Time of totals begin

Errors

This menu is for control of any interruptions in the function of the transmitter. Errors are saved for any type of fault, date and time. By activating the >ALT<-Key, all error messages can be deleted one by one.

Trend

Works like a small electronic writer. The last 100 average cycle values of level, velocity and height (depth) are stored. It can be selected in a sub menu.

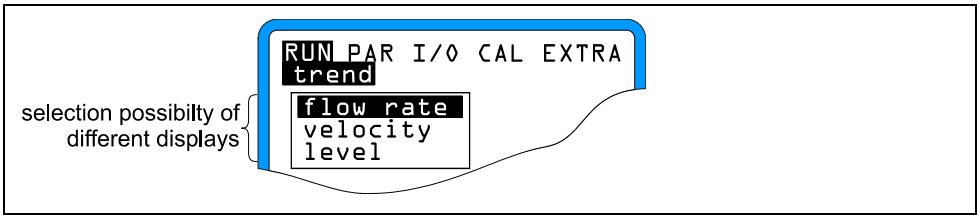


Fig. 8-8 Trend value selection

The logging interval of average values is visible on the lowest line of graphic display.
Inside this cycle, new values will shown as a line on the right side. The oldest value leaves the display on the left side. (max. 100 lines on display - see Fig. 8-9). You can set the storage time in menu: PAR-storage mode-time-cycle.

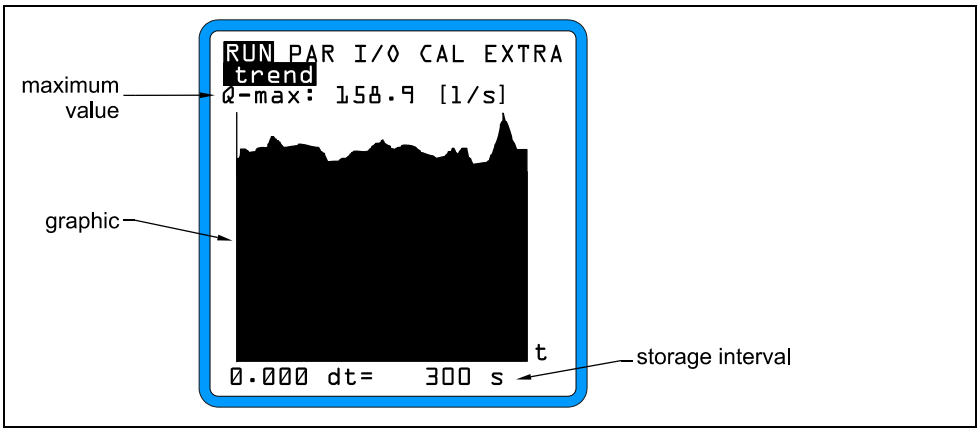


Fig. 8-9 Trend graphic example

If storage time or other value is changed in the parameter setting, all previous stored values in trend graphic will be lost.

8.4 Display Menu (EXTRA)

In this menu, you have the possibility to control the standard display, units, operation language and the display
It contains the following menus:

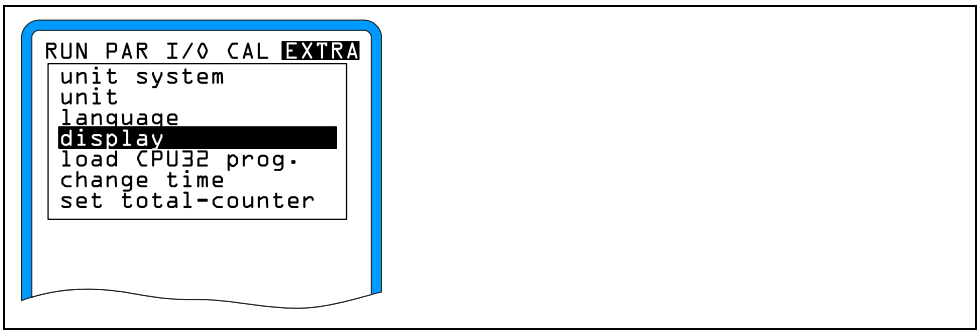


Fig. 8-10 Extra-submenus

Unit System Here you can select between the metric system (liter, cubic meters, cm/s etc.), english system (ft, in, gal/s, etc.) and american system (fps, mgd etc.).

Units This menu contains sub menus:

- Flow
- Velocity
- Level
- Total

For each of these 4 measured values you can select a unit. It appears on the display. Depending on the selected unit system, various units are available.

Language German, English, French or Czech

Display Is for display correction, with reference to contrast as well as brightness of back-lit. ▼ and ◄ is for LOW; ▲ and ► is for HIGH. ► and ◄ change the value in steps of 5%; ▲ and ▼ in 1%

Change Time

The equipment includes a system clock for different control and storage functions. It stores the dates of year, weekday and week number. If necessary, the selections must be corrected.

First select the menu point Info:

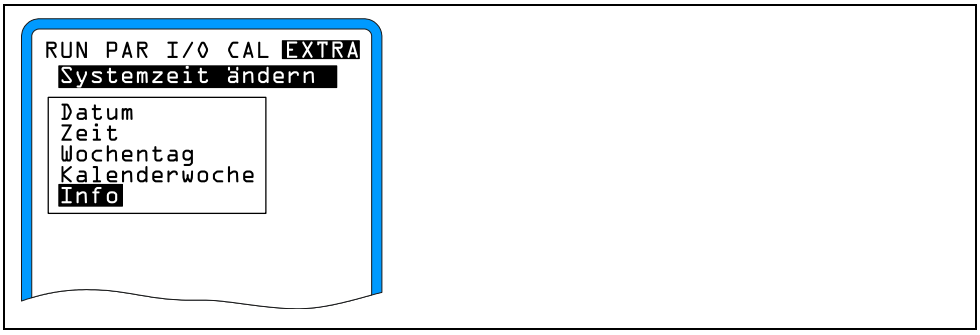


Fig. 8-11 Change Time Submenus

After entering, the complete system time is visible:

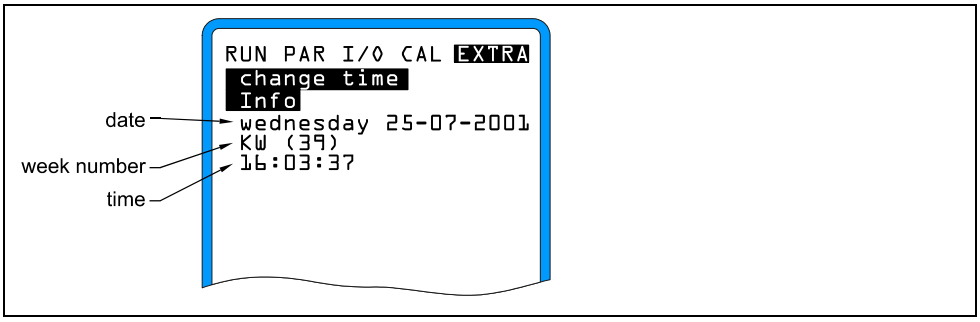


Fig. 8-12 Display complete system time

The system time cannot be changed here. It is only displayed. Changes can be carried out only within the submenus of the “change time“ menu.

Totalizer

Set totalizer is a function in this programming menu. Normally it is needed after changing a transmitter at a measurement place, when totalizer values have to be displayed.

8.5 Parameter Menu (PAR)

The parameter PAR is the most extensive and most important for programming of OCM Pro. It nevertheless is sufficient in most cases to program only some essential parameters.
This normally are:

- name of measurement place
- channel profile
- channel geometry
- sensor type
- analog output (function, measurement range and measurement span)
- relay output (function and value)

All further functions are additions which only are necessary in particular cases (special channels, storage mode, regulator or special hydraulic applications). These settings are normally made with the help of our service personnel.

This instruction manual describes all programming options of the OCM Pro. Depending on the device type various inputs and outputs may not be available. They may be programmable, but may not be available to be used as outputs or to be connected. This applies for the OCM Pro transmitter type S1, which has only 2 analog outputs, 2 relay outputs, 1 analog input and no digital input. This device cannot be operated as a controller.

The parameter menu >PAR< contains ten partially very extensive submenus. They are individually described on the following pages.

8.5.1 Parameter Menu “Measurement Place“

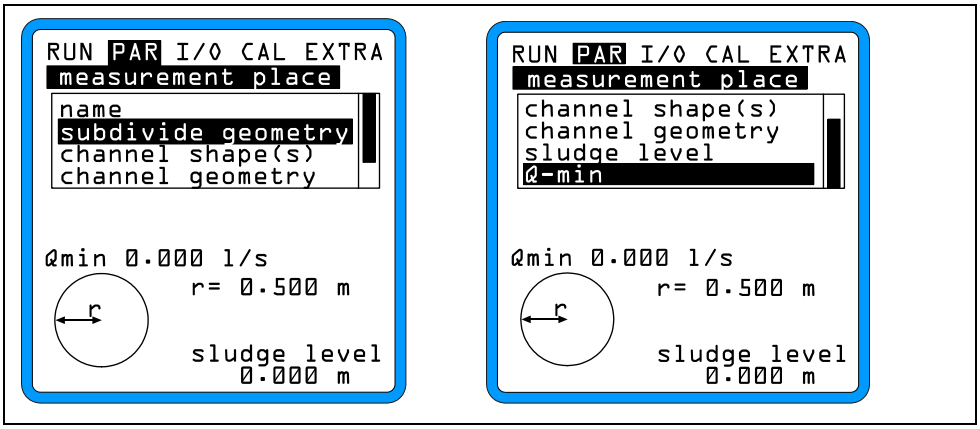


Fig. 8-13 Submenu measurement place

This menu contains the most important standard features of parameter setting. The measurement place is defined with its dimensions.
For applications purposes the whole menu isn't visible. This is recognizable at the black bar on the right hand side of the menu.

▲ ▼ Using the arrow keys the menu can be scrolled through.

Name of Measurement Place:

NIVUS recommends to coordinate and define the name with the documents. The name can be with max. 21 characters. The programming is similar to mobile phone programming:

After selection of submenu >name<, the display indicates “NIVUS”. By pressing the ALT-button you can change between 3 script menus

- lowercase letters
- uppercase letters
- DEL and INS

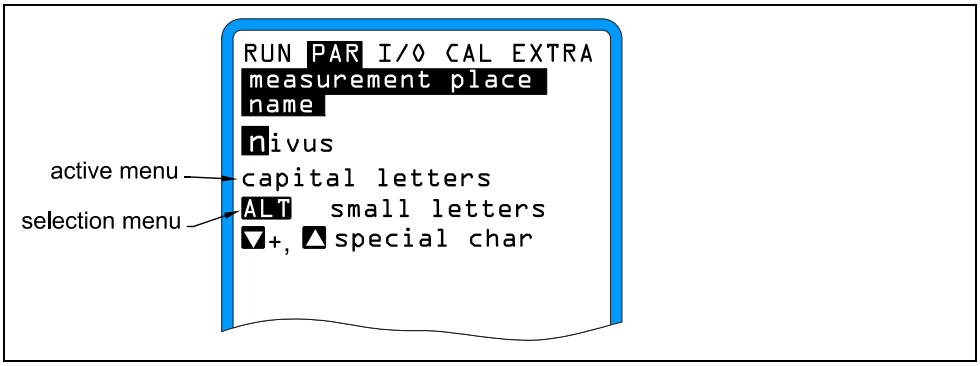


Fig. 8-14 Programming name of measurement place

The entry is made via keypad, in which three letters as well as a number is assigned to every key (see chapter 7.2). By multiple brief activity of the buttons you can change between these 4 signs.
If the button isn't pressed for 2 seconds, the cursor jumps to the next sign.

Keys:

◄ ► Moves the cursor left or right.

▲ ▼ With these buttons additional special signs can be selected which cannot be found on the keypad
(>ä<, >ö<, >ü<, >ß<, >%<, >(<, >)< >:<, >/<, >-<, >=< …).

◄ In DEL/INS-Mode you can delete step by step to the left.

► In DEL/INS-Mode you can insert step by step to the right.

Now you can delete the name (factory default). Set the cursor behind the last letter and change to DEL/INS-Mode.

◄ Pressing this key will delete the name!

Faulty input can be corrected with going back with the cursor and write again.

↵ The entered name must be confirmed with this button.

Subdivide geometry:

It is possible to subdivide large special profiles into 2 or 3 level areas.
Pressing >ALT< will select between the 3 following options:

- NO (no subdivision)
- 2 (subdivision in 2 level areas)
- 3 (subdivision in 3 level areas)

In the menu Parameter/measurement place/channel shape(s) the profile parts can be selected. In the lower shape area the shapes pipe, egg, rectangular, U-profile, trapezoidal and 3rgg are available. In middle shape a height/width or height/area characteristic can be entered in and a segment is entered for the upper shape.

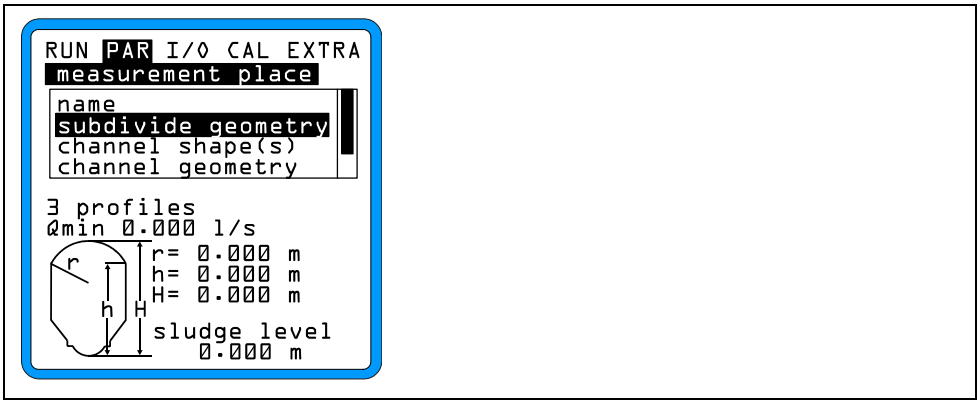


Fig. 8-15 Profile divided into 3 parts

Channel shape(s):

For a subdivided shape, using the >ALT<-Key first select the range and then the desired shape is adjusted. In this menu the profile of the channel has to be entered in. These are the choices at present from the following standard profiles (ATV A110):

- round pipe
- 3r egg (standard)
- rectangular
- U-profile
- Trapezoidal
- 2r egg

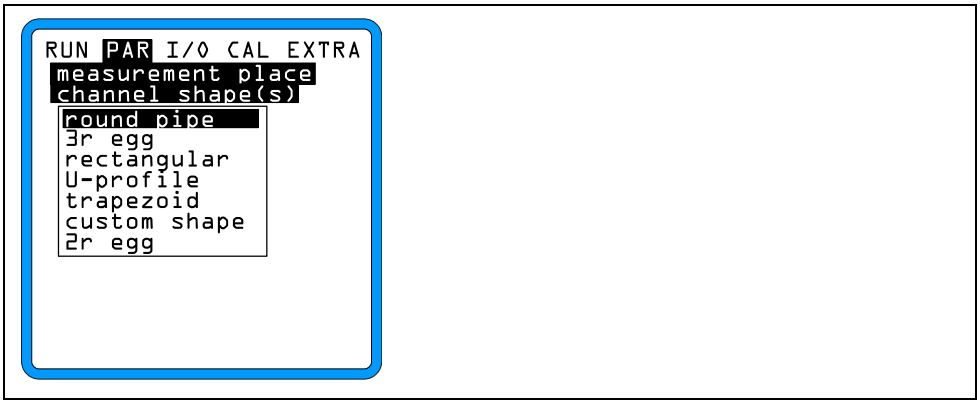


Fig. 8-16 Channel shapes

▲ ▼ These buttons select the channel shape.

↵ confirm with “Enter“.

The selected profile is taken and shown on the display (programming mode).

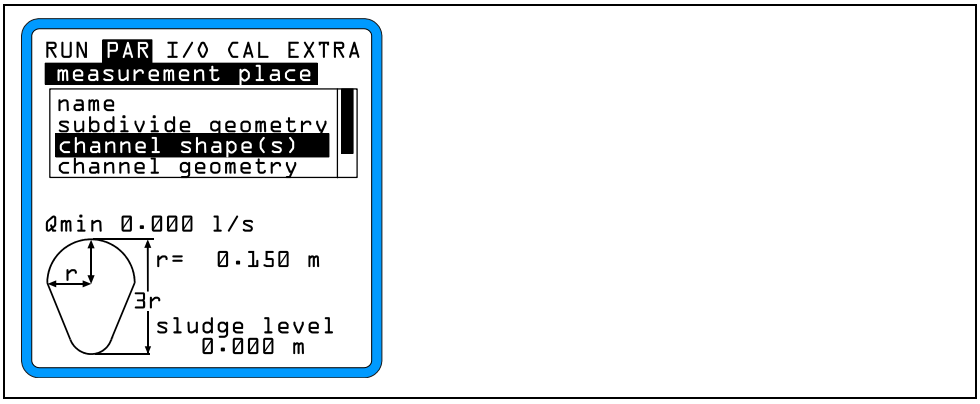


Fig. 8-17 Selected profile on display

If the available profile for the measurement place is not in this selection, please use custom shape.

↵ Confirm with “Enter“.

Following this, select the type of custom profile to be programmed.

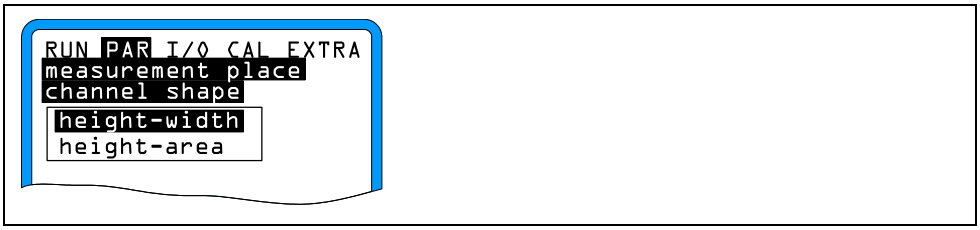


Fig. 8-18 Menu custom shape

Channel Geometry

Depending on the chosen profile, please enter the corresponding dimensions.

Please take the displayed measurement units into account!

If the >custom shape< is selected, a value table with 32 possible bases is displayed in this parameter.
As described above, the proportion of height-width or height-area has to be entered.

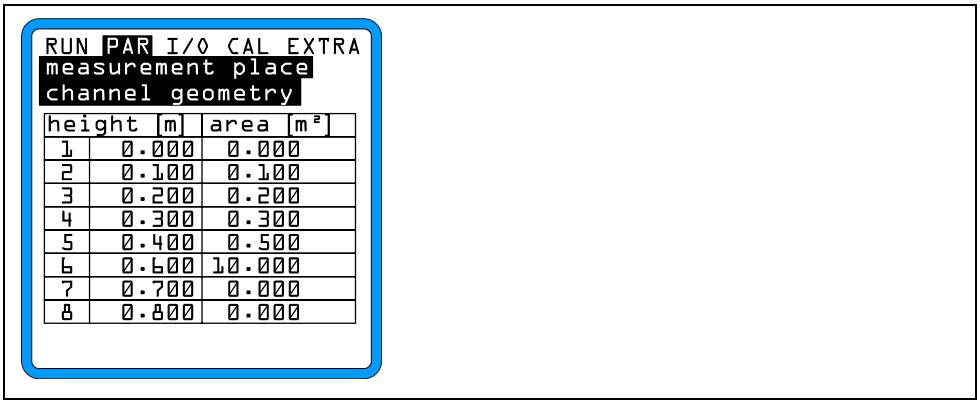


Fig. 8-19 List of bases for custom shape

The base 1 has to be started with 0 – 0, for defining a 0-point at the channel beginning.
All other bases can be entered freely for the height wide/area. The distance of the single height points can be variable. It is also not necessary to enter all 32 bases. Merely take into account, which OCM Pro is linearized between the bases. For very uneven changes, the distance between the bases has to be chosen more tightly.

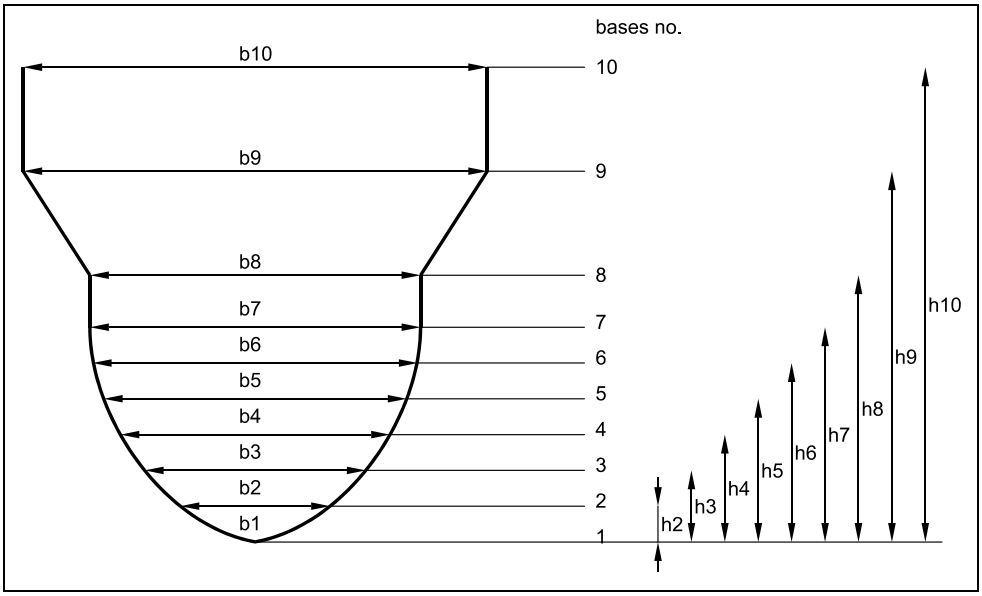


Fig. 8-20 Bases for custom shape

If the channel geometry is subdivided in two parts the following channel geometries are available:

Bottom area:
- round pipe
- 3r egg
- rectangular
- U-profile
- trapezoid
- 2r egg

Top area:
- custom shape

If subdivided in three profiles, the following parameters can be selected:

Bottom area:
- round pipe
- 3r egg
- rectangular
- U-profile
- trapezoid
- 2r egg

Middle area:
- custom shape

Top area:
- round pipe

Programming subdivided profiles requires comprehensive knowledge and experience in operating the OCM Pro. To avoid faulty programming or if in doubt this should be done by NIVUS service personnel.

Sludge Level

The entered sludge (silt) level is calculated as a non-moving patch. It is subtracted from the wetted hydraulic total area before calculating the flow.

Q-min

This parameter serves for suppressing slow movements or very little quantities.

Q_{min}: Measurements whose is smaller than this value is set at "0". Only positive results can be entered.

V_{min}: With this parameter smaller quantities can be suppressed for applications in large shapes and high levels/heights. Slow velocity changes can cause large quantity changes, the Q_{min} not being included.

Velocities of flow smaller than this value is set to "0“ and with it the Quantity will also get set to “0“. Only positive results can be entered.

Both options of oppressing smaller quantities are in an OR-Relation.

