Instruction Manual for Measurement System
NivuSonic Clamp On incl. accompanying Sensors

(Original Instruction Manual – German)

Valid as of Firmware V2.00

NIVUS AG

Hauptstrasse 49

8750 Glarus, Switzerland

Phone +41 (0)55 / 645 20 66

Fax +41 (0)55 / 645 20 14

E-mail: swiss@nivus.com

NIVUS Austria

Föhrenhaingasse 6

A - 2201 Gerasdorf bei Wien

Tel.: +43 (0)2246 32319

Fax: +43 (0)2246 32386

E-Mail: austria@nivus.com

Internet: www.nivus.de

NIVUS Sp. z o. o

Ul. Hutnicza 3 / B-18

81-212 Gdynia, Poland

Phone +48 (0)58 / 760 20 15

Fax +48 (0)58 / 760 20 14

E-mail: biuro@nivus.pl

Internet: www.nivus.pl

NIVUS France

14, rue de la Paix

67770 Sessenheim, France

Phone +33 (0)388071696

Fax +33 (0)388071697

E-mail: france@nivus.com

Internet: www.nivus.com

NIVUS U.K.

P.O. Box 342

Egerton, Bolton

Lancs. BL7 9WD, U.K.

Phone +44 (0)1204 591559

Fax +44 (0)1204 592686

E-mail: info@nivus.com

Internet: www.nivus.com

NIVUS Middle East

P.O. Box 9217

Building Q 1-1 ap. 055

Sharjah Airport Int. Free Zone

Phone +971 655 78224

Fax +971 655 78225

E-mail: middle-east@nivus.com

Internet: www.nivus.com

Translation

If the device is sold to a country in the European Economic Area (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.

Copyright

Names

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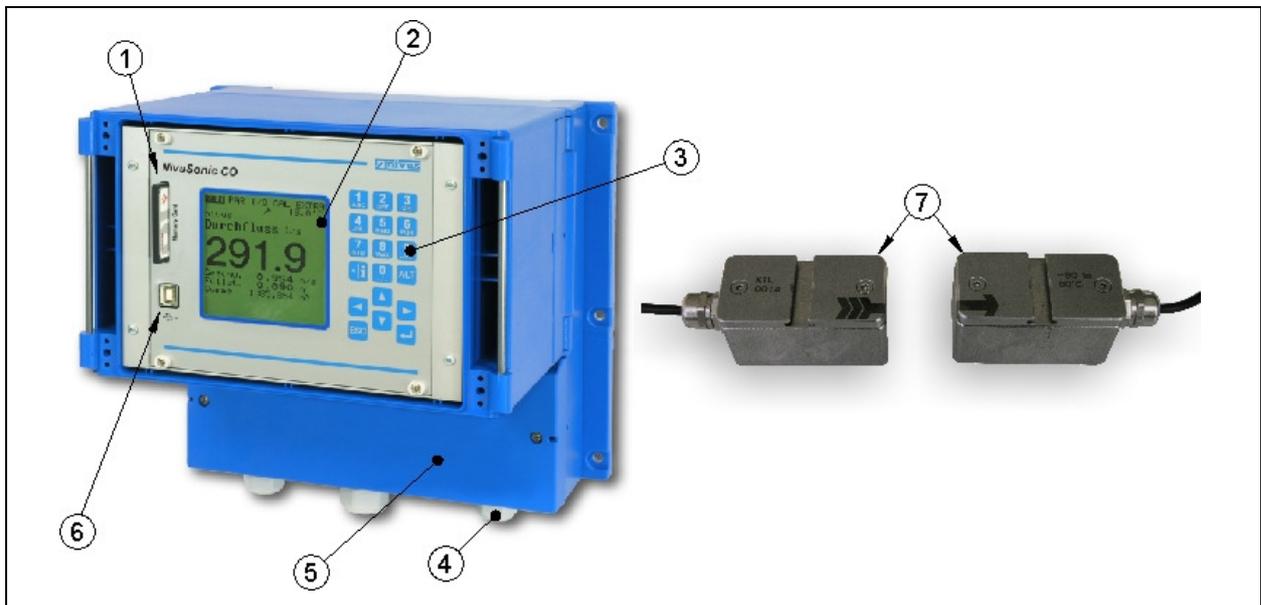
1   Contents

1.1   Table of Contents

2 Overview and use in accordance with the requirements

2.1 Overview

1	Slot with plugged memory card
2	Graphic display
3	Keypad
4	Cable glands
5	Terminal clamp housing
6	USB Port
7	Clamp on sensors (pair)

Fig. 2-1   Overview

2.2 Use in accordance with the requirements

The measurement device type NivuSonic CO including respective sensors is intended to be used for continuous flow measurement in slightly polluted to clear, clean water or equivalent media in full pipes. Here the allowed maximum values, as specified in chapter 2.3 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.

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

The transmitter and the sensors always have to be installed outside of Ex-zones!

2.3   Specifications

2.3.1   Transmitter

Power supply	100 to 240 V AC, +10 % / -15 %, 47 to 63 Hz or 24 V DC ±15 %, 5 % residual fluctuation
Power consumption	max. 48 VA
Wall mount enclosure	- Material: Polycarbonate - Weight: approx. ca. 3700 g - Protection: IP 65
Operating temperature	-20 °C to +50 °C
Storage temperature	-30 °C to +70 °C
Max. humidity	80 %, non-condensing
Display	Back-lit graphic display, 128 x 128 pixel
Operation	18 keys, dialog mode in German, English, French, Italian, Spanish, Polish, Czech and Dutch
Outputs	- load 500 Ohm, 12 bit resolution, accuracy better than 0.1 % - 5 switchable relays, loadable up to 230 V AC / 2 A (cos. φ 0,9) - RJ45 for Internet communication
Data storage	plug-in compact flash card up to 128 MB
Data transmission	Via Compact Flash Card, Modbus TCP, integrated web server; connection to local networks (LAN) and Wide Area Network (WAN, Internet) via Ethernet or optional internal ISDN/GPRS or analog modem