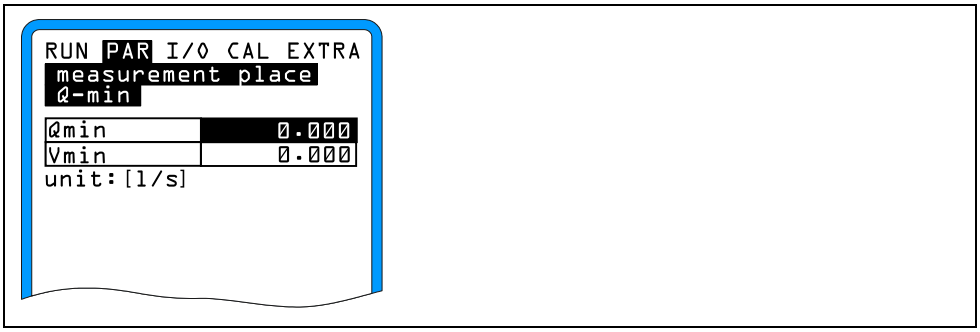


Fig. 8-21 Q-min selection

*The Q-min suppression is **no** offset, it’s a limit value.*

8.5.2 Parameter menu „Level“

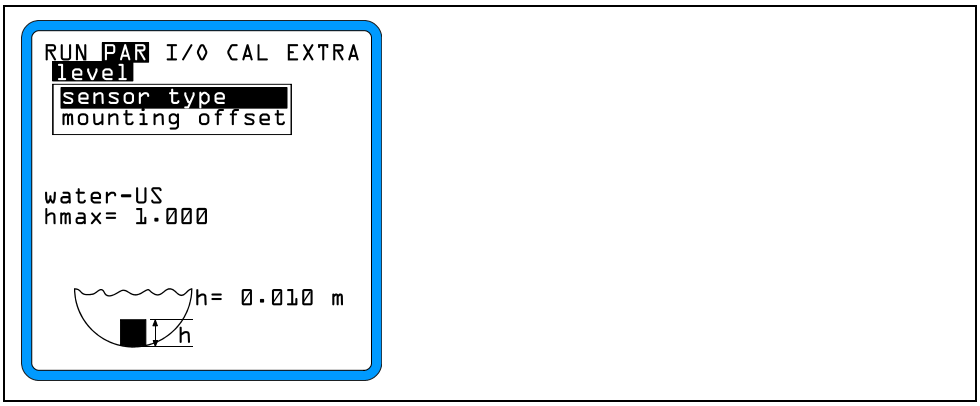


Fig. 8-22 Level measurement - submenu

This menu defines all parameter for the level measurement. Depending on the chosen sensor type, the parameter start display as well as the entered parameters are different.

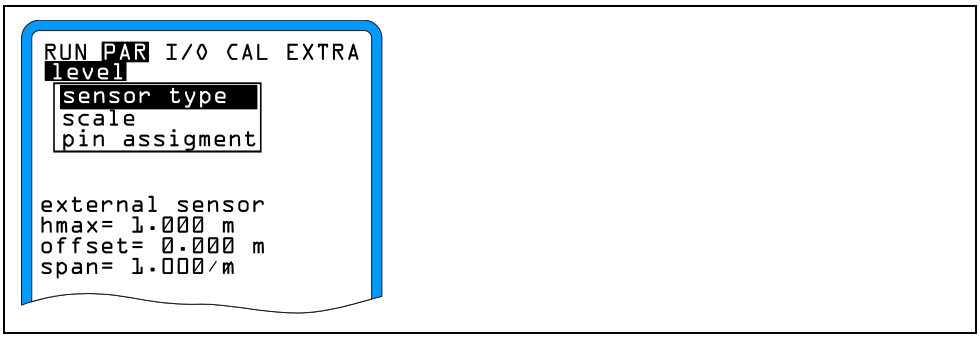


Fig. 8-23 Display example: external sensor

It is first necessary to select the sensor type. It is distinguished between the following types:

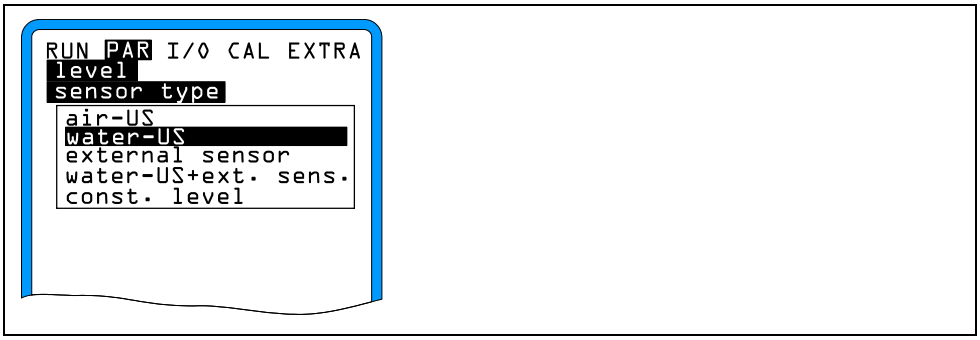


Fig. 8-24 Sensor type specification

water-ultrasonic	Standard type, measurement of velocity and level with combination sensor from the bottom up.
external sensor	Level measurement using an external 2-wire-sensor powered by the OCM Pro, like NivuBar pressure probes or with external transmitter like NivuMaster and level input via mA input signal.
constant level	This point is used for programming permanently full filled pipes and channels. Applications like these normally do not have a level measurement. The constant level is entered in “scale“.
water-ultrasonic + external sensor	Combination between mode 1 and 2. This mode may be necessary if due to constructional conditions one sensor is not sufficient to capture the area’s overall level from top or bottom. Up to three different level areas can be programmed in this point. A separate sensor can be programmed for level capturing in each area. Hence, even complex level switching in complicated applications can be realized.

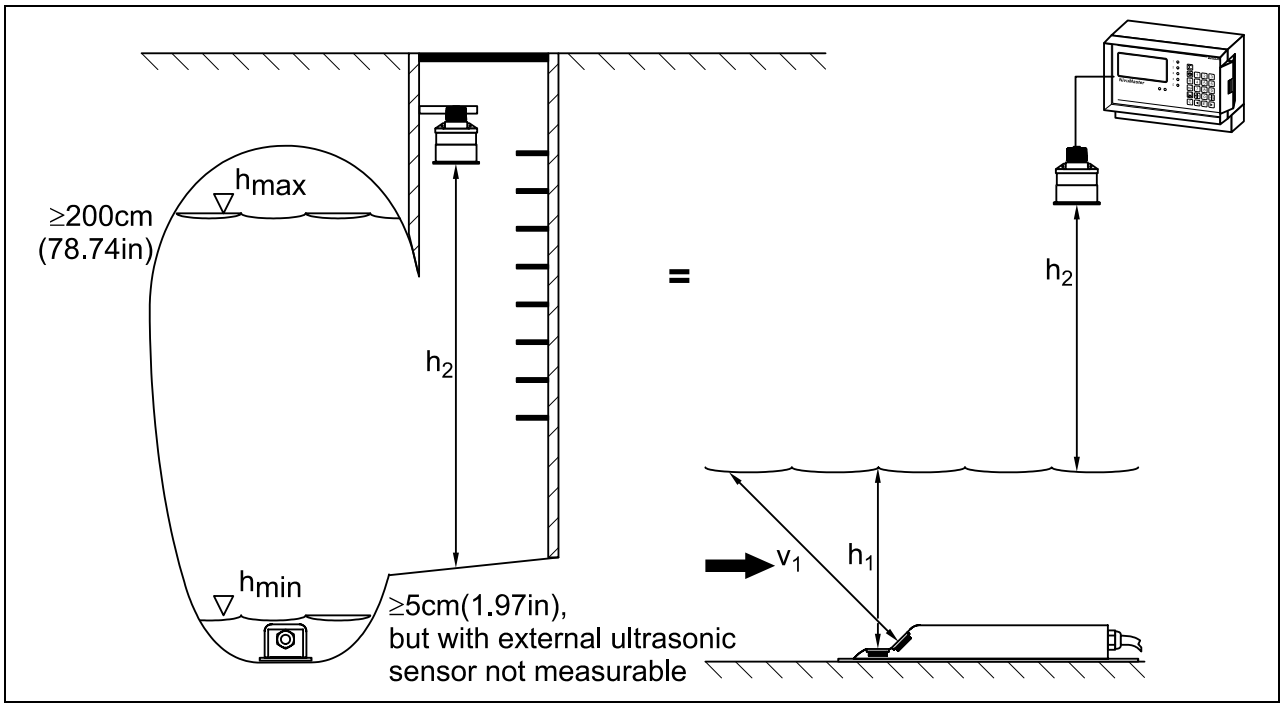


Fig. 8-25 Example of 2 level sensors

Mounting Height

Only visible and programmable, when sensor type 2 or 4 is selected. The standard value is 10mm (0.394in), this corresponds to the surface of the level sensor over the channel bottom. This value is not necessary to be changed, as long as the sensor is **not mounted higher**

For higher (offset) installation, an additional mounting height (to the 10mm (0.394in)) has to be added to the total height.

Scale

Not visible and programmable if sensor type “water-ultrasonic“ is set.

Depending on the sensor type a measurement offset, the measurement span or a fixed level can be entered which corresponds with the input signal.

Installation Height

Only visible and programmable if sensor types “water-ultrasonic“ or “water-ultrasonic + external sensor“ are set.

Here the installation height of the water-ultrasonic sensor must be entered.

Pin assignment

Only visible and programmable for external level/height sensor. With this setting the activation of the corresponding area can be carried out using the >ALT<-Key.

2-Wire-Sensors, powered by the OCM Pro, are connected to Ex-Termination b21 and c21. The menu point connection has to be programmed for “Ex-Zone“.

*External fed-in level/height signals, e.g. NivuMaster are **always** connected to the Non-Ex-Zone termination. The menu point connection is programmed for “AI 1“.*

For connection also not Fig. 6-18 and Fig. 6-19 in chapter 6.3.5 Sensor Connection.

Split sensors

This Parameter can only be selected if “water-ultrasonic + external sensor“ is set.

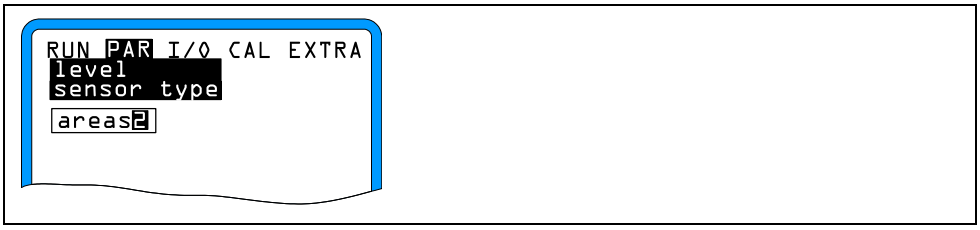


Fig. 8-26 Dividing level areas

It is possible to split the level areas in 2 (top and bottom) or 3 parts (top, middle, bottom). This enables you to detect and calculate the current level and flow volume e.g. in the top area by using water-ultrasonic and in the middle area by using an external sensor.

To toggle between upper and lower area this is selected with >switch level<.

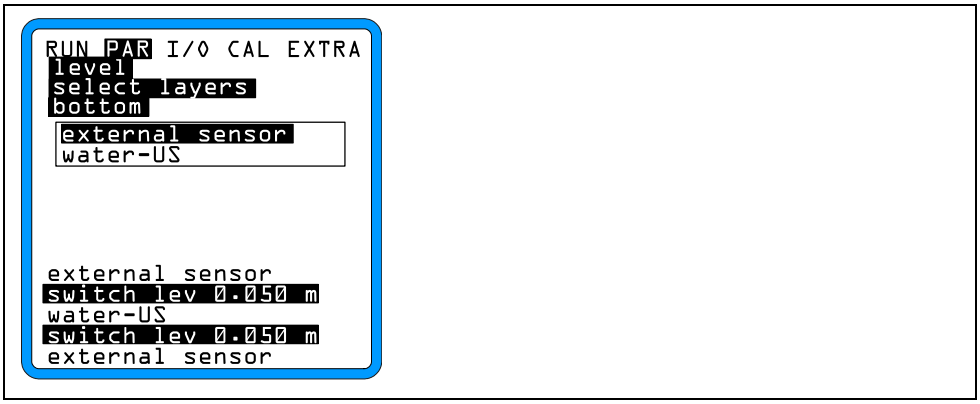


Fig. 8-27 Programming switch levels

8.5.3 Parameter menu “Velocity“

Connecting 1 sensor

The number of sensors is set to >1< by default.

Fig. 8-28 Selection number of sensors

The programming of additional sensors requires extensive hydraulic knowledge and must be exclusively carried out by NIVUS personnel!
This is why profile parameter setting with multiple sensors is merely mentioned briefly.

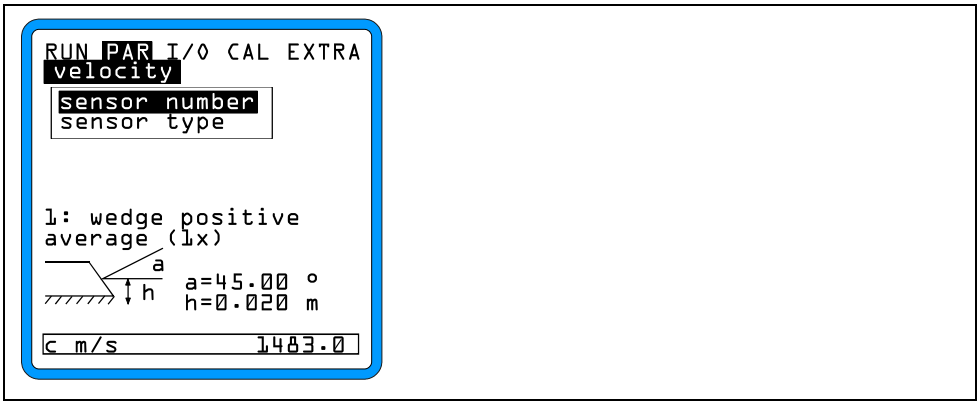


Fig. 8-29 Sensor settings

To select the sensor type the following is displayed:

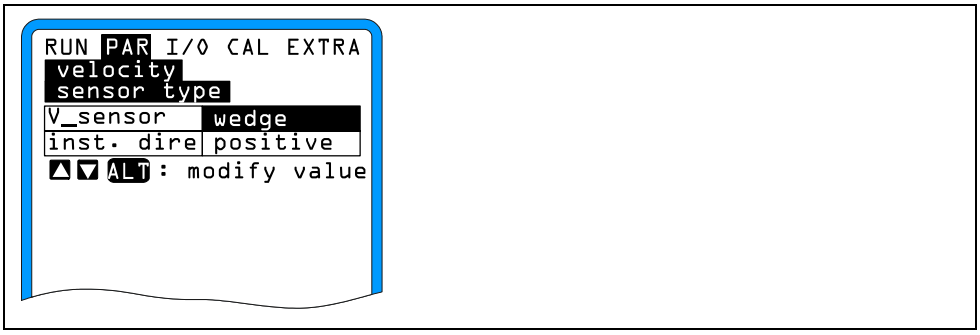


Fig. 8-30 Selecting sensor types

Sensor type

The sensor type, using >ALT<-Key can be selected between wedge/mouse and pipe insertion type.
The **installation situation** is set to “positive“ by default. This parameter shouldn't be changed. It is used only for special applications, the velocity sensor is installed in the flow direction, but nevertheless positive velocities shall be displayed.

Mounting place

In this menu point, the assembly height of the velocity sensor is adjusted. This default value is 20mm (0.787in), which is the middle of the velocity sensor corresponding over the channel bottom. This value doesn't need to be changed, as long as the sensor is **not raised** during installation. With raised installation, the additional assembly height over the 20mm (0.787in), must be added and entered as a total amount.

Connecting 2 or 3 sensors:

If the number of sensors is extended to 2 or 3, the following is displayed:

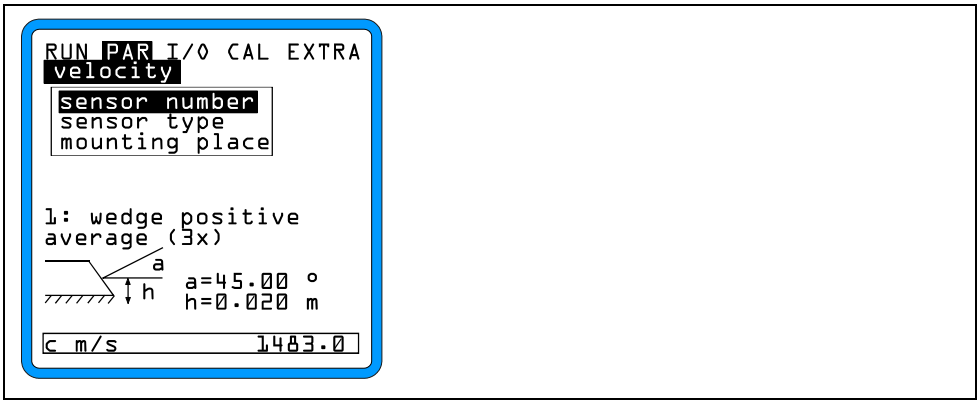


Fig. 8-31 Extended sensor setting

With the menu point >velocity/sensor number<, the sensor (which has to be programmed) is selected.
After the selection of the sensor type, the following appears:

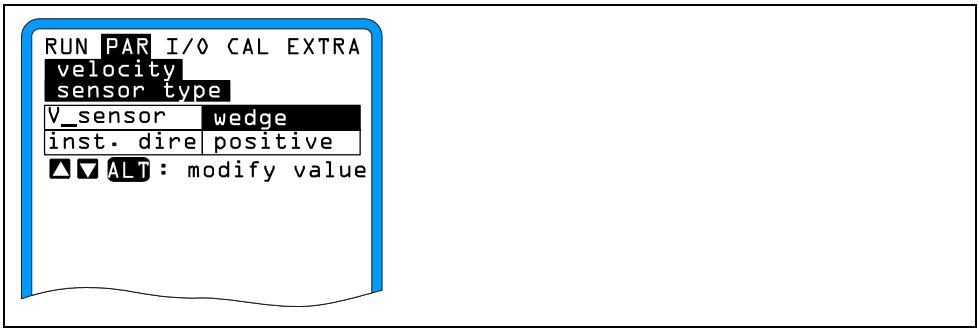


Fig. 8-32 Selecting sensor type

Sensor type

Selecting and programming the sensor type is done the same way like with a flow velocity sensor.

Mounting place

The installation height for every velocity sensor has to be entered. Sensor 1 works as primary sensor. All height information relate to this sensor. For that reason sensor 1 must be assembled at the deepest point (see Fig. 8-33)

Sensor 1 is the leading sensor. All levels relate to it. For that reason it must be assembled at the deepest point. If multiple flow velocity sensors are in use and one of them is the ultrasonic level measurement from the bottom, this one is always sensor 1.

If the mounting place of the level sensor is changed the parameter >Cal/velocity/channel number/h_crit< must be raised by the same amount.

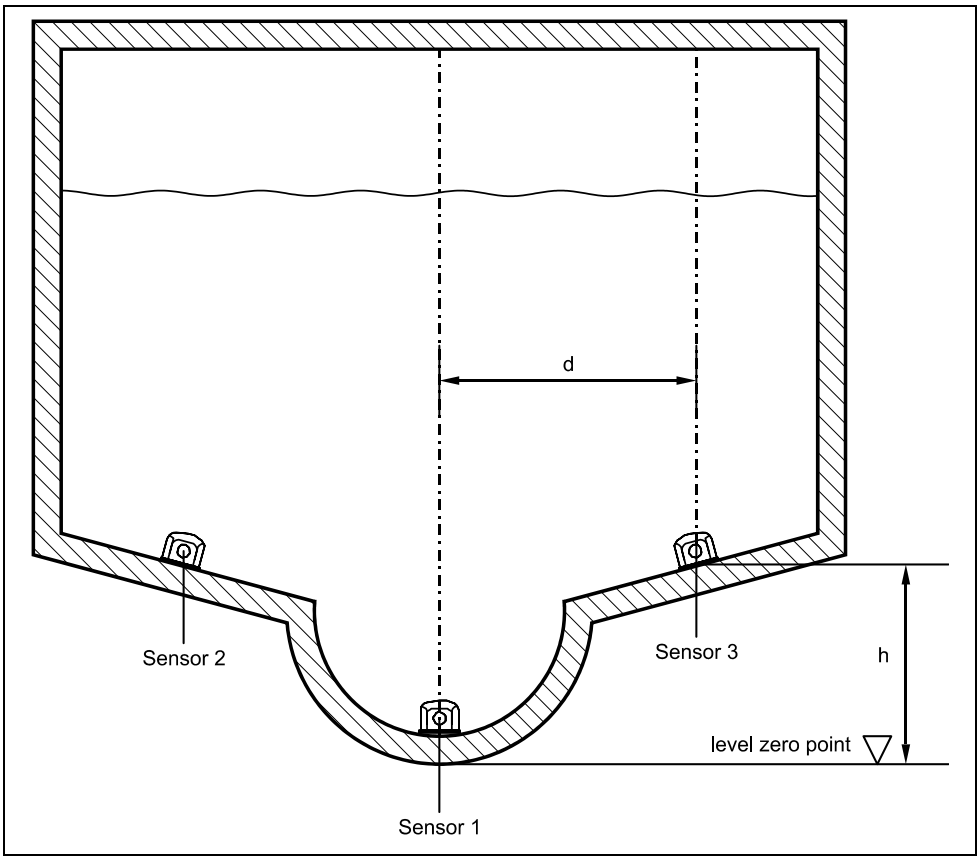


Fig. 8-33 Sensor assignment

When sensor 2 and 3 are higher than sensor 1, the height "h" under the menu point >mounting place< is entered. First it is carried out only at this height the evaluation of the velocity before any add-on connections are assessed for velocity for the overall result.