2.3.2   Clamp On System

Measurement principle	Ultrasonic transit time as clamp on system
Material	PEEK and stainless steel 1.4571
Measurement frequency	1 MHz; other frequencies upon request
Velocity range	±20 m/s
Inner pipe diameter	0,08 m to 1,4 m (DN 80 to DN1400)
Protection	IP 68
Operating temperature	-30 °C to +80 °C (ambient temperature)
Storage temperature	-30 °C bis +70 °C
Cable length	10 m
Type of cable	Twinax
Outside cable diameter	8,5 mm
Sensor types	Pair of sensors to clamp on pipes
Measurement uncertainty Depending on hydraulic conditions	- Flow velocity ($v_{average}$) within path ±0.1 % of measurement value - Flow (Q): ±1-5 % of measurement value - Offset velocity < ±5 mm/s

Temperature measurement using velocity of sound	
Measurement range within medium	0 °C to +80 °C
Measurement uncertainty	± 1 K

2.3.3 Accessories (optional)

Memory card	Type: Compact Flash Card; storage capacity: 128 MB; fabricator: SanDisk
Readout adapter	Adapter unit for PCMCIA interface, primarily for data readout via Laptop or Notebook
Readout unit	With USB interface for connecting to PC. Network connection via RJ45 Ethernet interface (TCP/IP), internal web server or ModBus TCP.
Clamping system	Band with a length of 10m; 2 turnbuckles for sensor installation
Evaluation software	Type: NivuSoft for Windows XP / Vista / 7 for data readout, creation of hydrographs, average values, hour, day and month totals etc.

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 NivuSonic CO 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 observed.
All operations, which go beyond steps to install, to connect or to program the device, must be carried out by NIVUS staff only due to reasons of safety and guarantee.

3.1.2   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
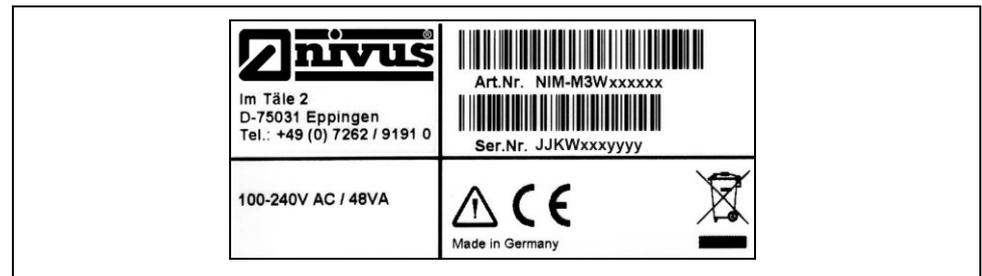
Fig. 3-1   NivuSonic CO nameplate
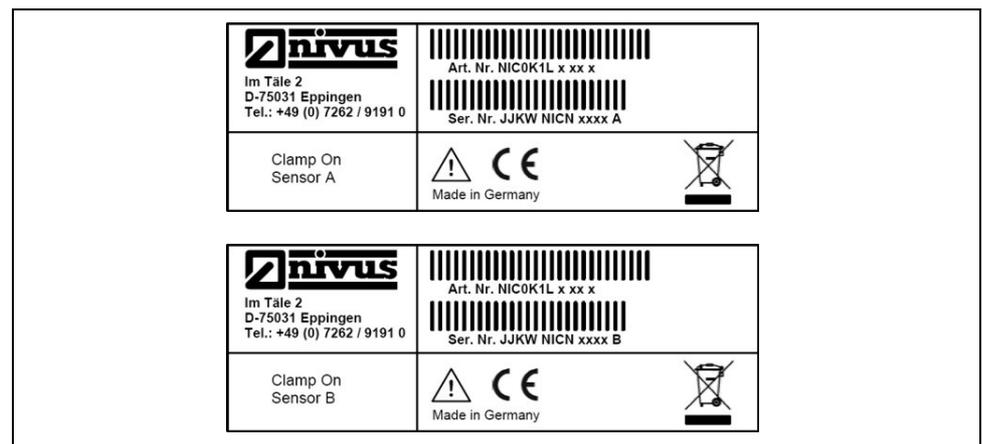
Fig. 3-2   Nameplate for Clamp on sensors, Typ NIC0

An additional nameplate protected by a transparent shrunk-on hose can be found on each end of the fixed cable providing the following:

- article no. of sensors

- serial no. of sensors

It is important for enquiries and replacement part orders to specify article number as well as serial number of the respective transmitter or sensor. 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 (authorised staff personnel only) the device shall be disconnected from mains and shall be prevented from being turned on again unintentionally.

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

- approvals available from local authorities

Connections:

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

4   Functional Principle

4.1   General

NivuSonic CO is a non-contact, stationary measurement system for flow measurement and hence is pressure-independent. The storage of detected readings and remote access using TCP/IP is carried out via network connection, Intranet or Internet. It is mainly designed for use in slightly polluted to clear watery fluids of various consistencies. It can exclusively be operated in full filled channels and pipes.

The flow velocity measurement method is based on the ultrasonic transit time principle. Due to this reason it is indispensable for the system functionality that the solid content (dirt particles, gas bubbles or similar) is not too high to enable ultrasonic signal transmission between both sensors due to reflections and hence damping.

The NivuSonic CO uses up to two sensor pairs for flow velocity determination.
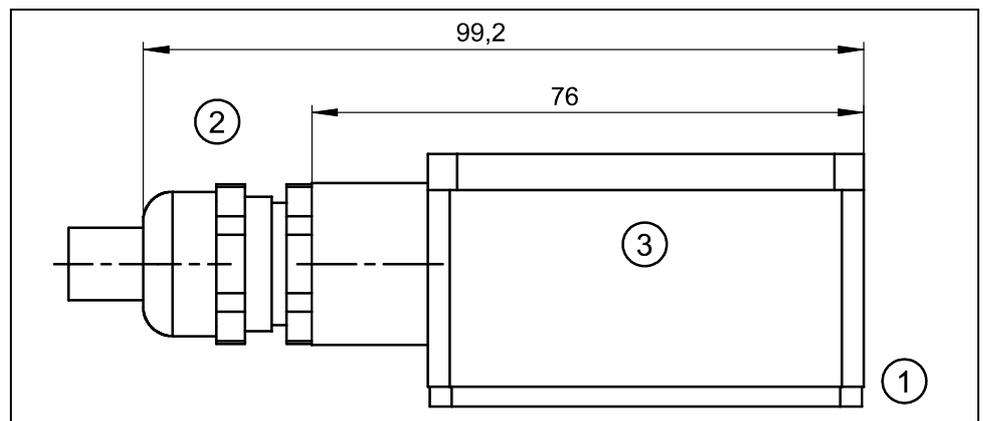
1   sensor face
2   cable gland
3   sensor housing, material stainless steel 1.4571

Fig. 4-1   Assembly of clamp on sensors incl. straps

4.2 Flow velocity detection

The flow velocity is determined by using the ultrasonic transit time principle.

1   Sensor 1
2   Sensor 2

Fig. 4-2   One-path transit time measurement principle

This measurement principle is based on directly measuring the transit time of acoustic signals between two ultrasonic sensors, the so-called hydro-acoustic converters.

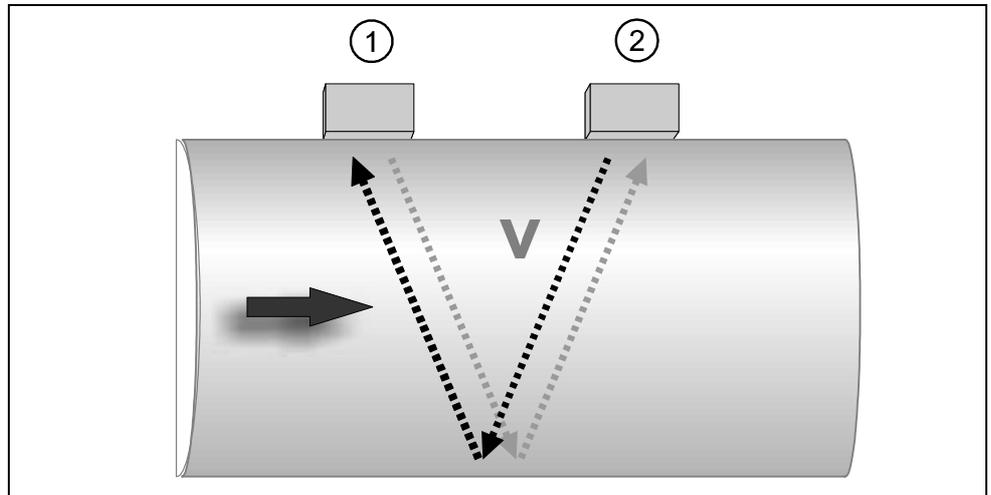A short ultrasonic impulse with a defined frequency sent towards the medium flow direction in a defined angle requires a longer transit time than another impulse being sent with the medium flow direction in an inverse angle.

The difference between the transit times is proportional to the average flow velocity within the measurement path.

Flow determination is possible as soon as both cross-sectional area as well as flow geometry of pipe or channel are known.

Presuming that $C \gg \upsilon_{1\text{-}2}$ and the flow direction is known, it is possible to approach the transit time (Δt) applying

$$\Delta t = \frac{2L_{1-2} \cdot \upsilon_{1-2}}{c^2}$$

Whereat:

$L_{1\text{-}2}$ length of acoustic measurement path between sensors 1 and 2
C   velocity of sound in water
$\upsilon_{1\text{-}2}$ average flow velocity between sensors 1 and 2 along the measurement path

Using two paths (instead of one as used for transit time measurement) fixed on the outside of the pipe allows to collect more information on flow velocity and flow can therefore be determined more accurate.
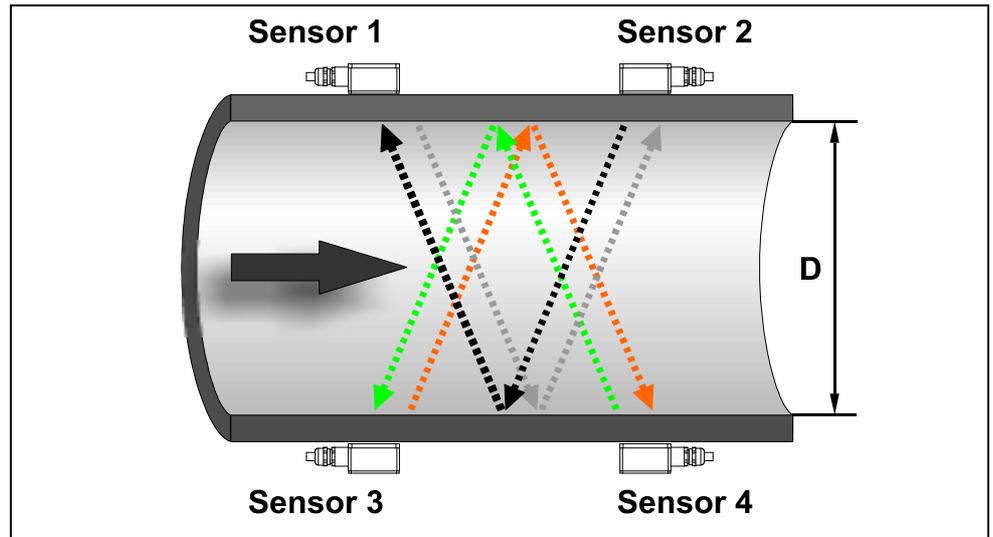
Fig. 4-3   Two-path transit time measurement principle

Investigate the velocity as described below presuming $C \gg \upsilon_{1\text{-}2}$:

$$\upsilon_{1-2} = \frac{L_{1-2}}{2 \cdot \cos(\Phi_{1-2} + \alpha)} \cdot \left(\frac{1}{t_{1-2}} - \frac{1}{t_{2-1}} \right)$$

bzw.

$$\upsilon_{3-4} = \frac{L_{3-4}}{2 \cdot \cos(\Phi_{3-4} + \alpha)} \cdot \left(\frac{1}{t_{3-4}} - \frac{1}{t_{4-3}} \right)$$

Presuming identical flow velocities in the paths it is possible to additionally determine the deviation angle α of the flow direction in two-path installations. This angle can be derived from a comparison between the readings from the single paths.