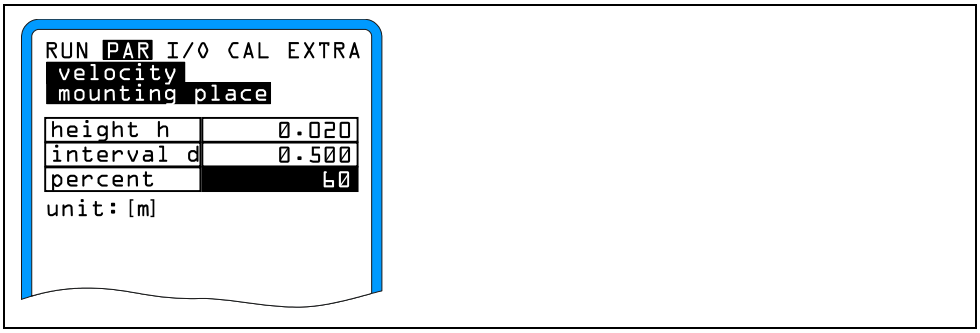


Fig. 8-34 Value assignment of single flow velocity sensors

The distance "d" is the distance to the centre line of the profile. This parameter is present without any function. With the entry „Percent" the velocity of the sensor is defined to the total result.

$$\frac{x\% + y\% + z\%}{100\%} = \frac{x\%}{\text{share x}} \text{ or } \frac{y\%}{\text{share y}} \text{ or } \frac{z\%}{\text{share z}}$$

x%, (y%), (z%) = entered percentage sensor 1, (2), (3)
share x, (y), (z) = Value share of the sensor for the total velocity

8.5.4 Parameter Menu “Analog Inputs“

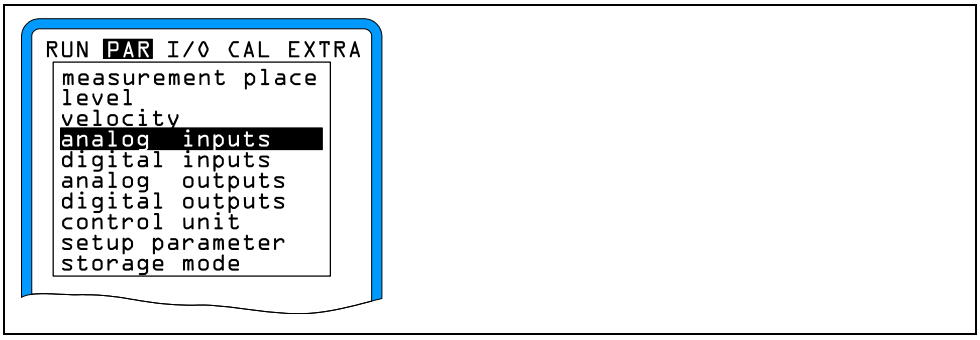


Fig. 8-35 Analog inputs - submenu

Depending on measurement transmitter type a various number of analog inputs are available. These are for transmitter Type >S1<:

- 1 analog input (galvanically isolated) for 2-wire sensors
- 1 additional analog input for the connection of an external level sensor

For transmitter Type >M0<:

- 1 analog input (galvanically isolated) for 2-wire sensors
- 4 additional analog inputs for connection of external level sensors as well as for external set points or data storage

All analog inputs can be selected and programmed in the main menu, although the Transmitter type “S1“ hardware has only 2 analog outputs available.

With transmitter type >S1< under menu point Level, an external level sensor (connection:AE1) is already active, so only analog input 2 is available for parameter setting.

Every single analog input can be programmed as function, measurement range or measurement span.
Also a linearization is possible on every input.

Channel Number The entry of analog input 1-4 is selectable. With this, additional parameters can be programmed.

Name No need to be entered. Only if analog inputs are stored on a MemoryCard, a name makes sense. This name is stored only on the storage medium.

Function With >Channel number< selected, analog input for a function gets assigned. By changing with >ALT<-Key the following various functions are selectable:

- analog input not active
- Archive value (analog input is stored [data logging function of transmitter])
- Set point value (analog input serves as external set point value for controller operation)
- Set point + Archive value (set point value + storage, analog input serves as external set point value for controller operation and is additionally stored)

Measurement span When required, alternatively the measurement range can be changed between 0-20mA and 4-20mA.

Units

This parameter is assigned for the stored name. See the following table.

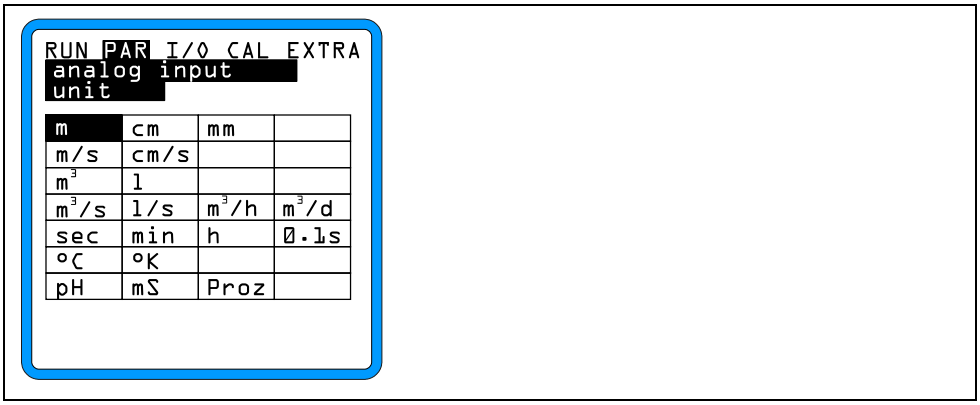


Fig. 8-36 Selection Table

Linearization

The range of the analog input is fixed here. It is additionally possible, to change the analog input for its value, by means of a max. 16 points supporting table. The parameter includes special performance by the OCM Pro. It is possible ,for example, to change and store a height signal into a quantity proportional signal, or outputting to an analog output for further processing or display.

↵ Confirm!

A list with the selected unit opens.

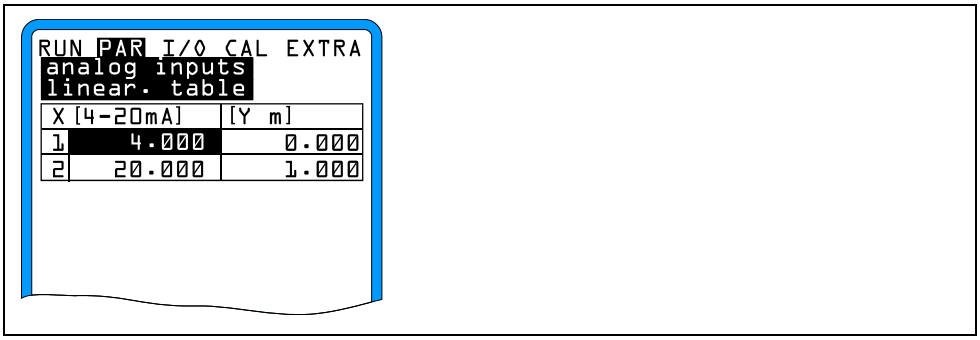


Fig. 8-37 Value Table for analog input range

In the X-column the mA-value, in the Y-column the unit system can be assigned (under "units" selected previously). For standard applications (e.g. set point or storage of a measurement value) “2” needs to be entered as a supporting value. The range of the analog input is fixed then, that means, the accompanying value for 4mA and 20mA.

Offset

Additional to the input current, a positive or negative offset can be added to the previously selected unit.

8.5.5 Parameter Menu “Digital Inputs“

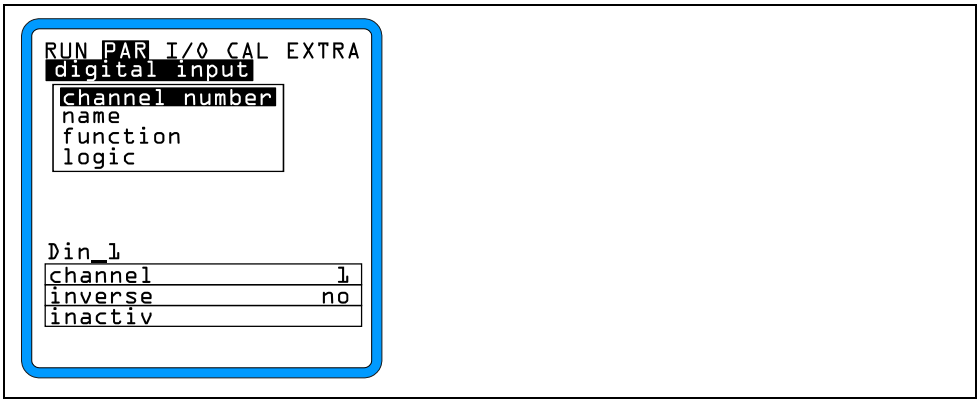


Fig. 8-38 Digital inputs - submenu

This section makes the selection and assignment of the digital input signals possible as “control open“, “control close“ as well as “torque close“. These are needed in the OCM Pro type >M0< merely for the function of standard operation. If using the transmitter without control operation, this section of parameter setting is not needed.

Channel Number The entry of digital inputs 1-4 is selectable. With this, additional parameters can be programmed.

Name Need not be entered. Only if digital inputs are stored on a MemoryCard, a name is meaningful. This name is stored only on the storage medium.

Function The digital input selected in >channel number< gets a function for the selection of control operation. Pressing the >ALT<-key enables to select various functions. Available are:

- not active
- control close (The gate end-switch for the close condition is on the selected digital input)
- control open (The gate end-switch for the open condition is on the selected digital input)
- torque (The torque-switch for the close condition is on the selected digital input)

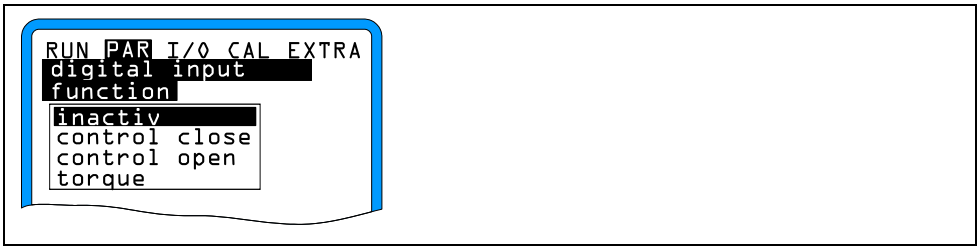


Fig. 8-39 Selecting functions for the digital inputs

Please note that the digital inputs are passive and have to be supplied with an external 24V DC!

Logic Pressing **>ALT<** switches between inverted and not inverted input. This means, that the slide valve slide valve signals as opener can be used and cable disruptions are easily recognizable.

8.5.6 Parameter Menu “Analog Outputs“

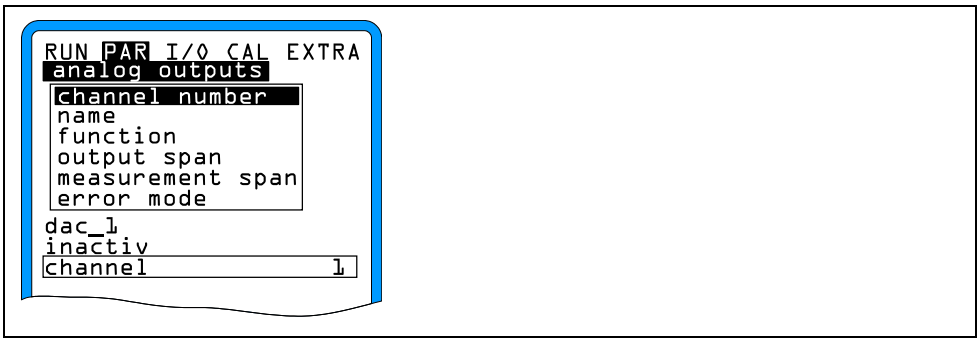


Fig. 8-40 Analog outputs - submenu

In this menu you can select the function of every individual analog output.

Basically all 4 analog outputs in this menu are selectable and programmable, although the type >S1< has only 2 analog outputs in its hardware.

Channel Number

The entry of analog outputs 1-4 is selectable. With this, additional parameters can be programmed.

Name

Needs not be entered. Only if analog outputs are stored on a MemoryCard, a name is meaningful. This name is stored only on the storage medium.

Function

The selected analog output in >channel number< gets assigned a function.

Available are:

- Inactive (analog output issues no signal)
- Flow rate output (proportional analog signal of a calculated flow quantity)
- level output (proportional analog signal of measurement level)
- velocity output (proportional analog signal of the average velocity - calculated from the single velocities)
- temperature water (analog signal of the measured water temperature)
- analog input 1 (value of analog input 1, changed with characteristic curve possible)
- analog input 2 (value of analog input 2, changed with characteristic curve possible)
- analog input 3 (value of analog input 3, changed with characteristic curve possible)
- analog input 4 (value of analog input 4, changed with characteristic curve possible)

If in menu point Velocity, 2 or 3 Sensors are selected, these are following functions to be selected from:

Function

- velocity v1 (the average velocity of 1 velocity sensor is given out as analog signal)
- velocity v2 (the average velocity of 2 velocity sensors is given out as analog signal)
- velocity v3 (the average velocity of 3 velocity sensors is given out as analog signal)

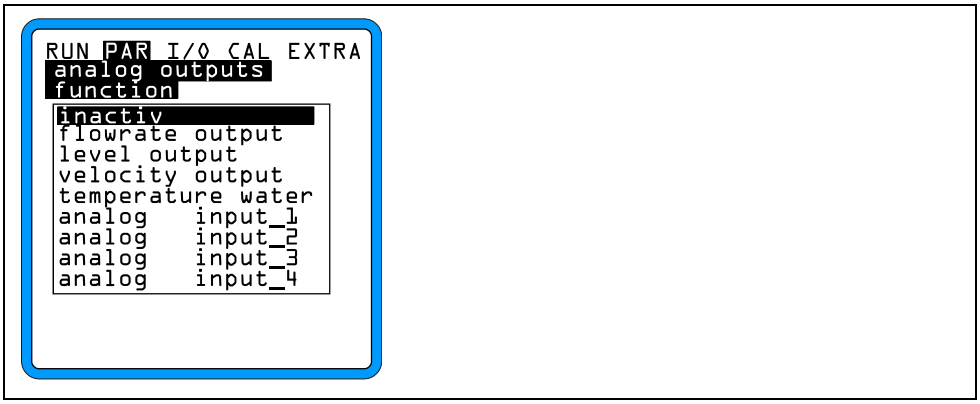


Fig. 8-41 Selecting functions for the analog outputs

Routing the analog input to the analog output can only be carried out with type >M0<! It is programmable in type >S1< but cannot be connected!

Output Span

If necessary the measurement span can be changed between 0-20mA and 4-20mA.

Measurement Span

Here you can fix the span of the analog output. Also **negative entries** are possible!

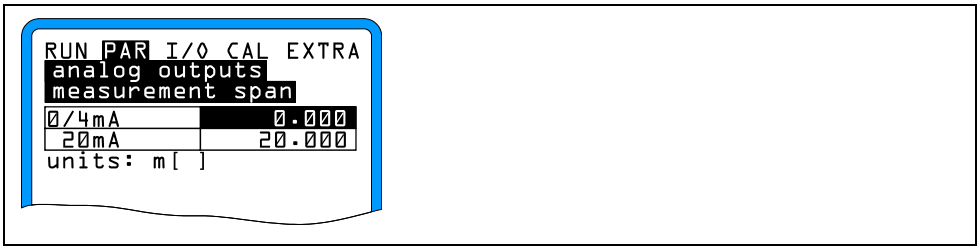


Fig. 8-42 Selection of measurement span

Example:

A measurement place is partly flowing in the reverse when full. The negative value shall be included also, but only 1 analog input is available on the protocol or process control system.
The analog output signal in this case is distributed "floating".
This means, no flow = a mA signal somewhere in the middle of the measurement span.
It would be programmed as following:

4mA = -100l/s (
20mA = 100l/s

If flow = 0 is given out in this case. At reverse flow, the analog signal decreases, at positive flow it increases.

Error Mode

The condition can be set here, which the analog output should take in case of error (e.g. cable disruption, failure DSP or others).

ALT Pressing this key selects between various functions.

Available are:
- 0 mA
- hold (holds the recent valid signal value until the error is removed or gone)
- 4 mA or
- 20,5 mA

8.5.7 Parameter Menu “Relay Outputs

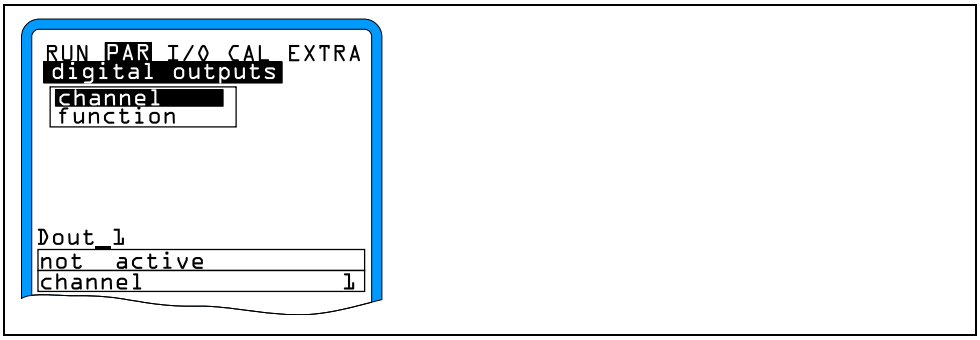


Fig. 8-43 Relay outputs - submenu

In this menu the functions as well as the accompanying parameters, limiting values, pulse interval and more can be set.

Basically all 5 relays in this menu are selectable and programmable, although the type >S1< has only 2 relays available.

If the regulator is activated (type >M0< only), relays 4 and 5 are reserved for regulator functions.

Channel Number The entry of relays 1-5 is selectable. With this, additional parameters can be programmed.

Name This menu is only visible, if the function is activated. It is the name of the selected relay. It is not necessary to give a name, because it is present inside the equipment.

Function The relay selected with the channel number gets assigned a function.
Available are:
- inactive
- boundary contact flow (relay reacts to the transgression and underrun of flow).
- boundary contact level (relay reacts to the transgression and underrun of level).
- boundary contact velocity (relay reacts to the transgression and underrun of velocity).

Each of the following functions are programmable only once

- *positive total pulse (the relay reacts with quantity proportional pulses to the flow in positive direction. The value and pulse interval is programmable)*
- *negative total pulse (the relay reacts with quantity proportional pulses to the flow in negative direction. The value and pulse interval is programmable)*
- *error messages (the relay reacts at error messages, like sensor error, cable disruption, mains power failure as well as processor failure)*

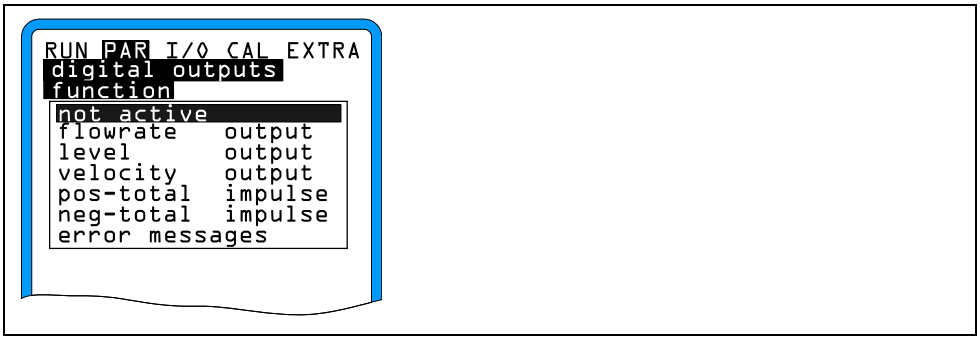


Fig. 8-44 Setting the function

Logic

With “ALT” between >contact close< and >contact open< can be switched. This means, that the slide valve signals as opened can be used and cable disruptions are easily recognizable. If >contact close< is selected, the relay reacts at arriving the entered function value, with >contact open< the relay reacts right after finish of the program (depending on the function value).

Trigger Level

This menu is only visible, when function >boundary contact< is selected.

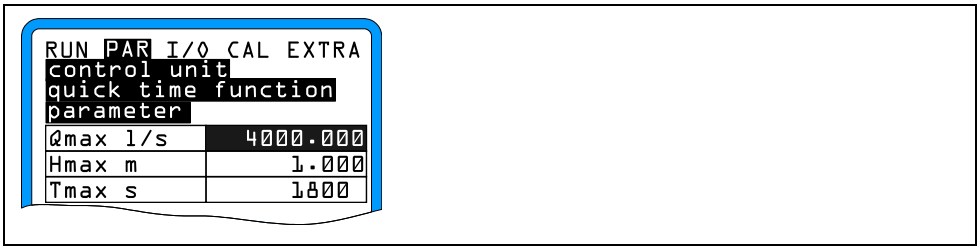


Fig. 8-45 Trigger level setting

The corresponding switching characteristics as switching threshold, depending on whether the in- switching point shall be smaller or greater than the out-switching period (ON > OFF) or In-Band-Alarm (ON < OFF).

Pulse Parameter

This menu is only visible, when >pulses< is selected.

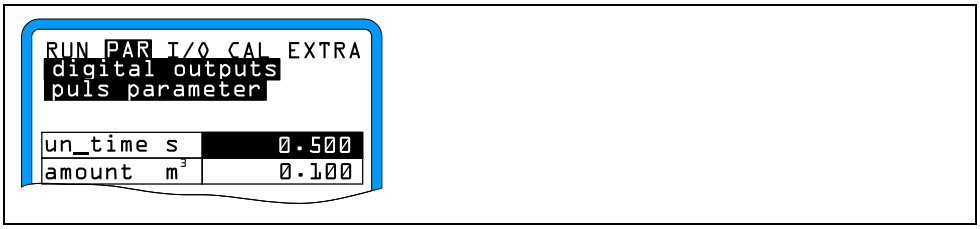


Fig. 8-46 Pulse parameter setting

The following options are available:

- Duration (the interval of the pulses between 0.01 s and 2.0 s selectable). The interval phases Pulse-Pause ratio are 1:1. A prolongation of intervals of the pulses is necessary for slow SPS-inputs or sluggish mechanical counters.
- Amount (defines the value of the pulses. The measurement quantity is integrated as long as the selected value is reached. Depending on the programmed interval, the signal and the internal value is 0, after which, the event starts again).

8.5.8 Parameter Menu “Control Unit“

Fig. 8-47 Basic setting control unit

This controller menu is for optimal proportioning of the transmitter for almost every application in the waste water industry. Slide slide valve slide valve control and torque control is possible as well as quick-close control or automatic flush function.
More information about the construction and the operation is found in chapter 6.6.

The control unit is only available for the type OCM Pro >M0<. Selection is possible in >S1< too, however there is no function!

Function: After activating this function (press >ALT<) as it is possible to access the other submenus. If it is not activated, no options are available on the display

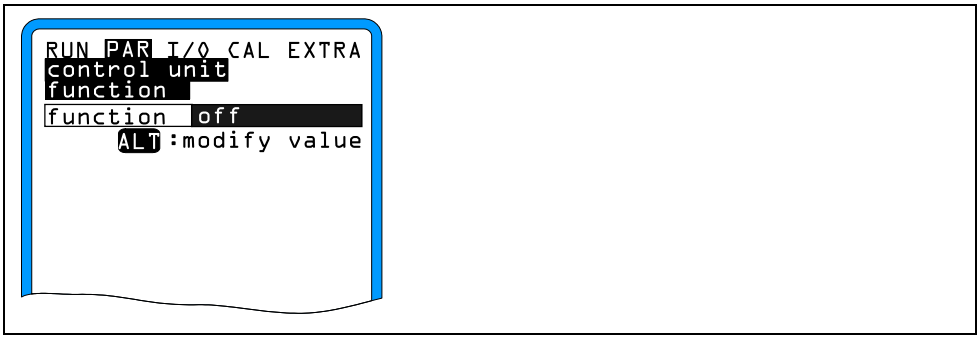


Fig. 8-48 Control unit activation

Set Point Type: It is distinguished between internal (set point is fixed in the OCM Pro) and external set point. (Set point is to be defined for an analog output from an external source e.g. possibility of the channel mains protocols).

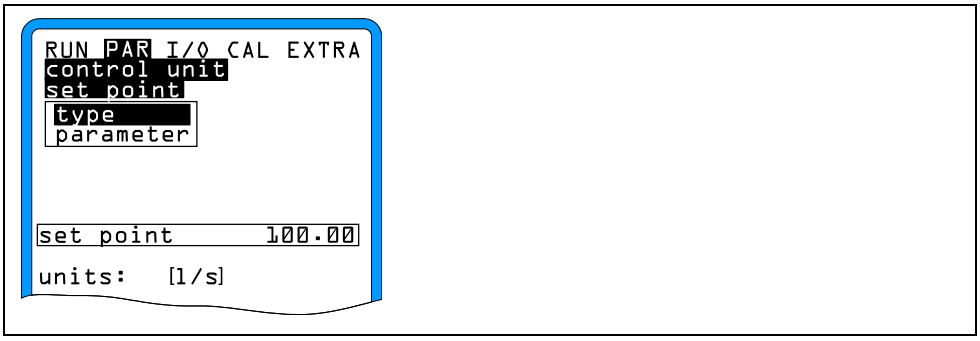


Fig. 8-49 Set point setting

Analog input 4 in principle is fixed as set point for analog input from the hardware. A change of the assignment is not possible.

Parameter:

Internal Set point:

- Specification of internal set points is entered as the displayed units.

External Set point:

- Name (Not absolutely necessary, for internal use only)
- Measurement range of external set points (it is possible to select between 0/4-20mA or 0–5/10V).
- Linearization of set point inputs (Authority number normally becomes as set >2< registered. This one gets following set point beginning (=0) for 0/4-20mA and the set point end as 20mA registered. It is also possible for linearisation of input ranges.)

Offset:

- This value will be added to the external set point. It is also possible to enter a negative value.

A cable disruption supervision is carried out if the external set point is prepared for the measurement range
4-20mA. If a cable disruption is recognized, it automatically changes to the internal set point (default 100l/s (26.4gal/s).)

Relays

The logical functions of the two output relays are changed in this menu.

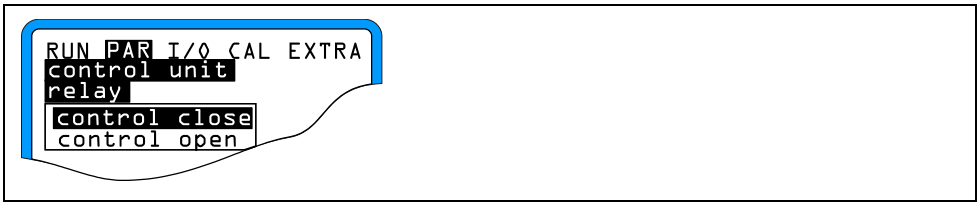


Fig. 8-50 Relay functions assignment

Slide valve CLOSED: The internal name (not necessarily required) as well as the logical function of Relay 4 (Open or Closed) can be selected.
The selection is via the >ALT<-Key .

Slide valve OPEN: The internal name (not necessarily required) as well as the logical function of Relay 5 (Open or Closed) can be selected.
The selection is via the >ALT<-Key

Relay 4 is set as >control CLOSE<, relay 5 is defined as >control OPEN<. Changing this assignment is not possible.

By selecting >Closed< the relay pulls the necessary calculated time for moving event, with >Open< the relay immediately starts after end of the parameter setting and when reaching the necessary calculated time, the moving event stops.

End Switch

In this menu the occupancy of the digital inputs are assigned to the functions as well as their logic.

The channel number is similar to the number of the digital input.
i.e. channel number 1 = digital input 1

By selecting the channel number and specification of the function, definition is possible for which end-switch is assigned on which signal input.

Name is only for internal use, and does not have to be programmed.

By changing the logic (inverse / non inverse) a supervision of cable disruption of connections is possible.

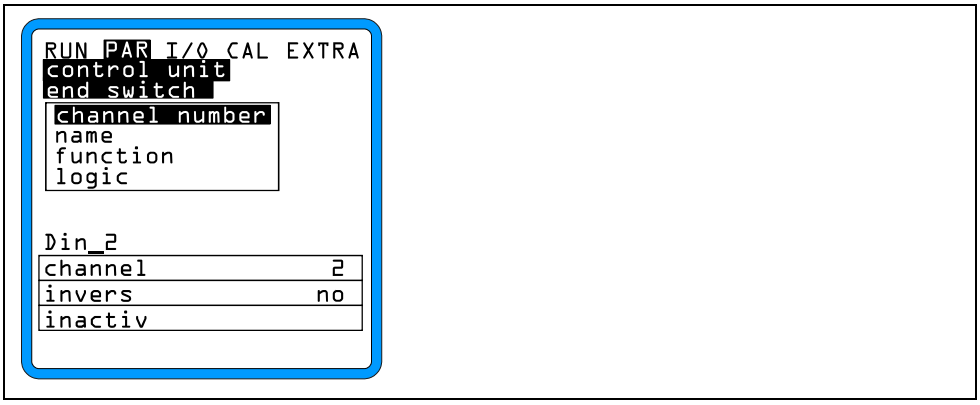


Fig. 8-51 End switch assignment

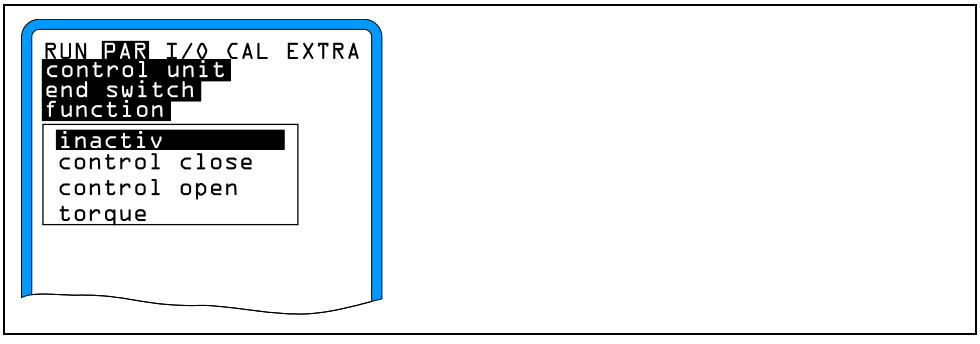


Fig. 8-52 Functions

P-Factor

The factor of proportionality states, what consequences a deviation Δ **w** from set point **w** has. The bigger the proportionality factor, the shorter the control time of the slide valve for similar regulator deviations.

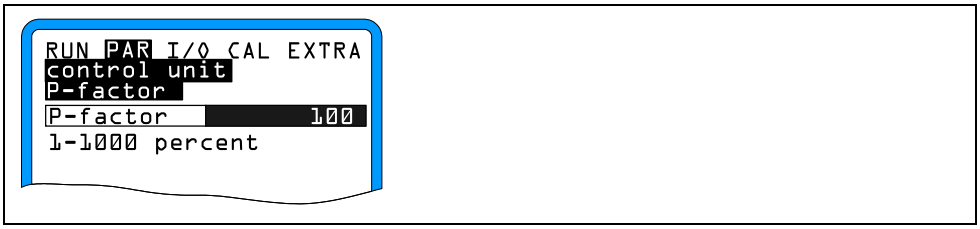


Fig. 8-53 P-Factor setting

Cycle Time

Operating interval of the control unit

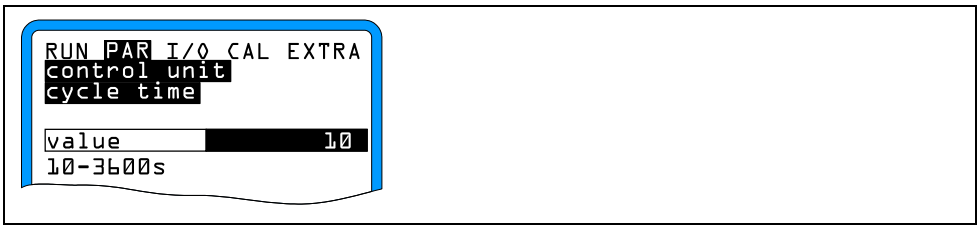


Fig. 8-54 Setting the cycle time

Long cycle time = stable regulation (however, the sluggishness of the control system increases)
Short cycle time = accelerates the control response (however results in unstable regulation – danger of regulator vibrations).
Orientation:

$$\text{cycle time} = \frac{\text{average flow velocity}}{\text{distance between control system and measurement}} \cdot 1{,}3$$

Deviation

This parameter defines the permitted set point deviation of the control system without using a regulating unit. It reduces the swinging slope of the system. Principally, the quantity measurements based on the hydraulics is the main reason. If there is no set point deviation allowed, the system tries to bring into line the actual value to compensate for the set point. This leads to a permanent movement of the drive and eventually to the mechanical failure or increased wear. Both values work in AND-function. An entry of the percentage range normally suffices. For control with an external set point (channel mains power management) and for greater control block, it is meaningful to enter an absolute value also, otherwise, for small set points, the permitted percentage deviation is so small that it sees it as an absolute value. The regulator circle tends to swing.

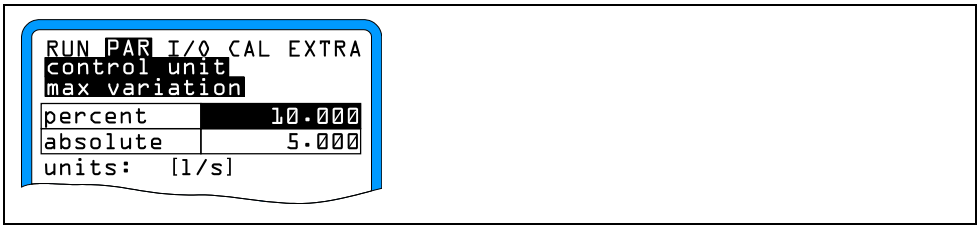


Fig. 8-55 Setting permitted deviations

Minimum Control Pulse Time

This parameter in its function is similar to the I-part of the PID-Control. It defines a long control time of the moving part, so that the calculated minimal control pulses causes mechanically another change of the moving part. This means that the minimum control pulse time shall be initial motor time + transmissions + slide valve.

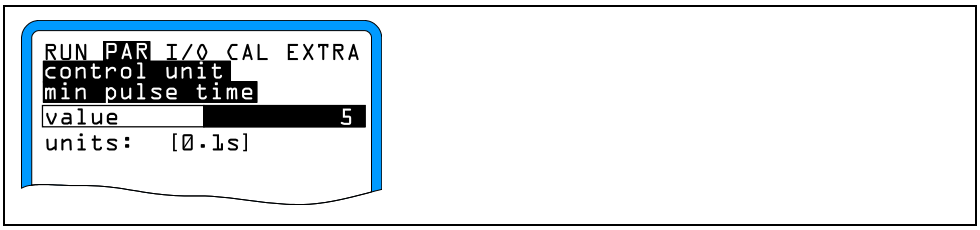


Fig. 8-56 Setting min. control pulse time

Slide valve Run Time

This parameter serves for the supervision of spindle break, slide valve plate break, transmissions defect, black-out of the moving part and additional error sources which states the fact that no moving movement is carried out although moving signals are distributed.

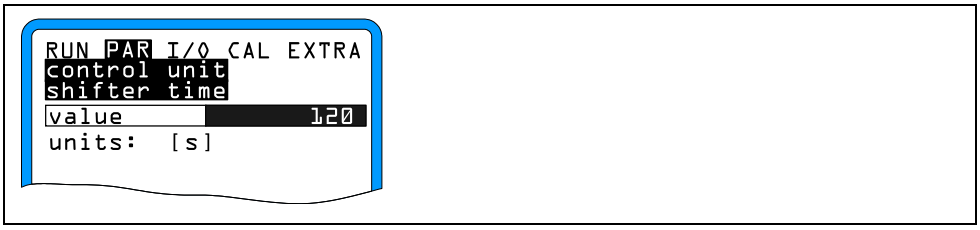


Fig. 8-57 Setting slide valve run time

If the regulation unit does not reach the close (end) switch after the shifter time, an error report is emitted.

Orientation:

slide valve running time to be adjusted = time in the permanent operation between open and closed condition of the slide valve • 1.2 .....2.0.
(the longer slide valve run time, the smaller the factor)

*The slide valve run time is similar to the P-factor and **must** be set!*

Quick Close

The quick close function is applied at large nominal width, slide valve run times and great dead times for the measurement distance. It controls the slide valve, at rain events starting suddenly independently of the calculated control time from the static condition to a drive condition. This happens during the permanent operation without run time interruption.

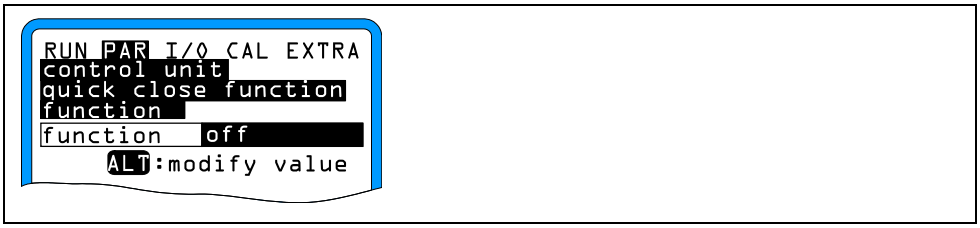


Fig. 8-58 Activating the quick close function

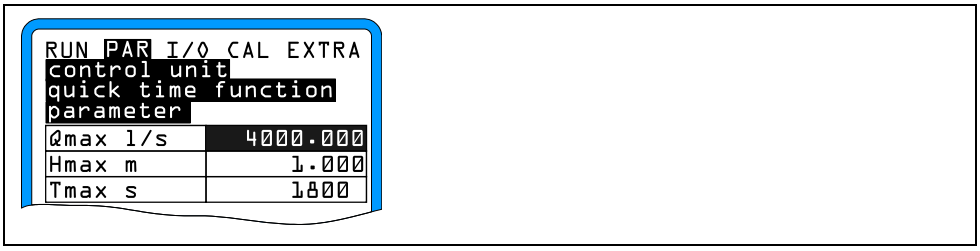


Fig. 8-59 Quick close parameters

Q_{max} and h_{max} operate as OR parameter. You have to put a higher condition, depending on application, of between 10 -50%, for the system to go from the dry weather operation to the regulator operation.
t_{max} is the time, the moving organ needs, to go from the open condition to the position in which it approximately is under normal regulator operation.

Automatic Flush Function

This function makes the execution of a flush function of the measurement channel possible (in dry weather operation) in regulator operation. For this the control unit is closed on programmable **start days** at an adjustable **start time**, to cause the medium to flush the measurement channel if it dams up again and a flushing is generated. After the control unit completely opens **the dam duration,** the duration is fixed and remains open over the time period of the programmable **flush duration**. This event is then repeated. The number of the **flushing events** is programmable from 1 to 9.

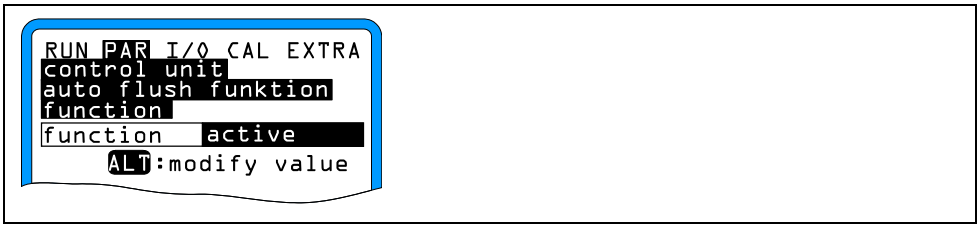


Fig. 8-60 Activating the flush function

The flush function does not work when the device is in control operation.

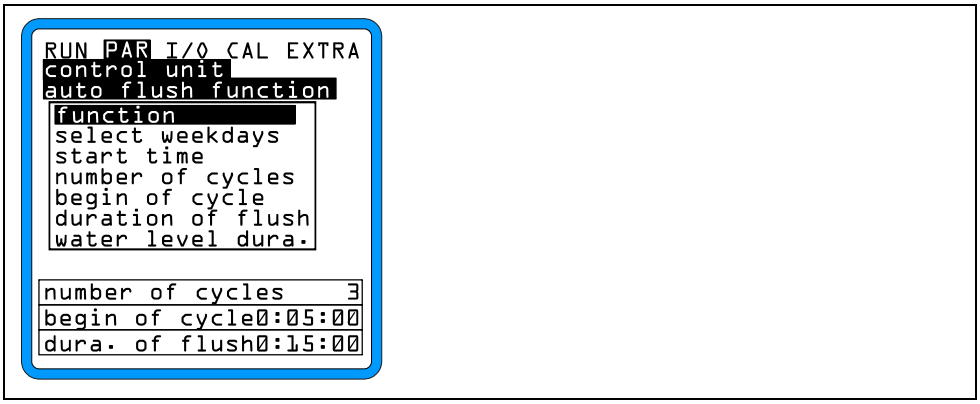


Fig. 8-61 Flush function parameters

Start Days

= the days of the weeks for the flush.

ALT Every single day is activated by means of this button.

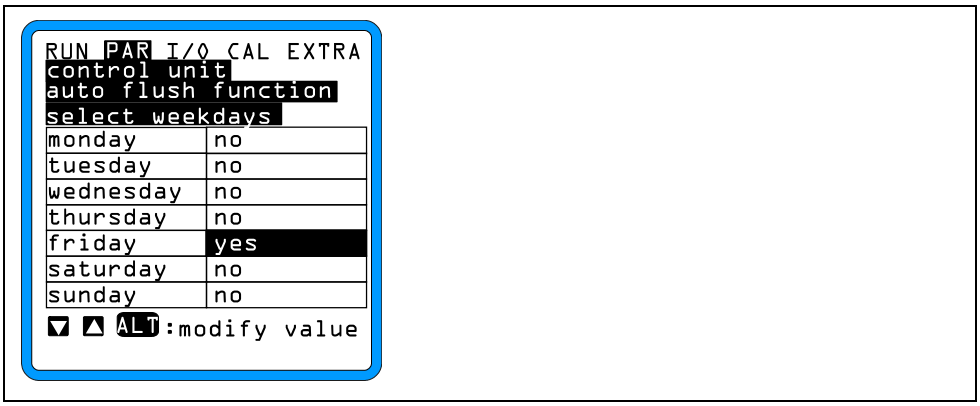


Fig. 8-62 Activating single flush events

Start Time

= the time when the flushing event shall start. The start time can be entered for any activated start day.

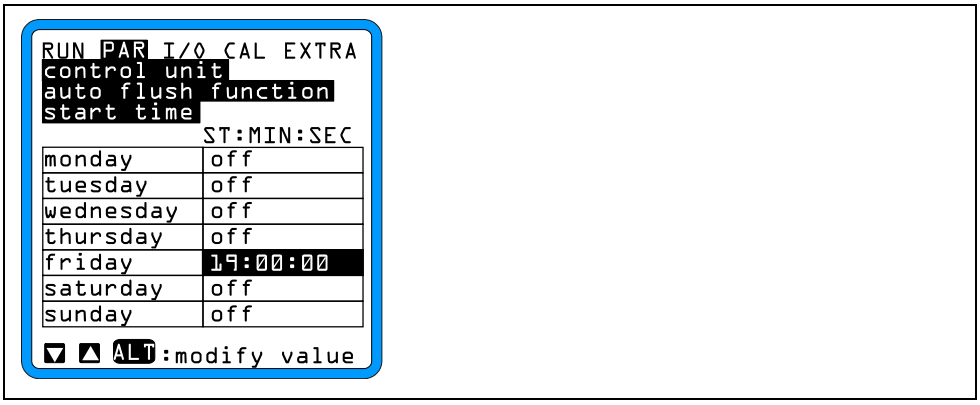


Fig. 8-63 Programming the beginning of flush time

Total Flush Events

= Defines how many times the flush shall happen. A flush event consists of one duration of flush + begin of cycle.

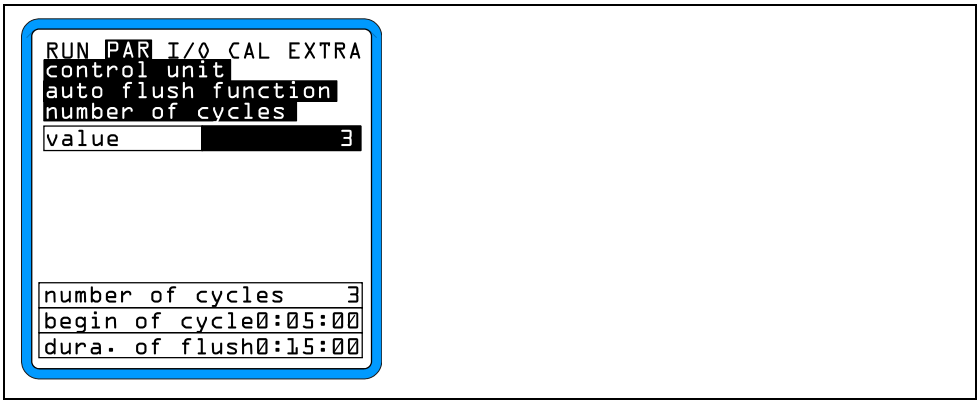


Fig. 8-64 Programming total flush events

Flush Duration = the time, when a control element independent of the initial measurement value remains in the open position.

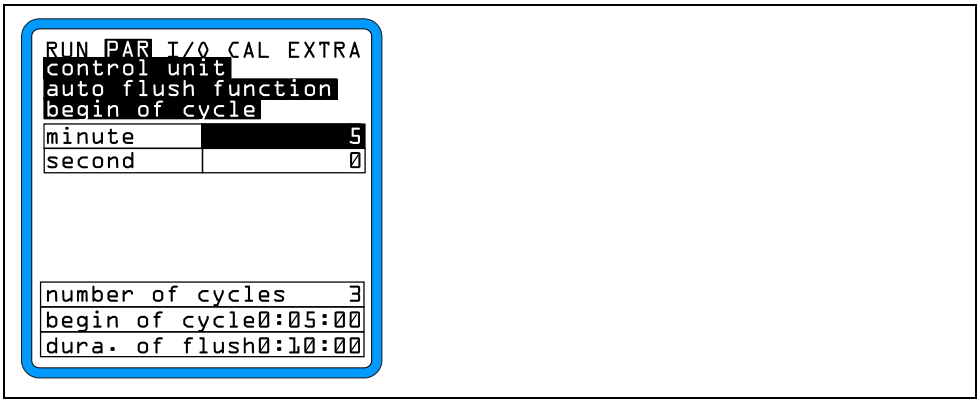


Fig. 8-65 Programming flush duration

Duration of Flush = the time, when a control element independently of the value of the measurement, remains in closed position, around the medium being flushed in the measurement channel.