$$\alpha = \arctan\left(\frac{\upsilon_{3-4} \cdot \cos\Phi_{1-2} - \upsilon_{1-2} \cdot \cos\Phi_{3-4}}{\upsilon_{3-4} \cdot \sin\Phi_{1-2} + \upsilon_{1-2} \cdot \sin\Phi_{3-4}} \right)$$

4.3 Flow calculation

In case of using single-path or two-path installations in one level under the condition

$$Q = \upsilon_m \cdot A$$

Given:

υ_m average flow velocity

A   cross-sectional flow area

it is required to involve a velocity coefficient k in order to compensate the difference between measured velocity υ_g and average velocity υ_m within the cross-sectional area.

$$k = \frac{\upsilon_m}{\upsilon_g}$$

Using the transit time of the signal it is possible to calculate flow subsequently as described below:

$$Q = k \cdot A \cdot \upsilon_g = k \cdot A \cdot \frac{L_{1-2}}{2 \cdot \cos \Phi_{1-2}} \cdot \left(\frac{1}{t_{1-2}} - \frac{1}{t_{2-1}} \right)$$

4.4 Device variations

NivuSonic CO transmitter and the respective flow velocity sensors are available in different versions. The tables below provide an overview on various possibilities.

Transmitters

The transmitters primarily vary in terms of power supply and data transmission options. 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.

NIM-	M3W						Standard version with 5 relays, 4mA outputs, 4 mA inputs
							Data Transmission
		IN					Internet communication via Intranet
		MA					Internet communication via internal analog modem
		MI					Internet communication via internal ISDN modem
		MG					Internet communication via GPRS
							Power Supply
			AC				100-240 V AC / 47-63 Hz
			DC				24 V stabilised
							Sensor connection
				D			Direct connection of sensors
							Number of Paths
					1		1-2 paths, max. 2 paths
							Firmware
						01	Standard firmware Clamp On
NIM-	M3W			D	1	01	

Fig. 4-4   NivuSonic CO transmitter type keys

Ultrasonic sensors for NivuSonic CO

The sensors are available in various constructions and vary in terms of cable length and connection. The article no. can be found on a nameplate on the cable end (device side) which is protected by a transparent shrunk-on hose.

NIC0	K1L				Clamp On sensor pair for connection to NivuSonic CO; range ±20 m/s
		0			No ATEX approval
			10		10 m cable lengths, pre-configured
			15		15 m cable lengths, pre-configured
			20		20 m cable lengths, pre-configured
			30		30 m cable lengths, pre-configured
			50		50 m cable lengths, pre-configured
				K	Connection to NivuSonic CO transmitter
NIC0	K1L	0		K	

Fig. 4-5   Type keys for clamp on 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!

5.2   Delivery

The standard delivery of the NivuSonic CO measurement system contains:

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

- a NivuSonic CO transmitter

- min. two ultrasonic sensors, construction: clamp on

- a mounting set with a clamping strap and turnbuckles for 2 sensors

- readout software Type, NivuSoft for Windows® XP, Vista and Windows® 7

Additional accessories such as memory card, card reader or similar depending on order. Please check by using the delivery note.

5.3   Storing

The following storing conditions shall be strictly observed:

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

The devices must be protected from corrosive or organic solvent vapours, radio-active radiation as well as strong electromagnetic radiation.

5.4   Transport

Sensors 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.

5.5   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

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

The NivuSonic CO 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 unit protection rating is IP 65.

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

- direct sunlight (use weatherproof cover if necessary, e.g. NIVUS weatherproof cover Art. No. ZMS0 180000)

- heat emitting objects (max. ambient temperature: +50 °C)

- objects with strong electromagnetic fields (e.g. frequency converters, contactors / relays, electric motors with high rated input or similar)

- corrosive chemicals or gas

- mechanical shocks

- direct installation close to footpaths or travel ways

- vibration

- radioactive radiation

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 with min. diameter 4.5 mm. These screws must reach min. 40 mm into the wall or min. 50 mm into appropriate dowels (to be set).

The transparent door of the measurement transmitter is equipped with a protective foil for protection during transport and from scratches during assembly. This protective foil has to be removed immediately after assembly.

If the view door with protection foil is exposed to direct sunlight for a long time, 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

Never change the cable lengths of the sensors delivered since this will lead to faulty measurements or even complete measurement failures.
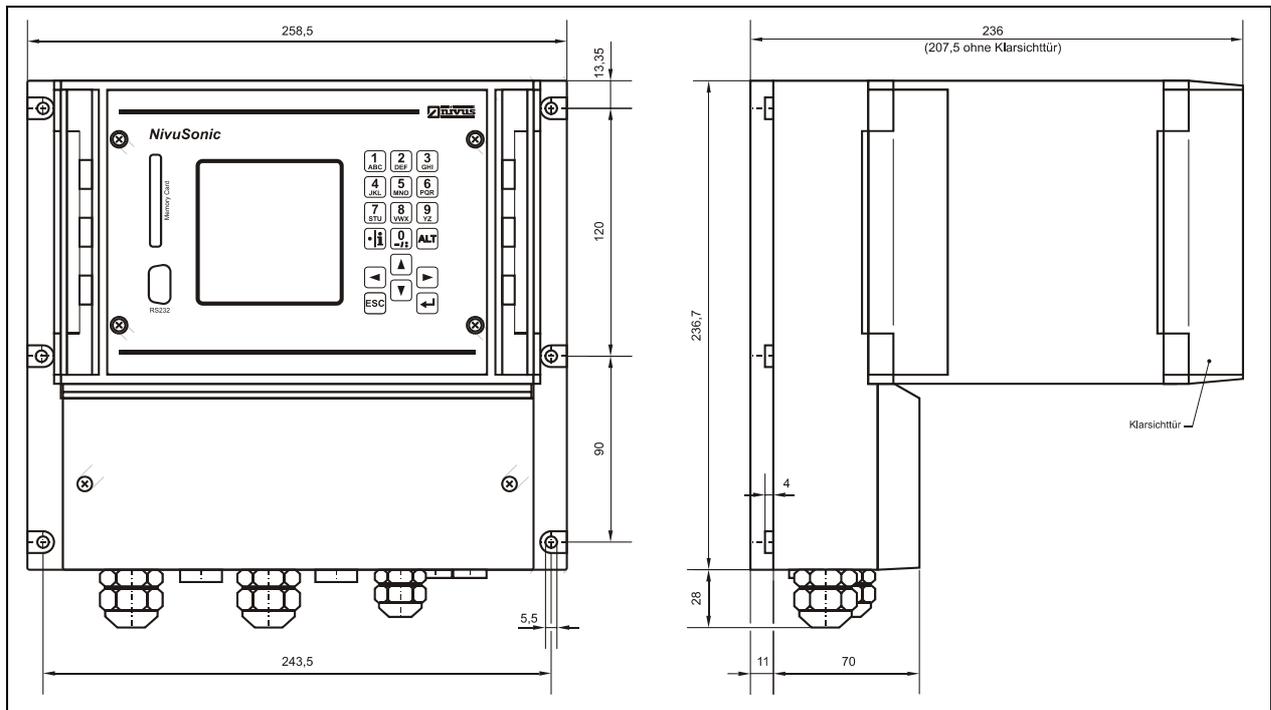
6.2.2 Enclosure dimensions