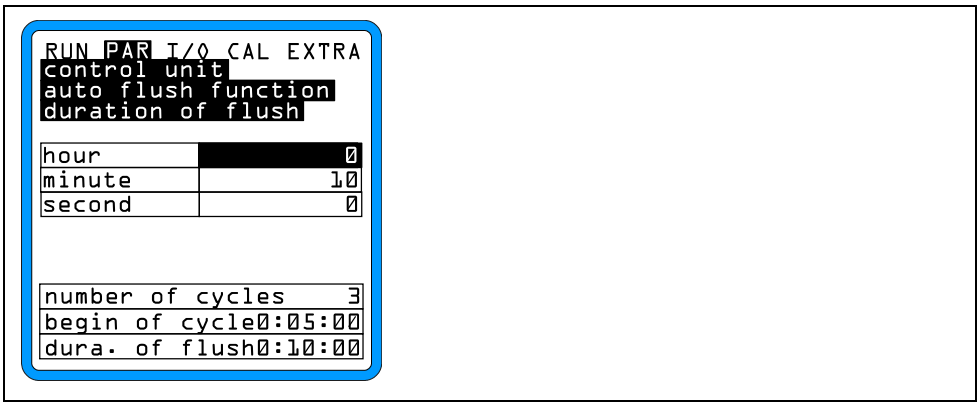
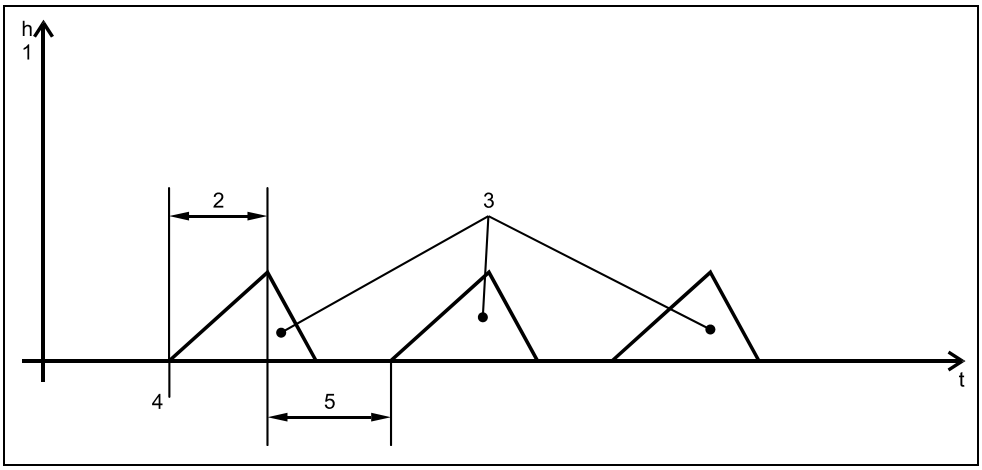


Fig. 8-66 Programming duration of flush



1 Backwater
2 Duration of flush
3 Total flush events
4 Start day, start time
5 Flush duration

Fig. 8-67 Flush process

8.5.9 Parameter Menu “Settings“

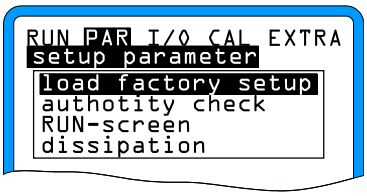


Fig. 8-68 Settings - Submenu

This menu item allows you to change or to restore some fundamental settings of the system.

System Reset

This sub-menu item allows a general reset. The selection appears as:

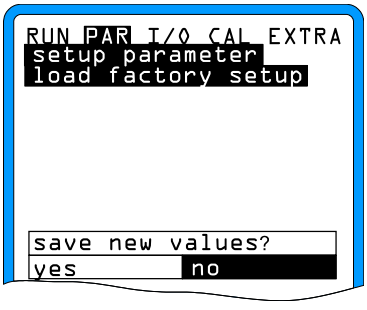


Fig. 8-69 General reset

By selecting "yes" the system is reset to original factory defaults and all the customer’s entries are reset to these parameters. (general reset of the system)

Service Code

By entering a special code number, additional changes of the system are possible. e.g. to change the one beam angle of the ultrasonic velocity sensor, transmitting ranges or special control of transmission crystals. Since these settings require extensive specialized knowledge and are not required for normal applications, they should be handled only by NIVUS personnel.

Start Screen

In this menu, the relays are freely definable under reporting texts, which appear on the lower section on the display of the OCM Pro. (see chapter 7.3 Fig. 7-2)

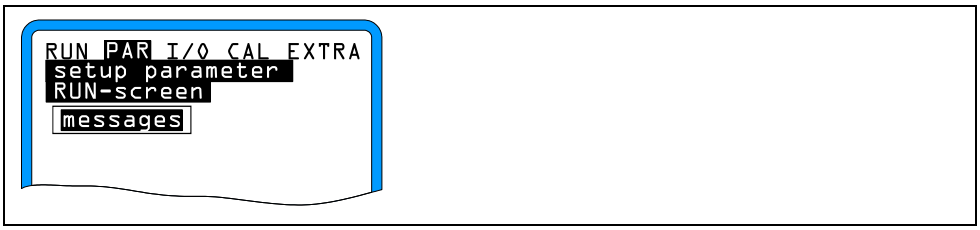


Fig. 8-70 Selection start screen

The following screen is displayed after selecting the report texts:

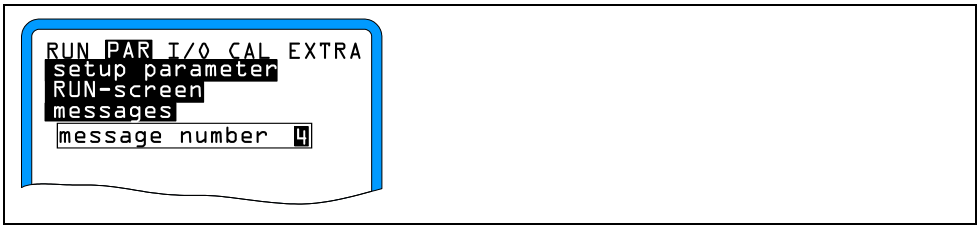


Fig. 8-71 Entry field total

Here the number 1 -5 can be displayed depending on the number of the activated relays.
After confirmation the display goes into the entry mode for the desired texts.

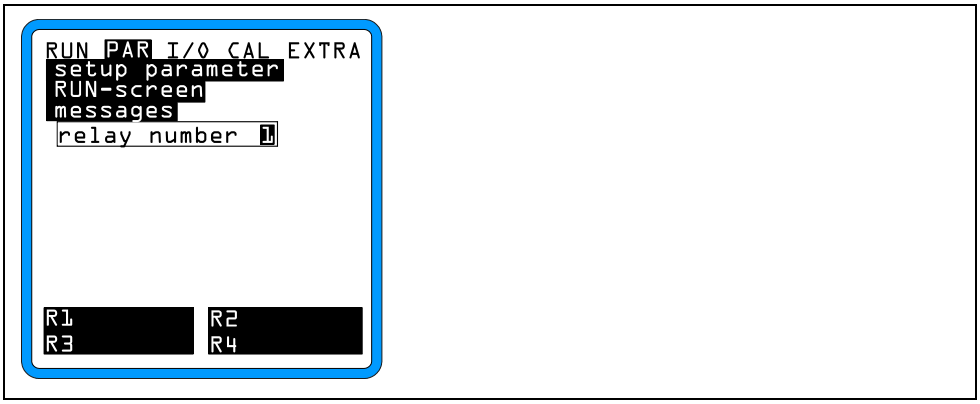


Fig. 8-72 Selection field number

The first programmed text report is assigned the selected relay number, for example: > 1 <

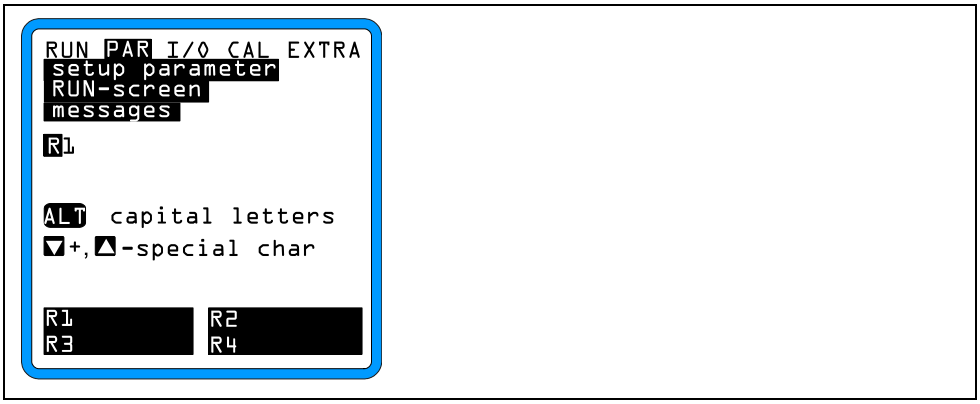


Fig. 8-73 Entering the messages

The corresponding reporting text can now (as described in the section >PAR-measurement place-measurement name<) be programmed.
Please, note that depending on the number of the desired reporting texts only a definite order number is available.

These are:

1-2 messages	21 characters
3-4 messages	10 characters
5-6 messages	6 characters
7-8 messages	4 characters

The registered text/sign appear in the operation menu in the lower two lines of the display as black dot as long as the respective relay is activated.

Dissipation

This menu item allows a change of the damping of display and analog output between 20 to 600 seconds. This measurement means, that the jump corresponds for the calculated quantity from 0 to 100% the time it needs for display and output to refresh.

Example 1:

Damping of 30 seconds, the unit needs 30 seconds to run from 0l/s to 100 l/s (26.4gal/s), for a change from 0 l/s to 100 l/s (26.4gal/s) (=100%).

Example 2:

Damping of 30 seconds, for a change from 80l/s to 100 l/s (21.1gal/s to 26.4gal/s) (=100%) – The unit needs 6 seconds to run from 80l/s to 100 l/s.

8.5.10 Parameter Menu Storage Mode“

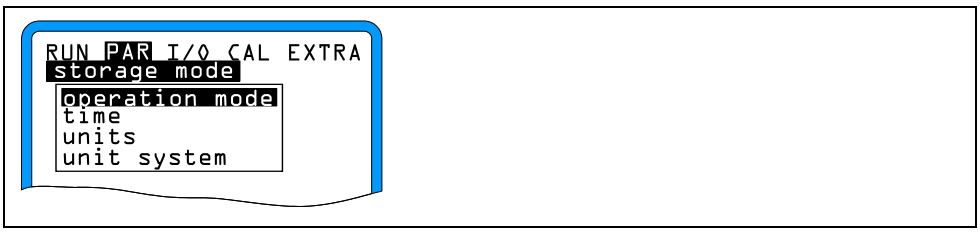


Fig. 8-74 Storage mode - submenu

To activate the menu the device must be equipped with a NIVUS CompactFlash card with a capacity of 4 .... 128 MB. If required, this card can be obtained from your NIVUS representative.

Use NIVUS CompactFlash cards only. Other manufacturer's cards may lead to data loss or measurement failure (permanent transmitter reset).

Please, put the card into the labeled slot (>MemoryCard<) on the front plate of the unit.

Fig. 8-75 MemoryCard slot

The OCM saves the measured data temporarily only to one full hour, due to technical restrictions for the number of possible memory cycles of approx. 100,000.This cycle is default by the internal system time.
(exception: at a very high data density and approx. 3000 – 4000 Byte of data coming up the data are written on the card too)

The storage is carried out in ASCII format. After this, every storage day of 24.00 hours a new data file is generated.

Example

The name for a data file from Tuesday, 21st October 2003 denominated as:

2003	43	02 .txt
year	week no.	weekday

The weekday is numbered from Monday =01 to Sunday =07.

The file extension >.txt< is only produced after 24:00 hours, before the change of day, the file extension is >.tmp<

The files can be exported and re-analysed using conventional data processing programs with ASCII interface, e.g. EXCEL.

Do not initialize the storage cards on PC. The OCM Pro normally is not able to recognize this format and therefore does not accept the card.

The data storage is carried out always as an average value via the set storage cycle, not as a temporary value at the moment of storage.

Operation Mode

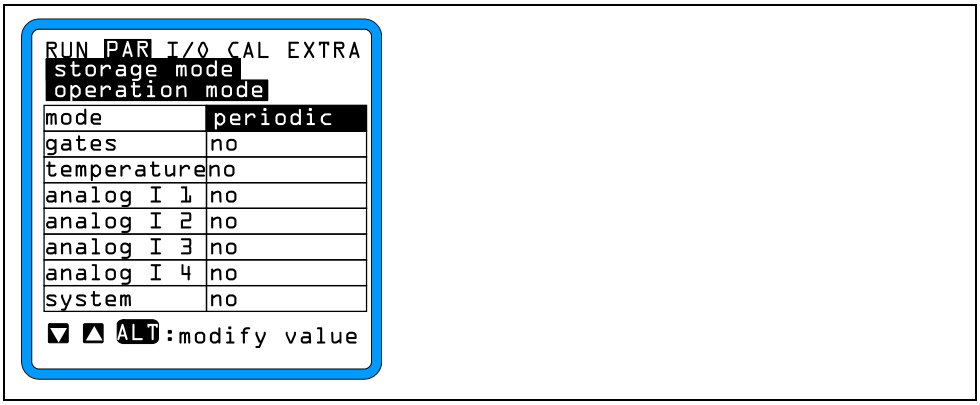


Fig. 8-76 Selection table storage options

Mode

ALT Pressing this key selects between:

off = no storage and
periodic = periodical storage of level/height, flow velocity and volume

Gates

ALT Pressing this key toggles between:

NO = no additional storage of single flow velocities and
YES = additional storage of velocity gates
The system storage is activated in addition to the gates storage, so all 16 gates are stored. If the system storage is not activated, the OCM Pro calculates the velocity distribution from the gates. This curve will be split into 10 similar large sections and in each window the calculated average velocity recorded. These values are stored as 10 mathematical (theoretical) gates.

Temperature

ALT Pressing this key toggles between:

NO = no additional storage of medium temperature and
YES = additional storage of medium temperature

Analog inputs 1 to 4

This setting makes sense only for type OCP/M0 measurement transmitter since only this unit has additional analog inputs.

ALT Pressing this key toggles between:

NO = no storage of respective analog input and
YES = storage of respective analog input

System

ALT Pressing this key toggles between:

NO = no storage of system parameters and

YES = storage of system parameters

Additionally, by activating these parameters the 16 measured gates can be directly stored.
When not activated the calculated 10 gates are recorded. (see also >Gates<)

Time

In this parameter, the storage cycle is selected. It is possible to select between 60 seconds and 1 hour. Only those results can be entered, that are in exact multiples of 1 hour. These are 60 secs.; 120 secs.; 180 secs.; 300 secs.; 600 secs.; 900 secs.; 1800 secs. or 3600 secs.

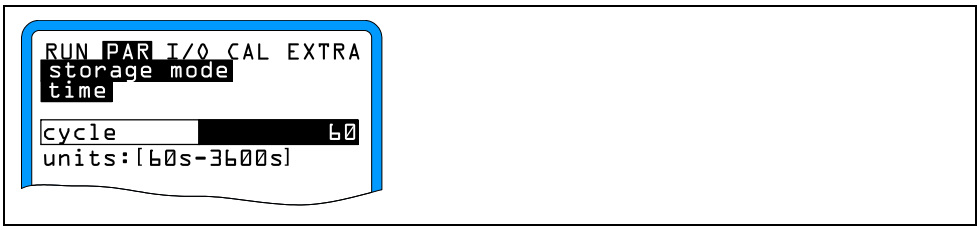


Fig. 8-77 Entering the storage cycle

Units

Flow, height (depth) and velocity are adjustable for the desired units of the logging in this menu for the 3 main memory parameters. Various choices are available depending on unit system selected. (see also >System Units<).

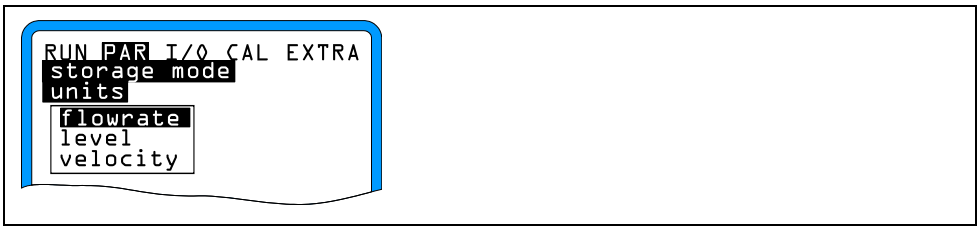


Fig. 8-78 Selection units

Unit System

Select between the metric system (e.g. litre, cubic meters, cm/s etc.), in Imperial System (ft, in, gal/s, etc.) or in American System (fps, mgd etc.).

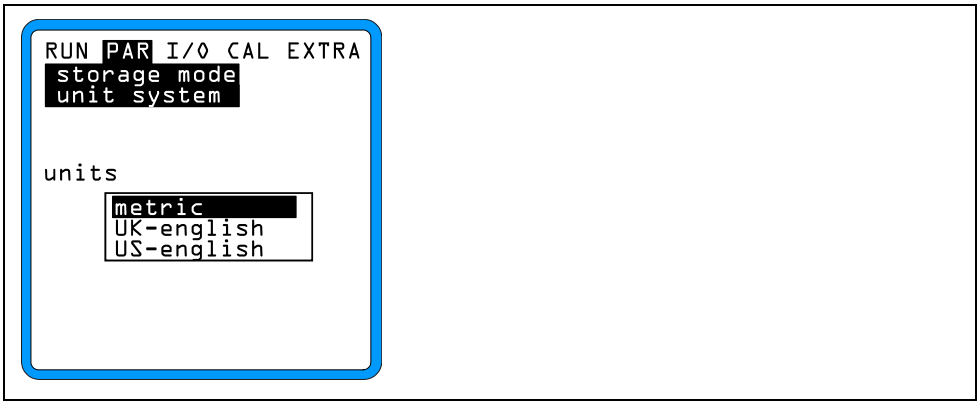


Fig. 8-79 Selection unit system

Gate Position Enables change of the storage of the mathematically created gate positions (see also >System<). Programming only makes sense if the system is not activated. This parameter is designated for scientific examinations and will not be needed in daily use.

8.6 Signal Input-/Output Menu (I/O)

This menu contains several shared menus for outputs for check and verification of sensors as well as control signal inputs and outputs. It indicates most results (current of inputs and outputs, relays status, echo profiles, single velocities, cable breaks etc.), however, no influencing of the signals or conditions are permitted (offset, comparison, simulation or similar).
It serves therefore as a matter of priority for the verification of the parameter setting as well as for the fault diagnosis.

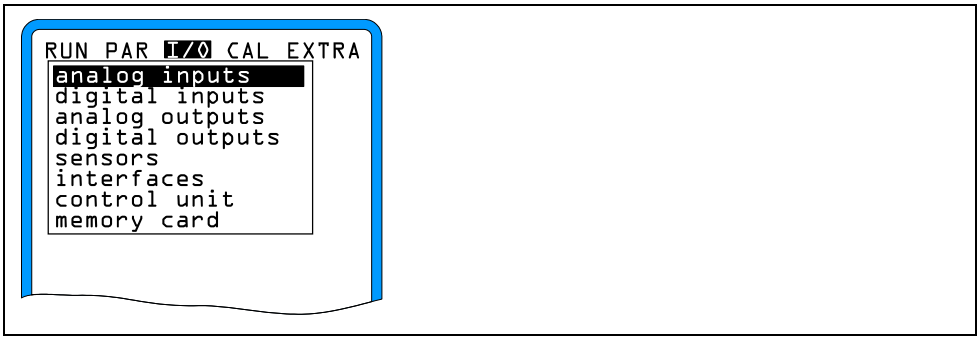


Fig. 8-80 I/O submenu

The menu indicates all theoretical inputs and outputs possible, even if (as in measurement transmitter type S1) none of them is available.

8.6.1 I/O Menu “Analog Inputs”

In this menu, input terminals of the measurement transmitter accepts the analog input results. A consideration is an initial (results in [mA/V]) or later (calculated results) are possible in the OCM Pro and therefore the possibility of linearization of the analog inputs.

Fig. 8-81 Selecting values

In general, it is used for control of initial input results in the display > value in [mA/V] <. The following appears:

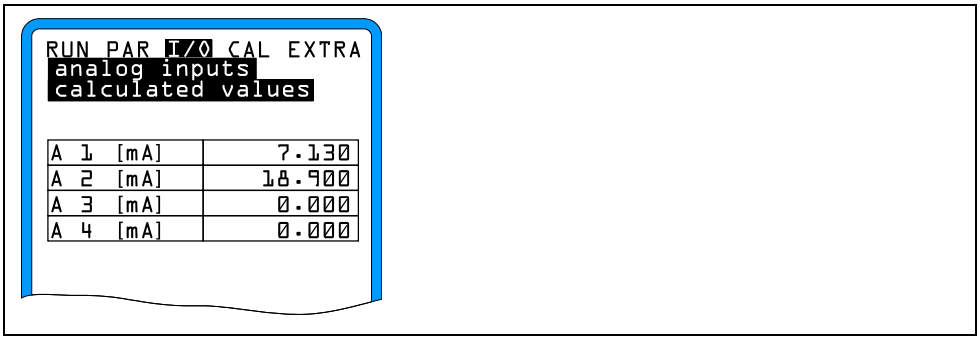


Fig. 8-82 Display of analog values

If >calculated values< is used for displaying without feeding a signal (>4mA), the following display appears:

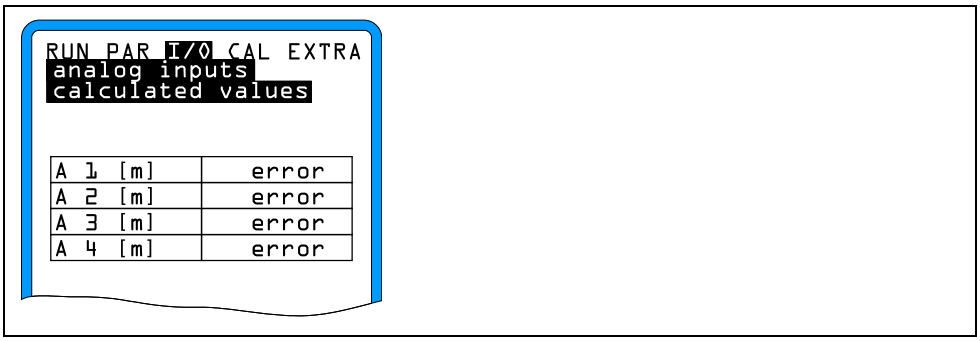


Fig. 8-83 Error message

8.6.2 I/O Menu “Digital Inputs”

At the input-clamps of the transmitter, the incoming input values can be displayed. It is logically separated between OFF or ON.