Fig. 6-1   NivuSonic CO wall mount enclosure

6.2.3 Transmitter Connection

General

The wall mount enclosure is equipped with cable glands and dummy plugs which have been installed or added as spare parts for replacement purposes.

Transmitter Type NivuSonic CO:

2 glands M20 x 1.5
2 dummy plugs M20 x 1.5
1 gland M16 x 1.5
2 dummy plugs M16 x 1.5
Using the accompanying cable glands the following outer cable dimensions can be reliably connected:

M16 x 1.5   3.5 mm – 10.5 mm
M20 x 1.5   6.0 mm – 14.0 mm

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 transmitter clamp terminals ensure a safe connection of single- and multi-wired cables with cross-sectional dimensions of 0.18-2.5 mm².
Due to reasons of better handling the flow velocity sensors are connected using plug connections.
The pre-configured NIVUS sensor cable ends or single- as well as multi wired cables with cross-sectional dimensions of 0.18-2.5 mm² can be connected to these plug connections.
The 7-pole plug connections of the flow velocity sensors can be interchanged. It however is impossible to interchange 7-pole and 9-pole plug rail (9-poles = flow velocity sensor or adapter box connection) due to mechanic construction.

For connection to terminal clamps use a flat-bladed screwdriver with a blade width of 3.0 mm or 3.5 mm. To connect the sensors to the plugs use a flat-bladed screwdriver with a blade width of 2.0 mm or 2.5 mm.
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 safe opening and proper contacting.

Please use the supplied lid and both accompanying screws to lock the terminal clamp housing in a way that protects water or dirt from leaking into the enclosure and to ensure that the unit protection rating according to DIN EN 60529 will be preserved.
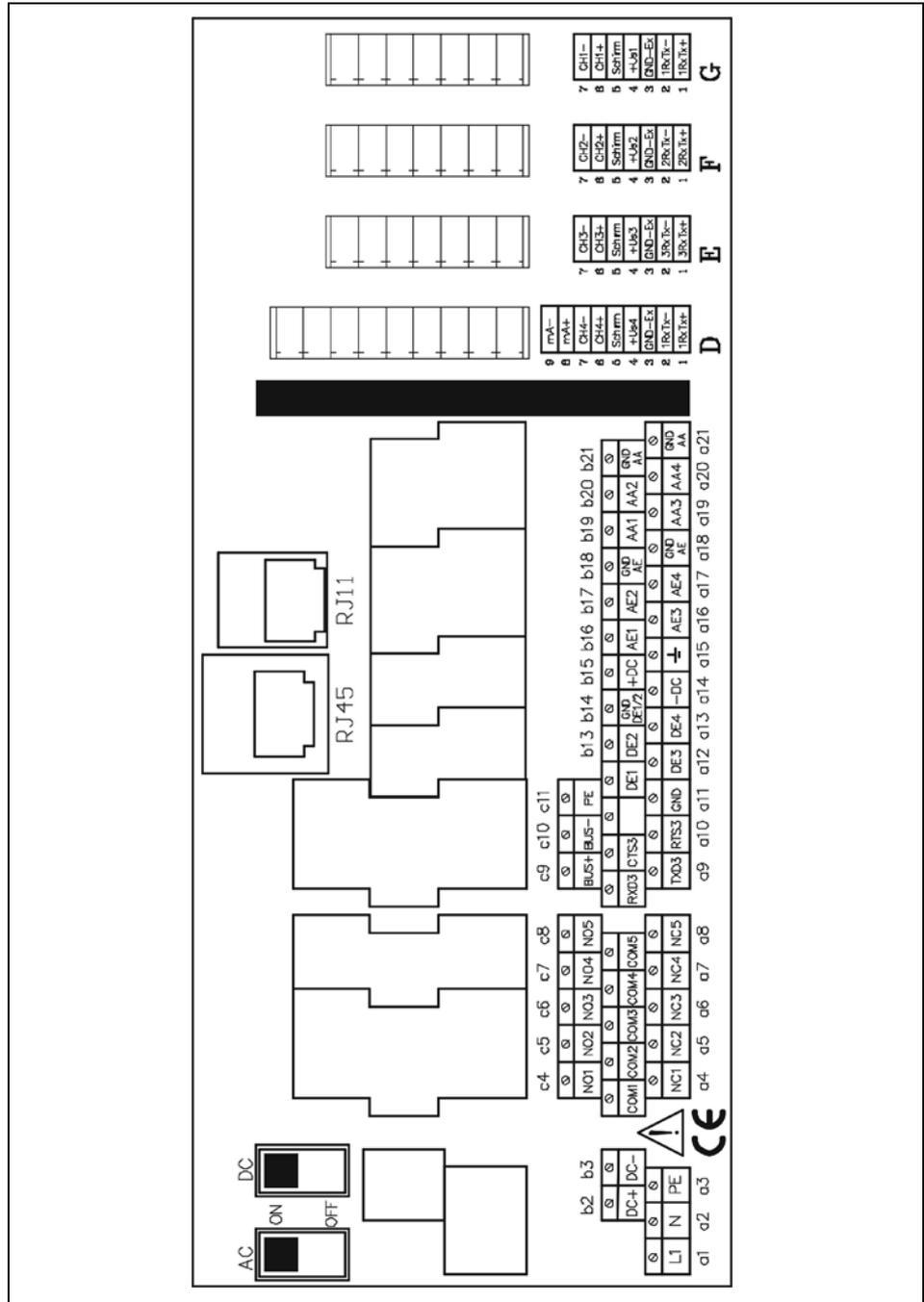
Fig. 6-2   Clamp wiring NivuSonic CO wall mount enclosure