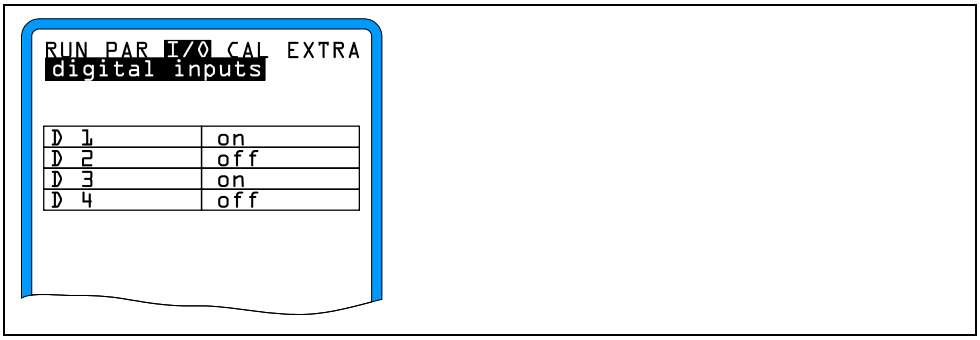


Fig. 8-84 Display of digital values

8.6.3 I/O Menu “Analog Outputs”

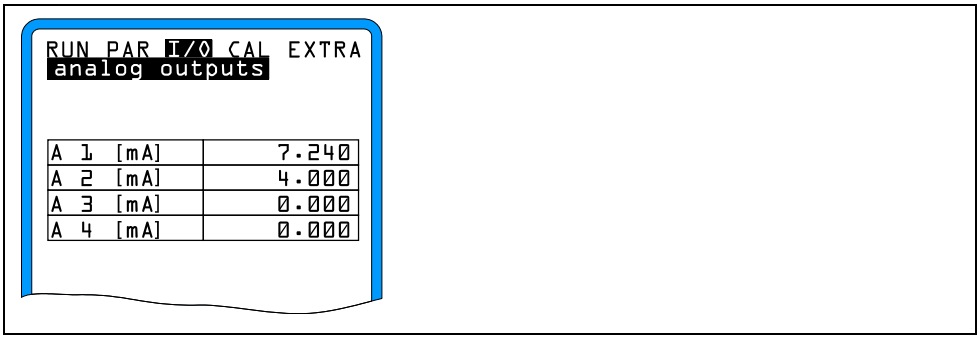


Fig. 8-85 Display of analog values

Values, which have to be displayed as mA signals are calculated in this menu. Please note that in type >S1< 4 analog outputs have to be set in parameter, but only analog output 1 and 2 can be given out.

Not the real values of the output terminals can be seen, only the signals.

In this menu you cannot notice any defects on the output transmitter or missing hardware.

8.6.4 I/O Menu “Digital Outputs”

This submenu calculates the conditions, which have to be output on the relays. It is logically separated between OFF or ON.

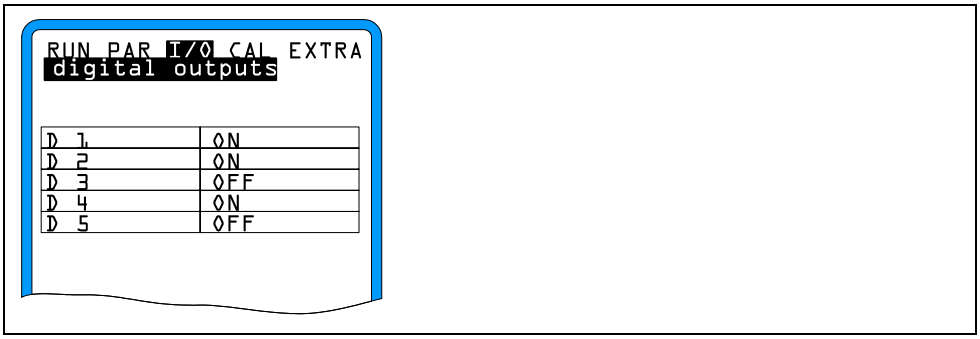


Fig. 8-86 Display of digital values

Not the real values of the output clamps can be seen, only the signals.

In this menu you cannot notice any defects on the output transmitter or missing hardware.

8.6.5 I/O Menu “Sensors”

In the submenus of this menu, you can choose the sensor and see the most important sensor conditions. They indicate the quality of the measurement place, cable layout, echo signal quality and broader parameters.
When using 2 or 3 velocity sensors, the channel number of the sensor can be selected.
Depending on the sensor technology (height (depth) measurement from the bottom up or external sensor) 2 different menus appear:

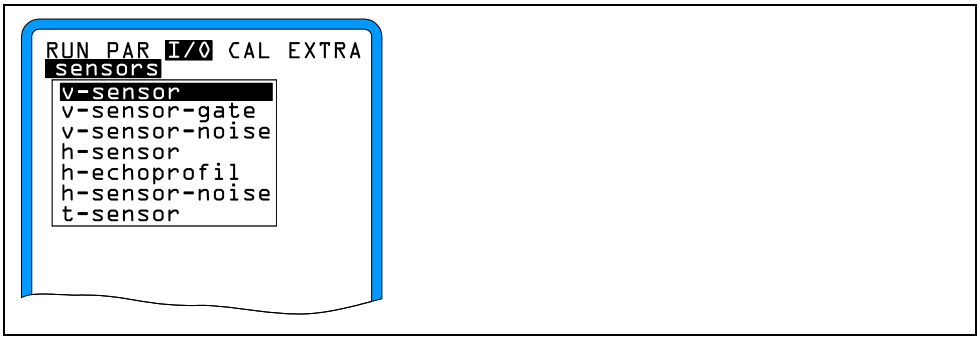


Fig. 8-87 Selection menu with submerged ultrasonic sensor from bottom up

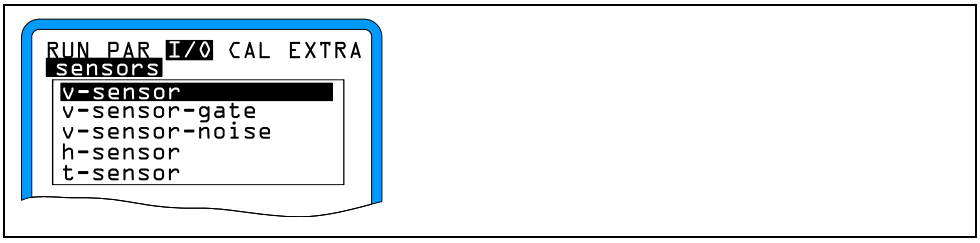


Fig. 8-88 Selection menu without submerged ultrasonic sensor from bottom up

The only difference is, the external level measurement device cannot measure the echo and the cable noise.

V-Sensor

When entered, there appears a 2-column table with all measured single velocities and the necessary levels of scan windows.

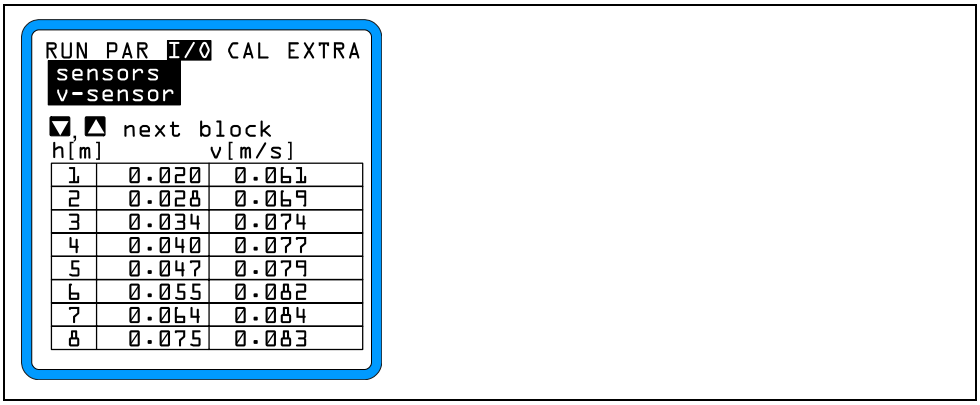


Fig. 8-89 Display of measured single velocities

▲+▼ Pressing these buttons, you can change between scan window 1-8 as well as 9-16.

If ------ is on the display it means, no velocity could be measured in this scan window (gates). This could be because of very clear medium in this area or a water whirl. This effect also appears, if the level is lower than 35cm. In this case, the OCM Pro reduces the gates automatically. (It is physical unnecessary to use a high number of gate in low level conditions)
Failures of single or few gates do not have any effect on the measurement result. For more than 50% failure it is necessary to search for the cause of the failure. (Exception: low levels). For fault inquiry NIVUS should be contacted.

V-Sensor Gate

This menu is predominantly used by NIVUS personnel. It allows to select single gates as well as the consideration of signal evaluation in this gate.

Fig. 8-90 Selection measurement gate

After selecting the Gate number 01 – 16 a diagram appears, which represents the cyclical measured velocities graphically in singles lines. Extremely short, non-changing graphics indicate unascertainable velocities in this gate.
Single negative runways are causing correlation faults and do not have any meaning.
Strongly fluctuating signals indicate unfavourable hydraulic conditions or vibration of the sensor.

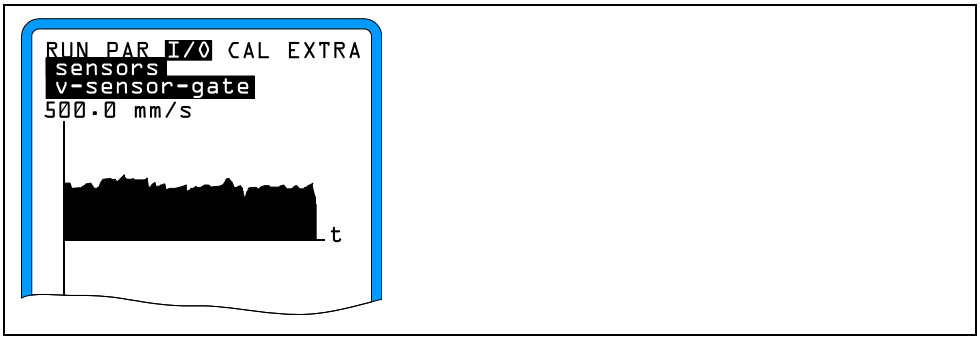


Fig. 8-91 Display of Received Reflection Signals

Gate 1 and 16 are subject to difficult hydraulic conditions (because of their spatial assignment – direct at the sensor or direct under the water surface with wave influence). Therefore the signals in these two gates are frequently of bad quality. In these 2 gates it is not of any importance.

V-Sensor Noise

The display allows the judgment about signal and cable quality. The results should be within the following ranges:

type. Signal: 0

max. Signal: < 32

type. Cable: 50 – 65

max. Cable: < 90

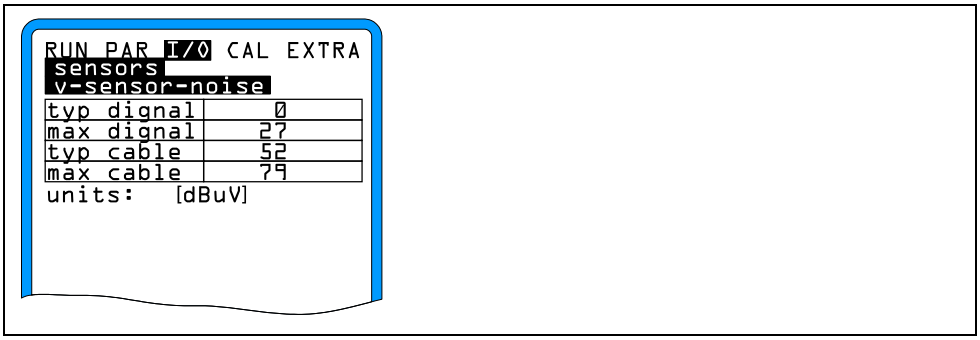


Fig. 8-92 Display of signal levels

H-Sensor

When using the submerged level sensor, the depth and its signal quality is displayed.

When using an external level measurement, under the menu point only the input signal (mA) of the sensors can be observed.

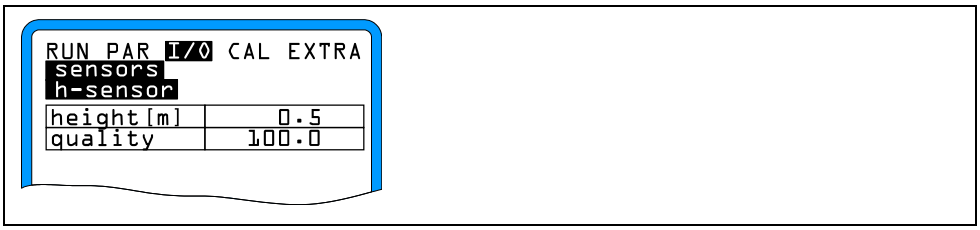


Fig. 8-93 Display signal quality height (depth) measurement

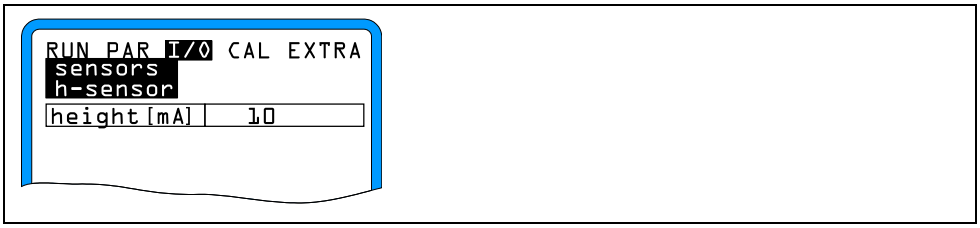


Fig. 8-94 Display h-sensor external height (depth)

The current height (depth) measured as well as the signal quality of the received echo signal are displayed.
The signal quality always should lie in the area between 90 - 100 %. If the quality is less than 50%, then the height (depth) measurement is judged incorrectly and set to 0.

H-Echo Profile (only active with height (depth) measurement from bottom up)

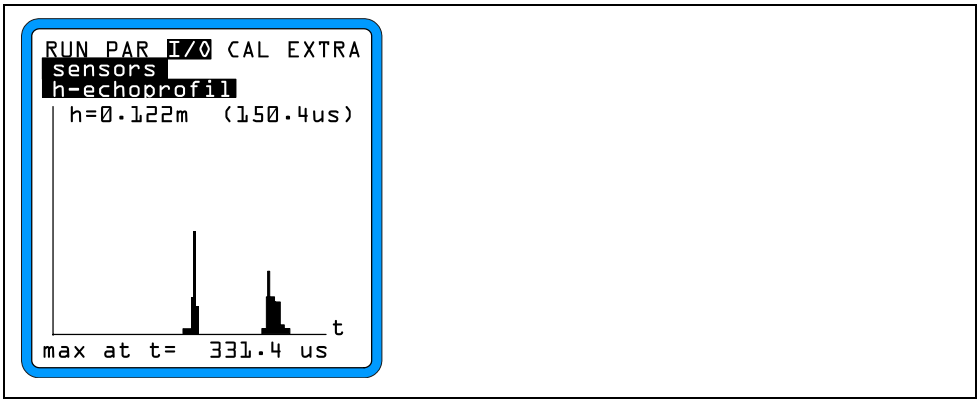


Fig. 8-95 Display echo profile level measurement

This graphic allows to make a judgment of the echo signal in the measured acoustic path by service personnel. In the ideal case, the first peak (reflection at the boundary layer water-air) is very tight, steep and high, all other peaks (double- and multiple reflections, caused by the medium between boundary layer water/air as well as water/bottom to and from traveling echo signals) are smaller and broad.

H-Sensor Noise (only active with height (depth) measurement from bottom up)

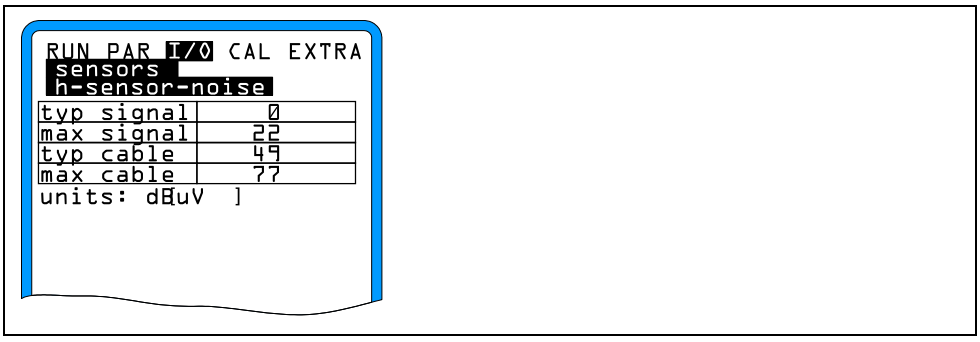


Fig. 8-96 Display of signal levels

The display allows for the judgment about signal and cable quality. The results should normally be within the following ranges:

type. Signal: 0
max. Signal: < 30
type. Cable: 50 - 65
max. Cable: < 90

T-Sensor

The measured water and air temperature appears on the display (only possible, when the OCM Pro is connected to the external air ultrasonic sensor). Incorrect results indicate cable disruption, short-circuit or improper clamp connections.

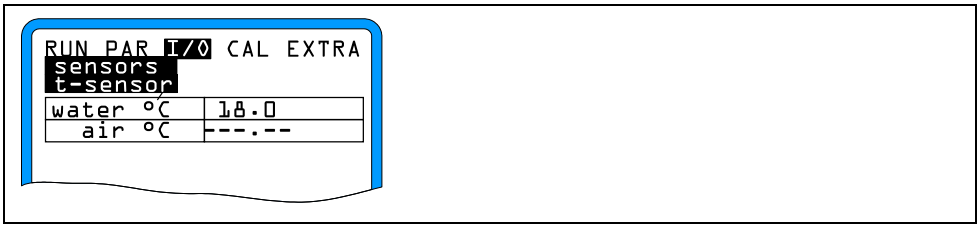


Fig. 8-97 Display of temperatures

8.6.6 I/O Menu “Interfaces”

This menu contains the transmission rates of the internal interfaces. It has no significance for the user or has no functions and is used only for service purposes.

8.6.7 I/O Menu “Control Unit”

This menu can only be used in active control unit. Otherwise it is not selectable. When control unit is active, the following submenu appears:

Fig. 8-98 Selecting control unit information

Info Screen

These menu shows all signals (end switch) and adjusted values (proportionality factor, slide slide valver run time, deviation etc.), which are required for regulator operation. As well the signal time (move- and switch time) issued are displayed.

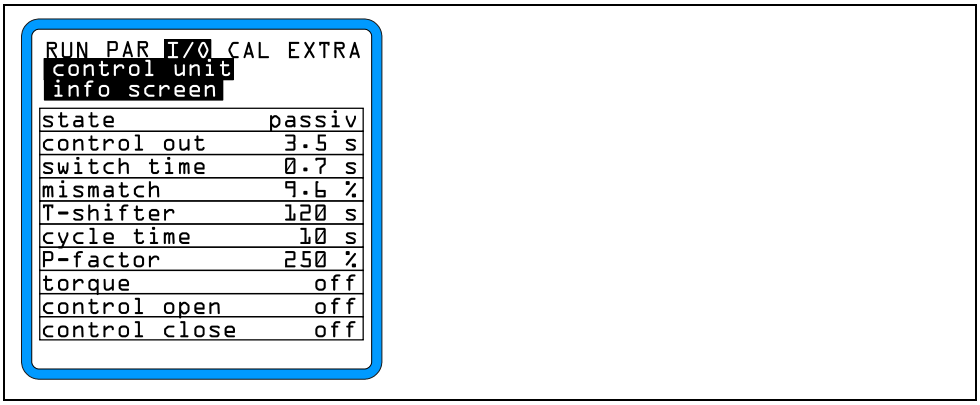


Fig. 8-99 Overview of the control unit processes

Manual Operation

The slide slide valver can be manually opened and closed for test purposes.

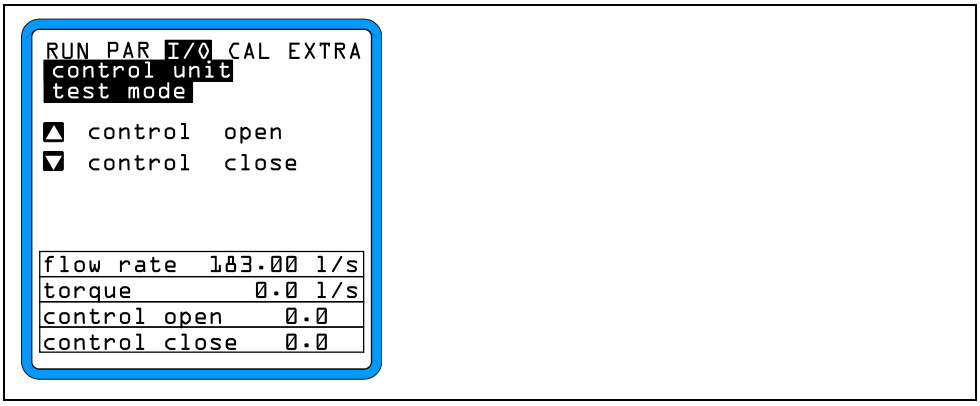


Fig. 8-100 Control menu for manual operation

8.6.8 I/O Menu “MemoryCard”

This menu contains information about memory card storage capacity and the remaining storage time.

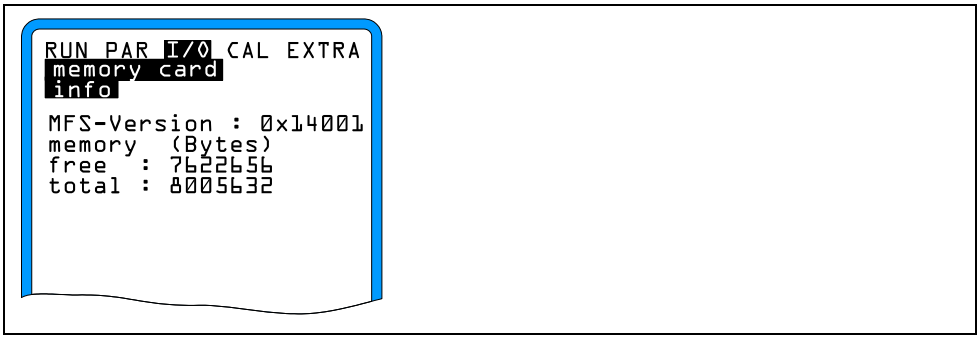


Fig. 8-101 Memory Card info

The display is only available with a memory card plugged in. For the indication of the remaining time and capacity , the card must be at least in the OCM Pro for 1 hour.
This menu is used for exchanging memory cards.

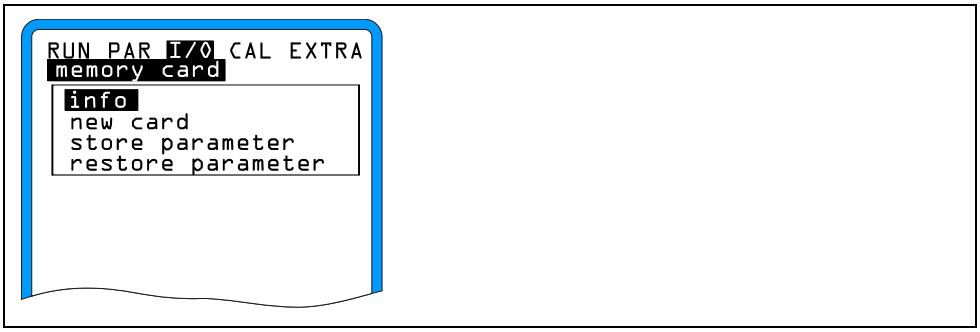


Fig. 8-102 Memory Card exchange

A confirmation of the menu point “remove card” asks for the removal of the memory card. Following, it requires a new reading of the selected card.

Fig. 8-103 Request for card exchange

The query is then carried out >Delete Storage <. With this, all the data memory in the OCM Pro is cleared.