6.3 Sensor Installation and connection

6.3.1 Sensor installation

The inserted sensors have to be fastened hard and tight. Use only non-corrosive fastening material! Before installing the sensor, please check material and wall thickness of the pipe. The material should be cast steel, steel or stainless steel. These materials can be selected directly from the start-up menu.

Before mounting the sensors, the transmitter must be programmed (see chapter 8).

Subsequently install the first sensor in flow direction according to the respective marking.
Apply coupling paste to the surface touching the pipe, thread the clamp band and attach the sensors on the pipe with the arrow pointing in flow direction (according to path arrangement).

Fig. 6-3   Sensor pair (sensor A and B)

Please use the delivered clamp bands (mounting accessory) for mounting. First shorten the clamp band to the length required. Then insert the clamp band into the slotted clamp and bend it over (see Fig. 6-4). Please observe to have the marked side of the slotted clamp facing upwards.


Fig. 6-4   Clamp band for clamp on sensors

Now put on the turnbuckle, fix it by folding over and tighten the knurled screw using an Allen® key.
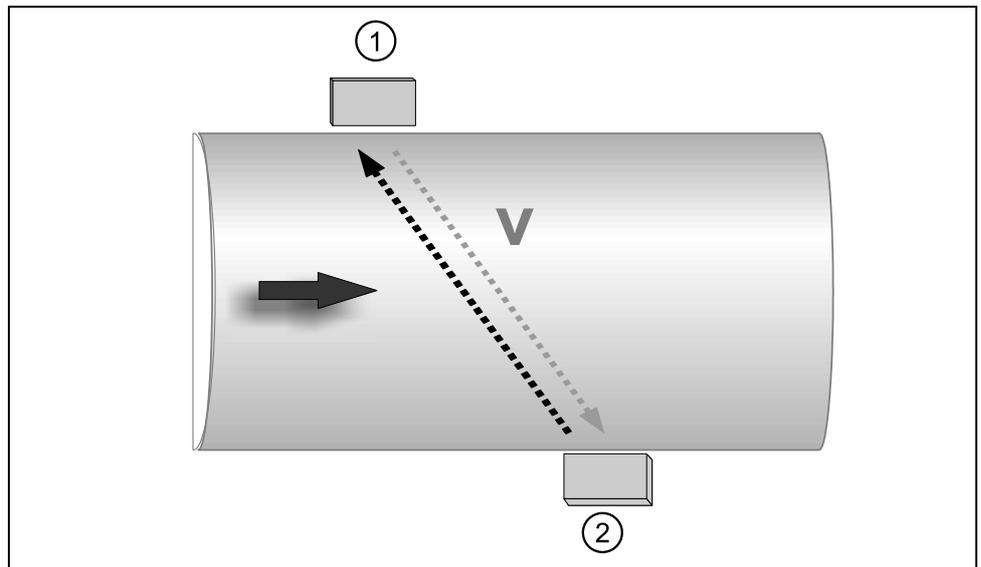Please observe to have a sufficient amount of coupling paste being applied to the sensor face.

Attach the second sensor parallel to the pipeline. The transmitter indicates the required distance to the previously mounted sensor. Then install the sensor as described before.
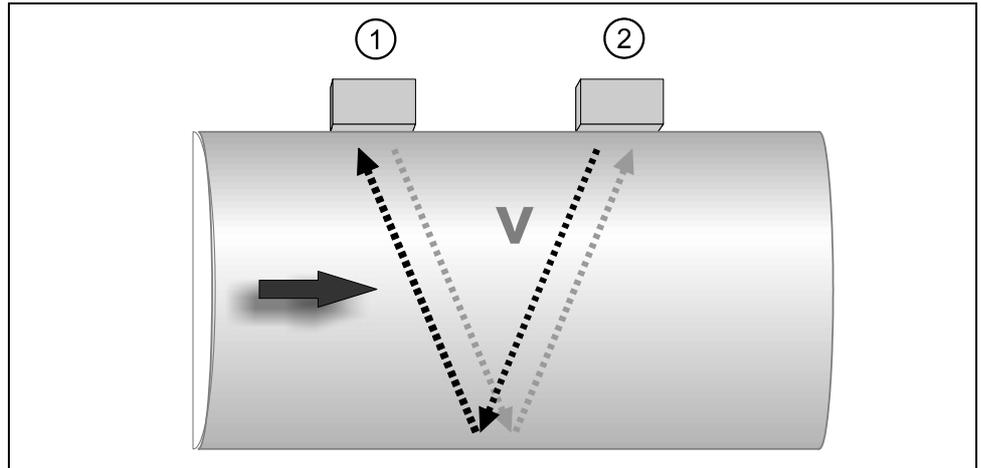
1   Sensor 1
2   Sensor 2

Fig. 6-5   1 path measuring, path arrangement: v echo

1   Sensor 1
2   Sensor 2

**Fig. 6-6   1 path measuring, path arrangement: diagonal**

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

Accurate sensor adjustment is very important. You can check it here in the menu item I/O-sensors-LDV signal strength (see Fig. 8-65). Readjust the sensor alignment on one sensor only. After reaching the highest possible signal strength fix the sensors by tightening the turnbuckles.

The minimum bending radius of the standard signal cable is 10 cm (3.94 in.) Smaller radii may result in cable break and, in case of using sensors with integrated air hose, kinked and blocked compensation lines (faulty or failed level measurement)!

In case of horizontally laid pipes avoid pipe top and pipe bottom as mounting place (risk of soiling or air bubbles resulting in measurement failure).
NIVUS recommends a mounting position of -45° ... +45° to the horizontal..
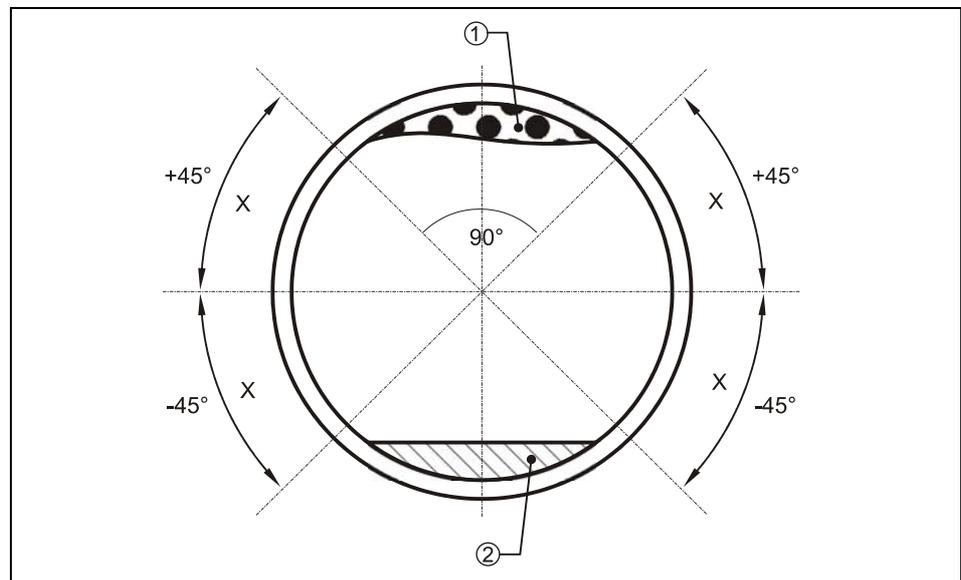
X = Recommended sensor installation positions
1 = Risk of air-bubbles
2 = Risk of sludge deposits

Fig. 6-7   Recommended installation angles

### 6.3.2 Choosing Sensor Position and Required Distances

Clear and defined hydraulic conditions are indispensable prerequisites for accurate measurements. This is why one has to be especially attentive to the required hydraulic calming sections.

- The pipe must be fully filled

- Falls, steps, fittings, profile change of channels or lateral supplies right in front of or behind the measurement point have to be avoided!

- The length of the approach channel must be min. 5x nominal diameter, the length of the discharge channel must be min. 2x nominal diameter. Longer sections may be required however in case of disturbed hydraulic conditions and distorted flow profiles resulting from these conditions

- Avoid measuring in bevelled pipelines or in pump intake lines.
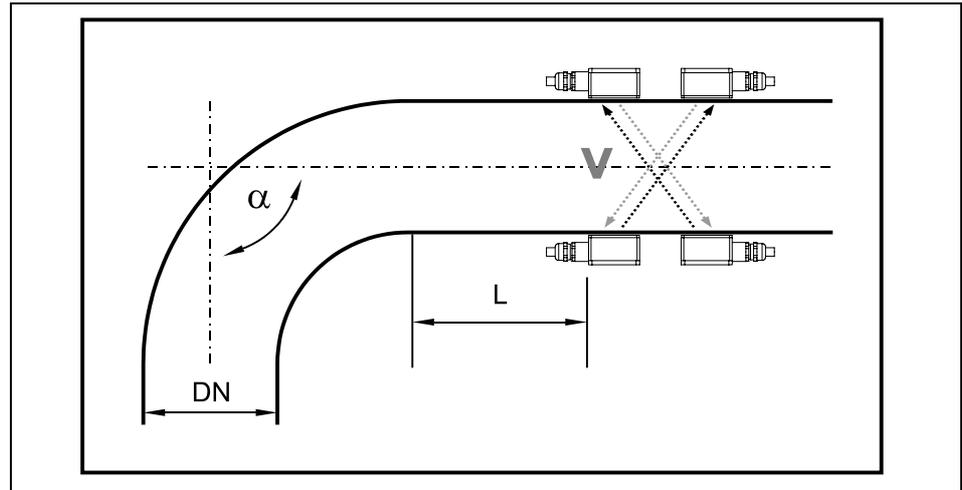
α ≤ 15°	L ≥ min. 3x DN	L ≥ min. 5x DN
α ≤ 45°	L ≥ min. 5x DN	L ≥ min. 10x DN
α ≤ 90°	L ≥ min. 10x DN	L ≥ min. 15-20x DN

Fig. 6-8   Sensor position behind curves or elbows
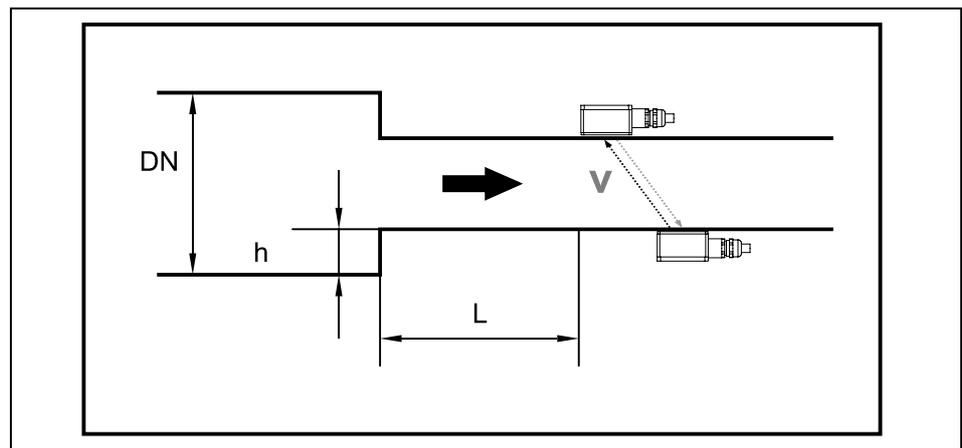
h ≤ 5% von DN	L ≥ min. 3x DN
h > 5% von DN	L ≥ min. 5x DN
h ≥ 30% von DN	L ≥ min. 10x DN