The data memory shouldn't be deleted in the normal case, since this may lead to data loss. .

After this the query appears “Card Delete“. With this, all of the data on the card will be deleted and the card will be reformatted.

The card can be changed at any time. Exception - >Memory Card active< is indicated the display (every full hour for approx. 1 second).

The programming can additionally be performed on the OCM Pro from this menu.

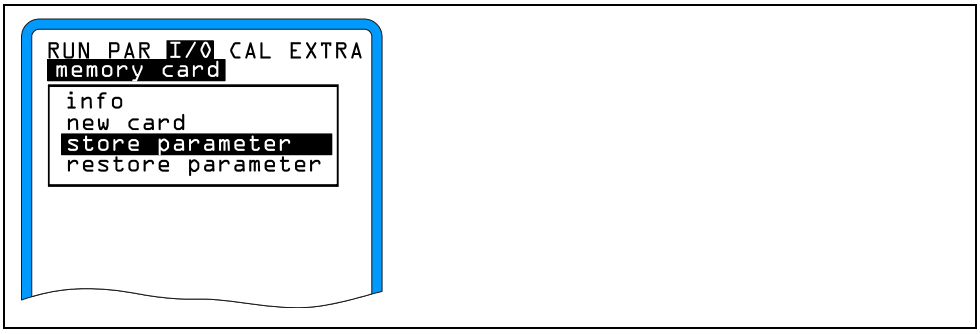


Fig. 8-104 Save or load parameters

With the menu point “Parameter save“ the Parameters from the storage card will be read. This will take approx. 30 sec. The progress over the period is indicated on the screen and the end is indicated with an >OK< and following re-entry on the Memory-Card menu.

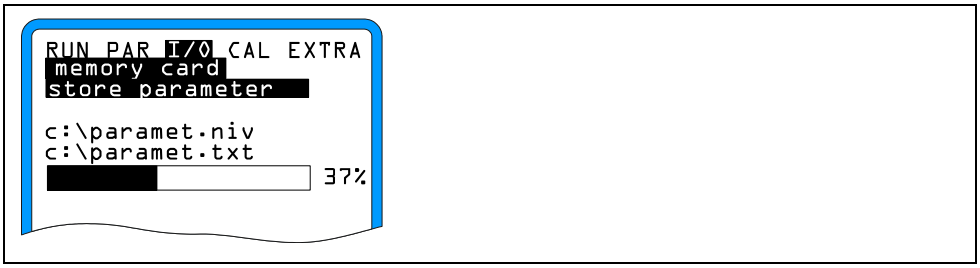


Fig. 8-105 Saving parameters on MemoryCard

In the menu point “Parameter load“ first all of the available programming files are reported on the display. After selecting the file, it will be transferred to the OCM Pro.
The required file is called “PARAMET.NIV“.

save = OCM Pro -> card
load = card -> OCM Pro

8.7 Calibration Menu (CAL)

The automatic calibration of the velocity can be activated/adjusted in this menu. Only use the calibration, if apart from the normal condition, the flow is at its lowest or, where there will be backwater!
The principle of the recording is based on this, that the level in the channels lowers such that no velocity can be recorded anymore. The height (depth) stays accurate (e.g. by means of external level unit). No velocity is measured now, the OCM Pro looks at the internal Q/h-value table with the last measured velocity value and the measured height (depth). For this the exponent of the channel has influence on this curve. For the measured flow level, the velocity is assumed for the calculation from this value table, even if the velocity cannot be measured any more.

Based on hydraulic conditions, the error in this measurement function is fundamentally greater than when the measurement is by means of velocity and level.

The function is only suitable in the minimum quantity range for backwater and deposit free channels – it should not be used otherwise!

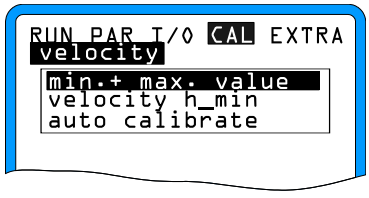


Fig. 8-106 Calibration - Submenu

min. + max. Value: Defines the measurement range of velocity which the OCM Pro evaluates.

The minimum value should be entered for results of 0 only if there exists the possibility of negative flow. In case of negative flow the value becomes “0“, and so isn't measured.

Velocity h_min: In the table displayed, you see the corresponding values (during the standard operation in automatic mode – measured level and necessary velocity), or these values can be entered here.
Depending on the chosen setting in the auto calibration menu, the registered values are checked at the next measurement event and corrected if necessary (Automatic system YES), or these results are fixed (Automatic system NO).

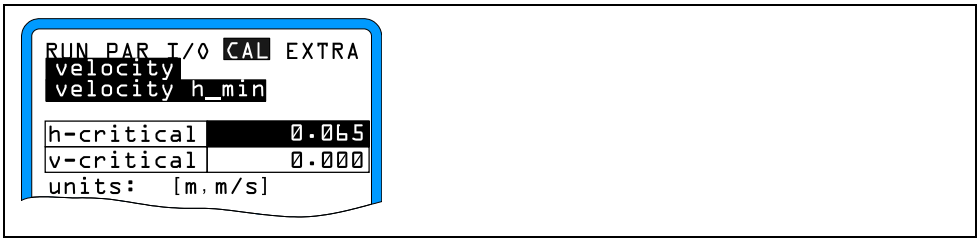


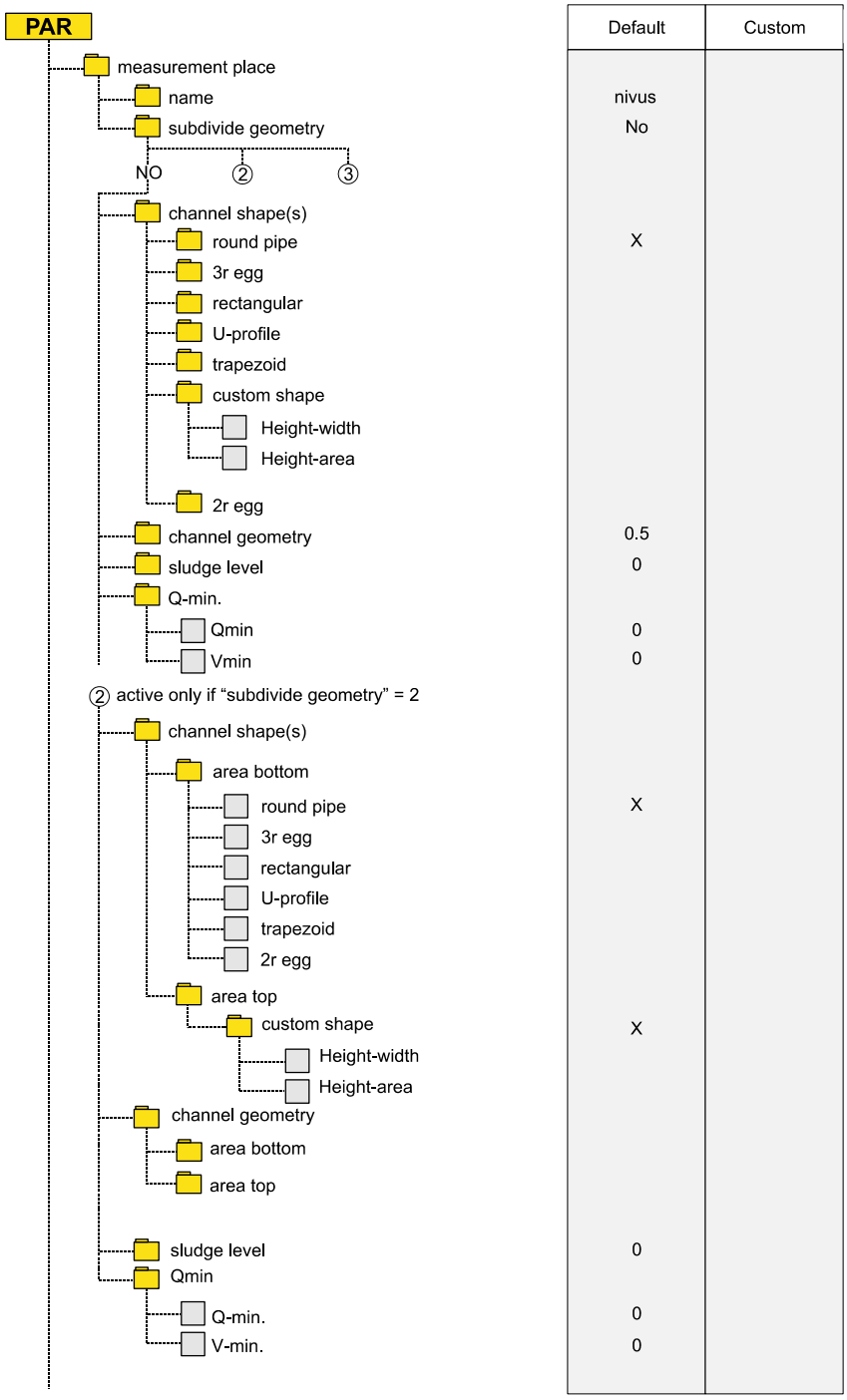
Fig. 8-107 Value Table for automatic Q/h-relation

Auto Calibration

The auto calibration mentioned above can be turned off or on by pressing >ALT<. Here, it must be taken into account that no backwater at lowest filling levels is resident. (danger of backwater, no need to measure lowest volumes in the gravity line).

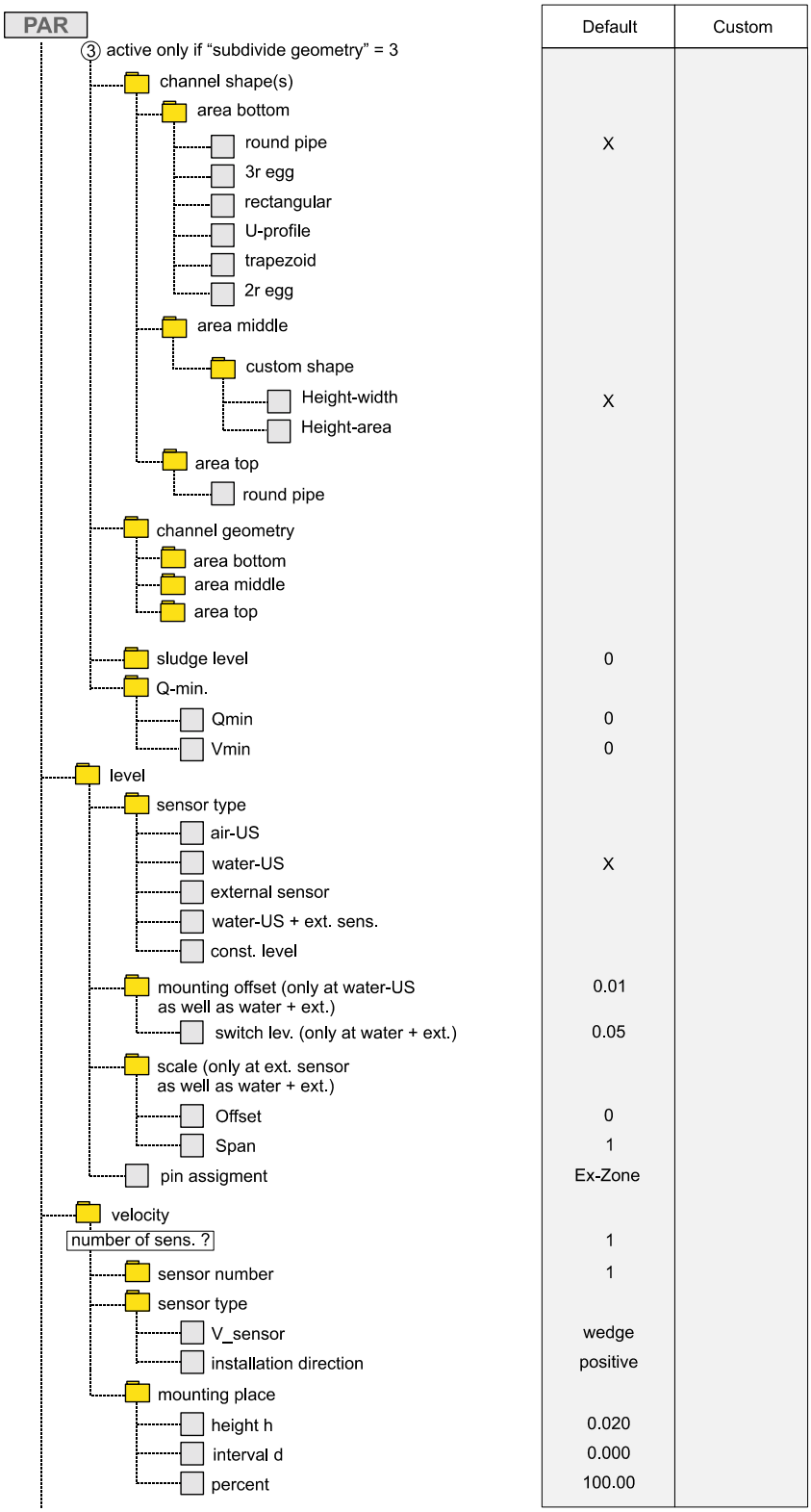
9 Parameter Tree

Parameter Menu (PAR) Part 1

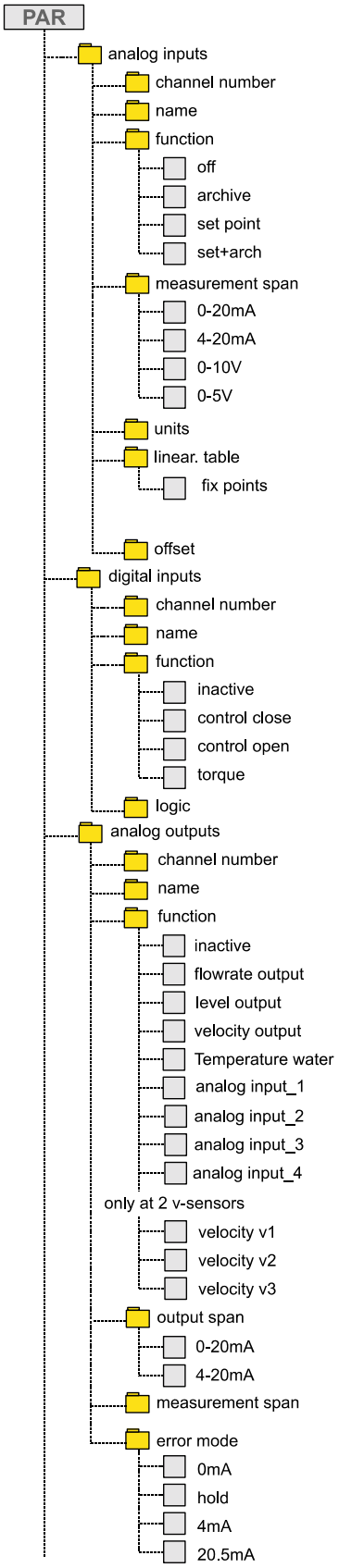


Default	Custom
nivus	
No	
X	
0.5	
0	
0	
0	
X	
X	
0	
0	
0	

Parameter Menu (PAR) Part 2

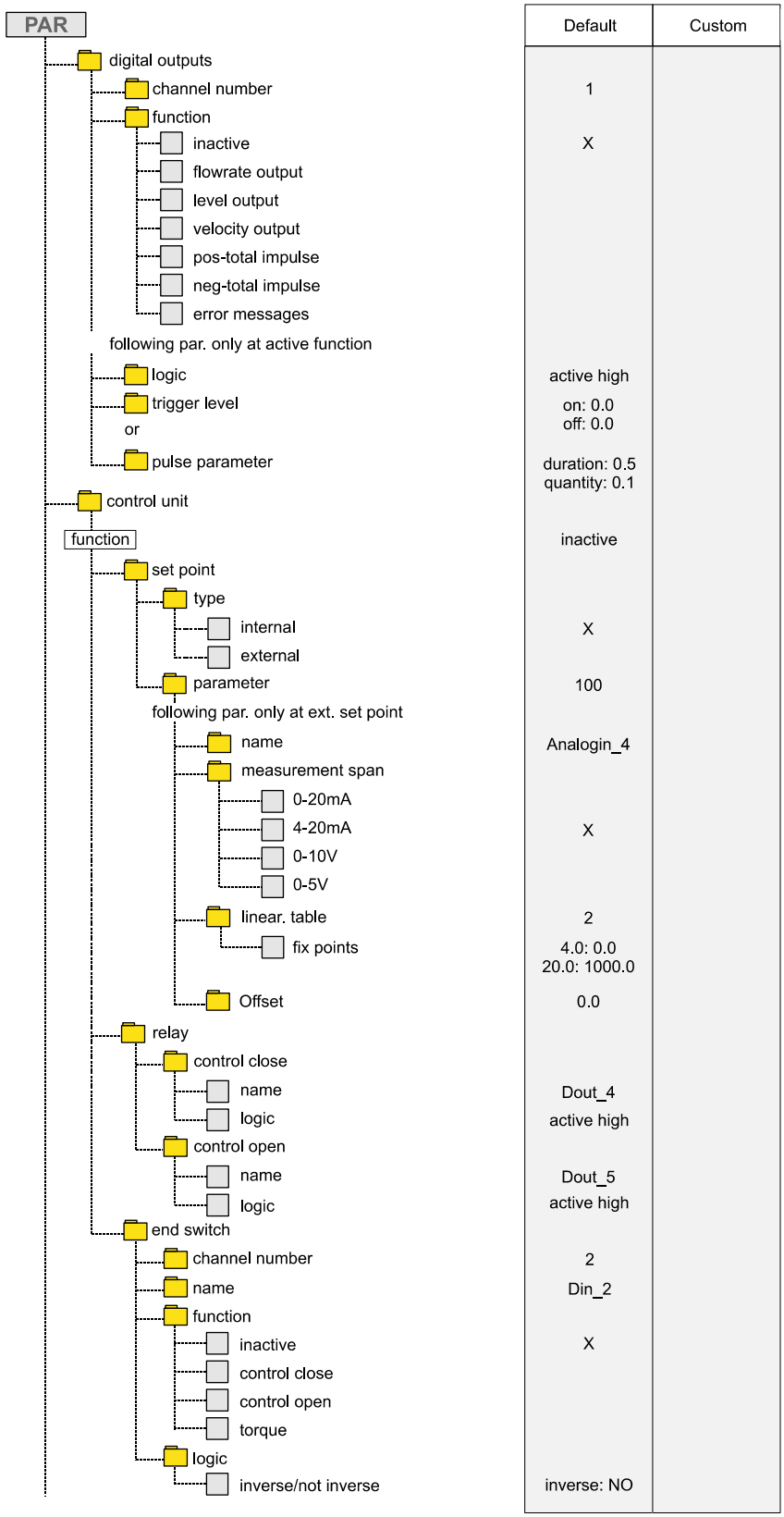


Parameter Menu (PAR) Part 3



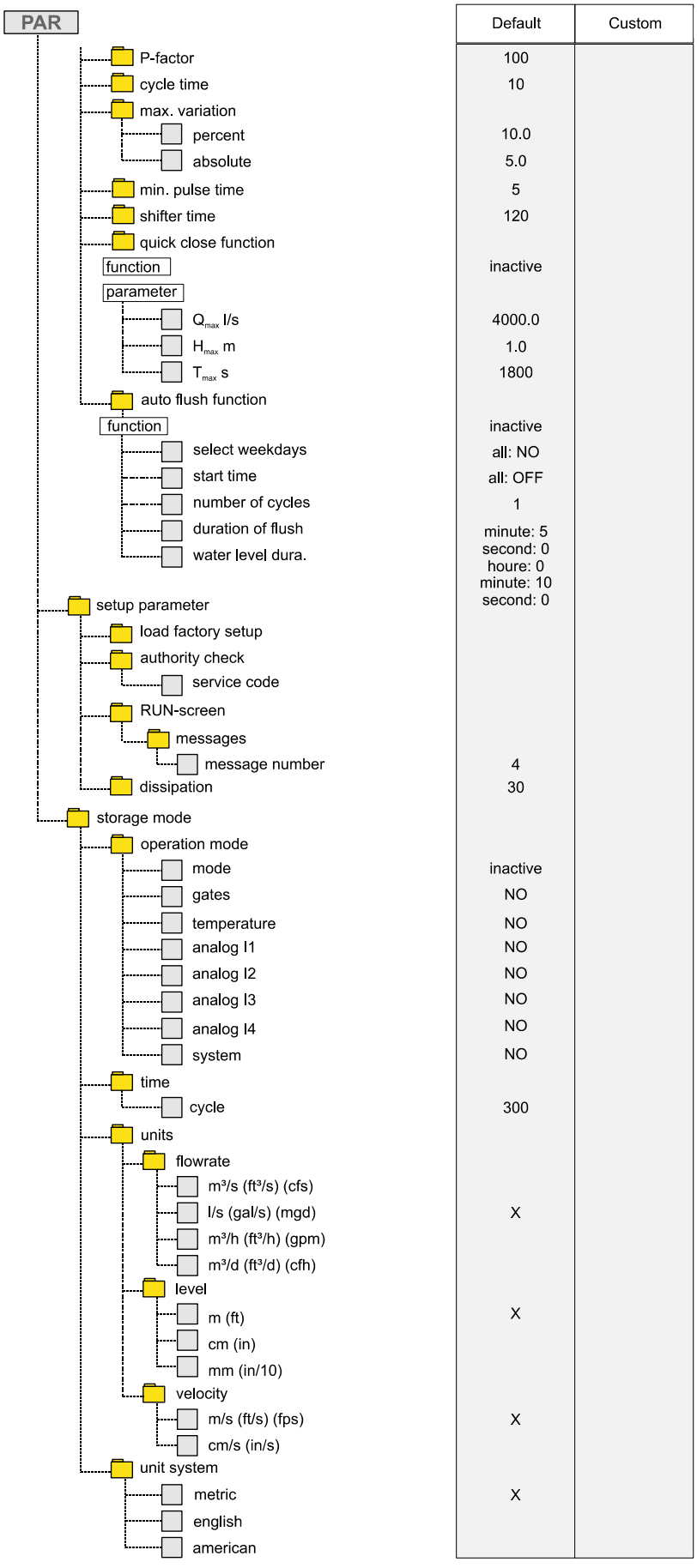
Default	Custom
1	
Analogin_1	
X	
X	
m	
2 4.0: 0.0 20.0: 1.0	
0,0	
1	
Din_1	
X	
inverse :NO	
1	
dac_1	
X	
X	
0/4mA: 0.0 20mA: 20.0	
0	

Parameter Menu (PAR) Part 4



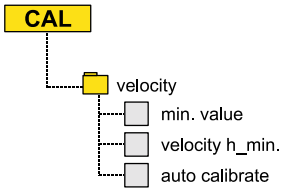
Default	Custom
1	
X	
active high	
on: 0.0 off: 0.0	
duration: 0.5 quantity: 0.1	
inactive	
X	
100	
Analogin_4	
X	
2	
4.0: 0.0 20.0: 1000.0	
0.0	
Dout_4	
active high	
Dout_5	
active high	
2	
Din_2	
X	
inverse: NO	

Parameter Menu (PAR) Part 5

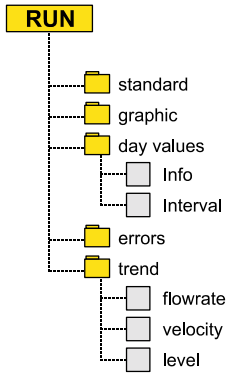


Default	Custom
100	
10	
10.0	
5.0	
5	
120	
inactive	
4000.0	
1.0	
1800	
inactive	
all: NO	
all: OFF	
1	
minute: 5 second: 0 houre: 0 minute: 10 second: 0	
4	
30	
inactive	
NO	
NO	
NO	
NO	
NO	
NO	
NO	
300	
X	
X	
X	
X	
X	

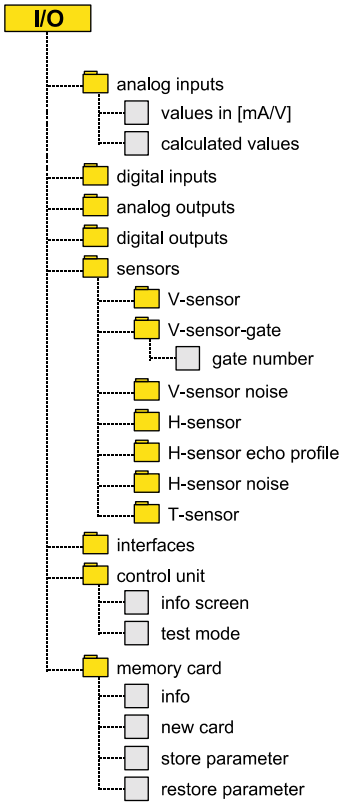
Calibration Menu (CAL)



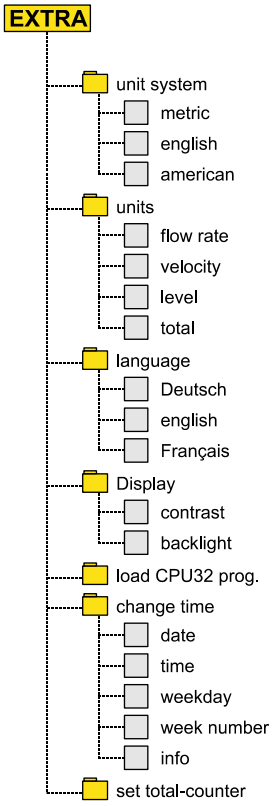
Operation Mode (RUN)



Signal Input-/Output Menu (I/O)



Display Menu (EXTRA)



10 Troubleshooting

Fault	Eventual Reason	Remedy
No flow indication (0)	Connection	Check connection of sensor cable to termination strip.
	Sensor	Check sensor mounting for flow direction and horizontal installation.
		Check sensor for fault (by removing it) or damage (exchange sensor)
	Height (depth) measurement	No height (depth) = no velocity measurement possible. Check height (depth) sensor for horizontal installation or external level measurement for function and signal assignment (Cable ways, Snap-in connections, Short-circuits, Loads) Check in menu >I/O/Sensors/H-Sensor (Echo profile)<
		Level/height > 65 mm (2.56 in)? In this case, the OCM/Pro at the beginning of operation in the Measurement mode of Q/H- Measurement. In Parameter CAL – Velocity – Velocity h_crit is manually entered for velocity expected at 65 mm depth.
		For full-filled pipes without level measurement, check entry for fixed value in the level measurement parameter.
	Transmitter	Recall error memory. Make corrections based on error message (Check cable ways and snap-in connections, Check sensor installation) or contact NIVUS Service (Fault DSP or CPU).
	Programming	Check complete parameter setting of the measurement transmitter.
No Display (dark / flickering)	Connection	Check power supply.
	Power Supply	Check power supply level.
		Check switch position on connection plate.
		Compare type of power supply (AC or DC) with transmitter type.
	Memory Card	Unauthorized card. Use NIVUS card.
		Memory card formatted on PC? Send card to NIVUS.
>Error Sensor<-Display	Connection	Check cable connection. Coaxial cable switched? Tight terminal connection? (tighten screws, slightly tug cable ends) Wire isolation pinned into clamps?
	Communication	Communication with sensor disturbed. Checkable by pressing the I-key. On the display muss in the 4th. line the sensor(s) must be indicated. Check the cables for cable disruption or loose connections. Check the sensor(s) for mechanical damage. Check the signal path in I/O-menu under >Sensor< H/V-Sensor Noise. Max. values 0 may indicate cable problems. (see also chapter I/O Menu “Sensors”)

>>Error DSP<<	Communication	Communication with CPU or Sensor disturbed. Checkable by pressing the >I<-key. On the Display the DSP version must be indicated in the 3rd line. Completely erase error memory (under >>RUN<<). Possibly disconnect the device from mains for 10 secs and try to restart.
	Contact problems	Only checkable by NIVUS personnel.
Measurement unstable	Measurement place hydraulically unsuitable	Check the measurement place suitability by means of graphic display of the velocity profile. Install the sensor at hydraulically better suitable place (Increase the laminar distance).
		Eliminate fittings, deposits or obstructions in front of the sensor.
		Improve the hydraulic profile by installation of suitable baffling elements and laminar elements, flow rectifier or similar prior to measurement place.
		Increase damping.
	Sensor	Assemble sensor against flow direction and check horizontal installation.
		Check sensor for pollution or faulty installation.
Measurement unplausible	Measurement place hydraulically unsuitable	See “Measurement unstable“.
	External level signals	Check for correct installation.
		Check cable ways on clamping places, circuits and inadmissible loads or devices without isolation (galvanic separation).
		Check measurement range and measurement span.
		Check the input signal in menu I/O.
	Sensor	Check for correct connection.
		Check cable ways on clamping places / extensions / cable types, circuits, overload conductor or inadmissible loads.
		Check level signal, echo profile, the velocity signals, cable parameters and temperature in menu I/O
		Check sensor installation for undesired vibrations, pollution, flow direction and horizontal position.
	Programming	Check channel geometry, dimensions (note measurement units), sensor type, sensor mounting height etc.
Faulty Relay Output	Connection	Check connections on termination strip.
		Check external control relays on power supply.
		Check the signals to be distributed in menu I/O.
		Check the output control function in the menu calibration.
	Transmitter	Check measurement transmitter type. Type S1 has only 2 relay outputs, type M0 has 5 relays.
	Programming	Check active relay outputs.
		Check assignment function outputs to output channels.

		Check additional or completing values, as pulse parameter, limiting values, logic etc.
No function of the regulator	Connection	Check cable terminations. (For the regulator function relay 4 and 5 is fixed).
		Check external control relays on power supply.
		Check the input signals of limiting contacts and set point.
		Check the exit control function by means of menu manual operation regulator.
	Transmitter	Check measurement transmitter type. Only the type M0 is suitable for regulator function.
	Programming	Check the programming. Regulator activated? Adjusted for regulator characteristic quantities? Analog output as set point activated and adjusted? Relay outputs activated?
Faulty mA-output	Connection	Check termination strip for correct wiring and polarity.
		Using one or several outputs: Check subordinate systems/indications for potential-free output. 2 analog outputs have a common ground.
	Programming	Output active?
		Check the correct assignment function to output channel.
		Check output range (0 or 4-20mA).
		Check output span.
		Check offset.
		Check output signal in menu I/O.
	Subordinate Systems	Check cables/cable ways as well as input and output clamps.
		Check input range (0 or 4-20 mA) of the subordinate system.
		Check initial range of the subordinate system.
		Check offset of the subordinate system.

No / incomplete Data on MemoryCard	MemoryCard	MemoryCard faulty. Verify in the menu: I/O – MemoryCard – Info
		Unauthorized card. Use NIVUS MemoryCard.
		MemoryCard formatted on PC. Send card to NIVUS.
	Transmitter	MemoryCard not properly inserted (reversed or not deep enough)
		MemoryCard not long enough in the slot. (at least 60 mins! Storage is made every hour)
	Programming	Data logging under Storage mode – Operation mode – Mode not active.
		“Storage Gates“, not “System Storage“ is activated. Thus only 10 calculated Gates are recorded.

11 Resistancies

The medium contacting parts of the OCM Pro sensor consist of:

- V4A (ground plate or pipe sensor jacket)
- PPO GF30 (sensor body)
- PMMA (sensor crystal cover) and
- Polyurethane (cable sheath and screwing)

The sensor technology is resistant to normal domestic sewages, dirt and rain water as well as mixed water from municipalities and communities. Also in many industrial plants (e.g. Huels, BASF etc.) the resistance does not present any problems. The sensor technology nevertheless is not resistant to all substances and substance mixtures.
Basically, there are dangers in chloride media as well as various organic solvents!
It has to be taken into account, that for substance mixtures (simultaneous existence of several substances) there is a possibility of occurrence of catalytic effects under certain circumstances, that would not occur in single substances. These catalytic effects cannot be completely checked due to the infinitely high possibility of variations.
Please, contact in case of doubt your NIVUS representation and request a free material test for long time test.

Chemical resistance Polyurethane at 21°C medium temperature.
Storing time: 6 months. The material is resistant against:

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

Chemical resistancies of V4A in various temperature ranges:

Substance	Concentration	Temperature	resistant	not resistant
Ammonium chloride	10%	100°C	x	
Methanol	100%	20°C	x	
Nitric acid	20%	20°C	x	
Hydrochloric acid	1%	20°C		x
Phosphoric acid	10%	20°C	x	
Ammonia	Gas	20°C	x	
Ammonia	Gas	70°C		x
Copper chloride	5%	20°C		x
Ferric sulfate	5%	100°C	x	
Soda lye	20%	100°C	x	
Sulphuric acid	10%	20°C	x	

Chemical resistancies of PPO at 20 °C:

Substance	Concentration	resistant	partly resistant	not resistant
Acetone	100%			x
Ammonia	10%	x		
Gasoline	100%			x
Benzene	100%			x
Chloroform	100%			x
Fuel oil	100%		x	
Acetic acid	80%	x		
Hydrofluoric acid	40%	x		
Glycerin	90%	x		
Potash solution	50%	x		
Sodium lye	50%	x		
Methanol	98%	x		
Soda lye	50%	x		
Petroleum	100%			x
Phosphoric acid	80%	x		
Nitric acid	10%	x		
Tetrachloride	100%	x		
Hydrochloric acid	10%	x		
Sulphuric acid	10%	x		
Soapsuds	1%	x		

Chemical resistancies of PMMA at 20 °C:

Substance	Concentration	resistant	partly resistant	not resistant
Acetone	100%			x
Ammonia	10%	x		
Gasoline	100%			x
Benzene	100%			x
Chloroform	100%			x
Fuel oil	100%		x	
Acetic acid	80%			x
Hydrofluoric acid	40%			x
Glycerin	90%	x		
Potash solution	50%	x		
Sodium lye	50%		x	
Methanol	98%			x
Soda lye	50%	x		
Petroleum	100%			x
Phosphoric acid	80%			x
Nitric acid	10%		x	
Tetrachloride	100%			x
Hydrochloric acid	10%	x		
Sulphuric acid	10%	x		
Soapsuds	1%	x		

Comprehensive resistancies can be requested from NIVUS GmbH in Eppingen.

12 Maintenance and Cleaning

The OCM Pro is conceived to be practically free of calibration, maintenance and material wear.
Clean the transmitter enclosure if necessary with a dry, lint-free cloth. For heavy pollution NIVUS recommends the use of surface-active agents.
Use of abrasive cleansing agents is not allowed.

When cleaning the enclosure surface with a wet cloth first disconnect the device from mains.

In heavy polluted media tending to sedimentation it may be necessary to clean the sensor regularly. To do this, please use a brush with plastic bristles, a broom or similar.

For sensor cleaning no hard objects like wire brushes, rods, scrapers or similar may be used. Cleaning by a water jet is allowed up to a pressure of 4 bar max.). Using a high pressure cleaner may lead to measurement failures and thus is not allowed.

In various countries it may be necessary to carry out regular maintenance with comparative measurements in particular applications to comply with official regulations. If desired, NIVUS takes the job to do all necessary checks, hydraulic and technical assessment, calibrations, troubleshooting and repairs according to an eventual maintenance contract. This service is carried out according to DIN 19559 incl. the agreed proof of the remaining residual error, as well as according to rules in the respective countries.

13 Emergency

In case of emergency press the emergency-off button of the superordinated system or switch the slide slide valver switch (see Fig. 6-20 Slide valve switch position on the bus board) on the device to OFF.

14 Dismantling/Disposal

The device has to be disposed according to the local regulations for electronic products.

15 Table of Pictures

Fig. 2-1 Overview 11
Fig. 4-1 Combination sensor type “Pro“ for ground installation 18
Fig. 4-2 Situation on first signal detection 19
Fig. 4-3 Situation on second signal detection 19
Fig. 4-4 Echo signal images and evaluation 20
Fig. 4-5 evaluated flow profile 20
Fig. 4-6 calculated 3-dimensional flow profile 21
Fig. 4-7 Type keys for OCM Pro transmitters 22
Fig. 4-8 Type keys for ultrasonic sensors 23
Fig. 6-1 Wall Mount Enclosure 26
Fig. 6-2 Panel Mount Enclosure 27
Fig. 6-3 Rack Model 27
Fig. 6-4 19“ Slide slide valve-in Unit 28
Fig. 6-5 Wiring diagram OCM Pro wall mount 30
Fig. 6-6 Wiring diagram panel and rack mount 31
Fig. 6-7 Dimensions wedge sensor 32
Fig. 6-8 Dimensions pipe sensor 33
Fig. 6-9 Installation suggestion for lowered wedge sensors 34
Fig. 6-10 Cable layout suggestion 34
Fig. 6-11 Notes for cable layout 35
Fig. 6-12 Notes for Pipe Sensor Installation 35
Fig. 6-13 Using the grease 36
Fig. 6-14 Installation Notes for Flow Velocity Sensors 37
Fig. 6-15 Connecting a flow velocity- or combination sensor 38
Fig. 6-16 Connecting a second flow velocity sensor to OCM Pro type M0 38
Fig. 6-17 Connecting a third flow velocity sensor to OCM Pro type M0 38
Fig. 6-18 Connecting a 2-wire sensor for flow level measurement 39
Fig. 6-19 Connecting an external flow level measurement via NivuMaster 39
Fig. 6-20 Slide slide valver switch position on the bus board 40
Fig. 6-21 AC-model power supply 41
Fig. 6-22 DC-model power supply 41
Fig. 6-23 Connecting the overvoltage protection 42
Fig. 6-24 Construction of a controlled system such as an effluent control 44
Fig. 6-25 Measurement position behind the slide slide valver 45
Fig.6-26 Wiring diagram for controller operation 46
Fig. 7-1 Keypad 49
Fig. 7-2 Display 49
Fig. 8-1 Language selection 52
Fig. 8-2 Operation mode 53
Fig. 8-3 Flow velocity distribution 54
Fig. 8-4 Flow velocity profiles 54
Fig. 8-5 Info menu 54
Fig. 8-6 Day values 55
Fig. 8-7 Time of totals begin 55
Fig. 8-8 Trend value selection 55
Fig. 8-9 Trend graphic example 56
Fig. 8-10 Extra-submenus 56
Fig. 8-11 Change Time Submenus 57
Fig. 8-12 Display complete system time 57
Fig. 8-13 Submenu measurement place 58
Fig. 8-14 Programming name of measurement place 59
Fig. 8-15 Profile divided into 3 parts 60
Fig. 8-16 Channel shapes 60
Fig. 8-17 Selected profile on display 61
Fig. 8-18 Menu custom shape 61
Fig. 8-19 List of bases for custom shape 62
Fig. 8-20 Bases for custom shape 62
Fig. 8-21 Q-min selection 63
Fig. 8-22 Level measurement - submenu 64

Fig. 8-23 Display example: external sensor 64
Fig. 8-24 Sensor type specification 64
Fig. 8-25 Example of 2 level sensors 65
Fig. 8-26 Dividing level areas 66
Fig. 8-27 Programming switch levels 67
Fig. 8-28 Selection number of sensors 67
Fig. 8-29 Sensor settings 67
Fig. 8-30 Selecting sensor types 68
Fig. 8-31 Extended sensor setting 68
Fig. 8-32 Selecting sensor type 69
Fig. 8-33 Sensor assignment 70
Fig. 8-34 Value assignment of single flow velocity sensors 70
Fig. 8-35 Analog inputs - submenu 71
Fig. 8-36 Selection Table 72
Fig. 8-37 Value Table for analog input range 72
Fig. 8-38 Digital inputs - submenu 73
Fig. 8-39 Selecting functions for the digital inputs 73
Fig. 8-40 Analog outputs - submenu 74
Fig. 8-41 Selecting functions for the analog outputs 75
Fig. 8-42 Selection of measurement span 75
Fig. 8-43 Relay outputs - submenu 76
Fig. 8-44 Setting the function 77
Fig. 8-45 Trigger level setting 77
Fig. 8-46 Pulse parameter setting 77
Fig. 8-47 Basic setting control unit 78
Fig. 8-48 Control unit activation 78
Fig. 8-49 Set point setting 79
Fig. 8-50 Relay functions assignment 79
Fig. 8-51 End switch assignment 80
Fig. 8-52 Functions 80
Fig. 8-53 P-Factor setting 81
Fig. 8-54 Setting the cycle time 81
Fig. 8-55 Setting permitted deviations 81
Fig. 8-56 Setting min. control pulse time 82
Fig. 8-57 Setting slide slide valver run time 82
Fig. 8-58 Activating the quick close function 83
Fig. 8-59 Quick close parameters 83
Fig. 8-60 Activating the flush function 83
Fig. 8-61 Flush function parameters 84
Fig. 8-62 Activating single flush events 84
Fig. 8-63 Programming the beginning of flush time 84
Fig. 8-64 Programming total flush events 85
Fig. 8-65 Programming flush duration 85
Fig. 8-66 Programming duration of flush 85
Fig. 8-67 Flush process 86
Fig. 8-68 Settings - Submenu 86
Fig. 8-69 General reset 86
Fig. 8-70 Selection start screen 87
Fig. 8-71 Entry field total 87
Fig. 8-72 Selection field number 87
Fig. 8-73 Entering the messages 88
Fig. 8-74 Storage mode - submenu 88
Fig. 8-75 MemoryCard slot 89
Fig. 8-76 Selection table storage options 90
Fig. 8-77 Entering the storage cycle 91
Fig. 8-78 Selection units 91
Fig. 8-79 Selection unit system 91
Fig. 8-80 I/O submenu 92
Fig. 8-81 Selecting values 92
Fig. 8-82 Display of analog values 93
Fig. 8-83 Error message 93

Fig. 8-84 Display of digital values....93
Fig. 8-85 Display of analog values....94
Fig. 8-86 Display of digital values....94
Fig. 8-87 Selection menu with submerged ultrasonic sensor from bottom up....95
Fig. 8-88 Selection menu without submerged ultrasonic sensor from bottom up....95
Fig. 8-89 Display of measured single velocities....95
Fig. 8-90 Selection measurement gate....96
Fig. 8-91 Display of Received Reflection Signals....96
Fig. 8-92 Display of signal levels....97
Fig. 8-93 Display signal quality height (depth) measurement....97
Fig. 8-94 Display h-sensor external height (depth)....97
Fig. 8-95 Display echo profile level measurement....98
Fig. 8-96 Display of signal levels....98
Fig. 8-97 Display of temperatures....99
Fig. 8-98 Selecting control unit information....99
Fig. 8-99 Overview of the control unit processes....99
Fig. 8-100 Control menu for manual operation....100
Fig. 8-101 Memory Card info....100
Fig. 8-102 Memory Card exchange....100
Fig. 8-103 Request for card exchange....101
Fig. 8-104 Save or load parameters....101
Fig. 8-105 Saving parameters on MemoryCard....101
Fig. 8-106 Calibration - Submenu....102
Fig. 8-107 Value Table for automatic Q/h-relation....103

16 Index

2

2-wire sensor 39, 65

A

Accessories 14
analog Inputs 92
analog Outputs 74, 94
Auto Calibration 103

B

Backwater-free 103

C

Cable
  Bending Radius 35
  build up 34
  Cable Length 37
  Type 37
Cables
  Layout 34
Calibration Menu 102
Caution 15
Change Time 57
Channel Geometry 61
Channel shape 60
Clamp Terminals 29
Cleaning 116
CompactFlash 89
Comparative Measurement 116
Connections 17
Control Algorithm 47
Control Pulse Time 82
Control Unit 78
Copyright 3
Cross Correlation 19
Cutting Ring 32
Cycle Time 81

D

Danger by electric voltage 15
Danger Notes 15
data storage 90
Day Values 54
Declaration of conformity 7
Delivery 24
Deviation 81
Device Identification 16
Device Variations 22
digital Inputs 73, 93
digital Outputs 94
DIN 19559 116
Display 49, 56
Display Menu 56
Dissipation 88
Dome Height 45
Duration of Flush 85

E

Echo Profile 98
Effluent Measurement Distance 36
Electromagnetic compatibility 7
End Switch 80
Errors 55
Ex-Approval 12

F

Flow profile 21
Flow Velocity Capture 19
Flush Duration 85
Flush Events 84
Flush Function 83
Functional Principle 18

G

Graphic 53
Gravity Line 103
Grease Paste 35
Guarantee 26

I

I/O Menu 92
Influent Measurement Distance 36
Info Screen 99
Initial start-up 48
Installation 25
Interfaces 99

K

Keypad 49
Keys 59

L

Language 56
Level 64
Level Measurement 18
Linearization 72
Low Voltage Directive 7

M

Maintenance 116
Maintenance Contract 116
Manual Operation 100
Measurement Distance 44
MemoryCard 100
  Capacity 100
  Card Info 100
  data loss 89
  Data Loss 101
  Exchange 100
  Save 101
Mounting Height 66

N

Name of Measurement Place 58
Names 3
Noise 97
Note 15

O

Offset 72
Operating permits 17
Operation 50
Operation Mode 53
Overvoltage Protection 42

P

Panel Mount Enclosure 27
Parameter Setting 51
Parameter Tree 104
P-Factor 81
Pipe Sensor 35
Power Supply 40
Pulse Parameter 77

Q

Q-min 63
Quick Close 82
Quick Start 51

R

Rack 27
Receipt 24
Reflection Signals 96
Regulator 43
Required Distances 36
Resistancies 114
Return 25

S

Screwing 29
Sensor
  Cable Thread Joint 32
  Connection 37
  Ground Plate 32
  I/O Menu 95, 110
  Installation 32, 33
  Montageort 68
  split 66
  Typ 68
Service Code 87
Set Point 78
Signal Levels 97
Slide slide valver Run Time 47, 82
Sludge Level 63
Specifications
  Sensor 14
  Transmitter 13
Start Days 84
Start Screen 87
Start Time 84
Storage 88
Storing 24
System Reset 86

T

Totalizer 57
Translation 3
Transmitter
  Connection 28
  Dimensions 26
  Installation 25
Transport 24
Trend 55
Trigger Level 77
Troubleshooting 110
Turn-off Procedure 16
Type Keys 22, 23

U

Unit System 56, 91
Units 56, 91
Use in accordance with the requirements 12

W

Wall Mount Enclosure 27
Warning 15
Wedge Sensor 33