Fig. 6-9   Sensor position after change of profile

A correct and reliable measurement can be performed only in full filled pipes. For this reason do not install measurements in downpipes or at the highest point of the pipeline.
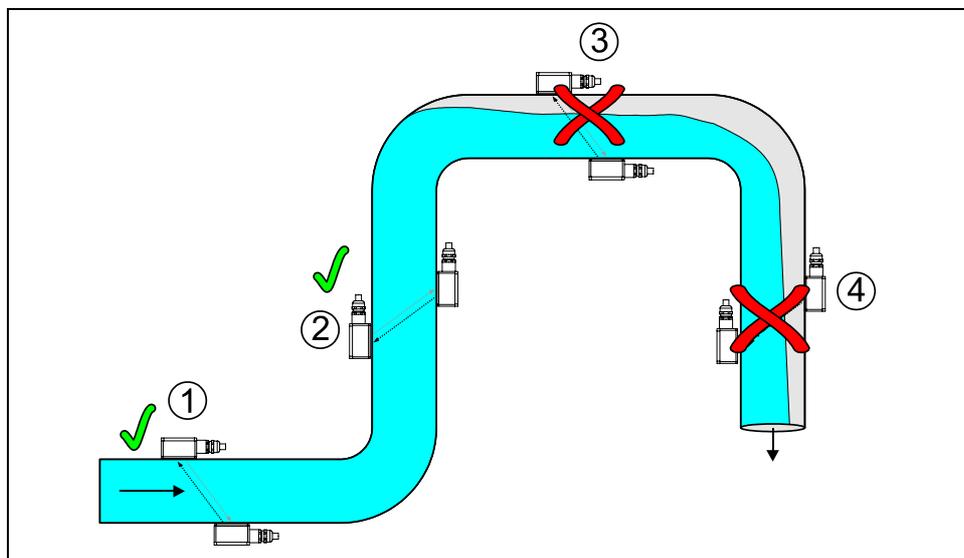
1 = recommended range in almost horizontal position
    (sensors can be installed on the side)
2 = recommended range in vertical pipe
3 = not recommended due to part filling/idling
4 = measuring impossible due to idling

Fig. 6-10   Comparison of installation places

In case of planning measurements in horizontal pipelines we recommend to consider a slightly inclined section or an inverted siphon.
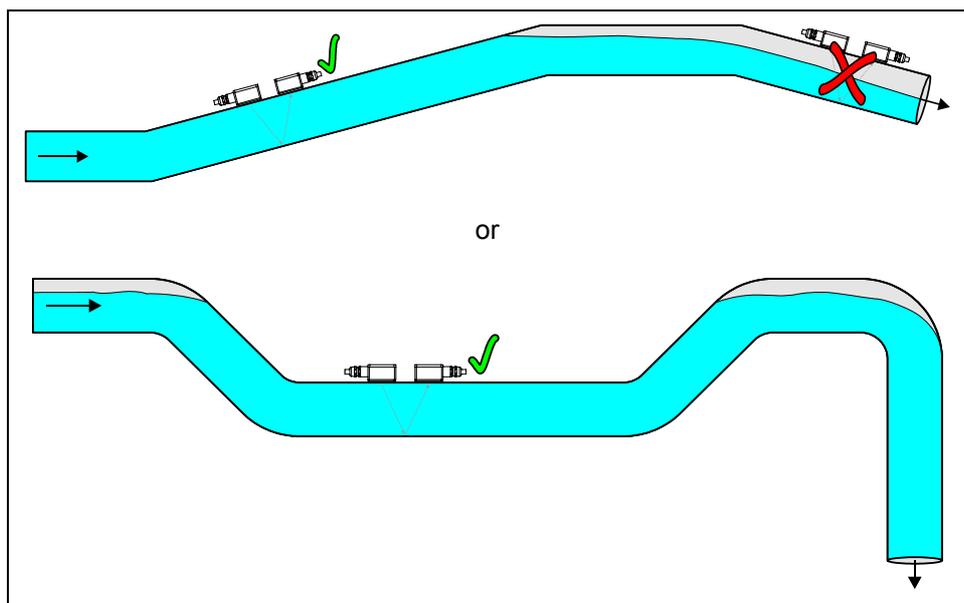

or

Fig. 6-11   Horizontal pipe with inverted siphon

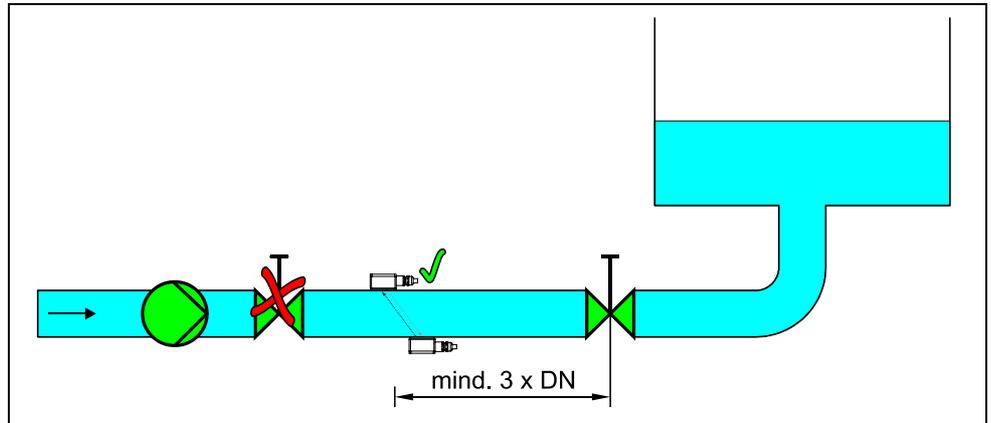Shut-off valves and control fittings shall be installed **always downstream** of flow velocity sensors.

Fig. 6-12   Using shut-off valves and control fittings

6.3.3 Sensor Connection

The sensors are available with permanently attached cable. It is not allowed to extend or shorten the sensor cable. Connect individual path sensors directly to the NivuChannel transmitter (one or two sensor pairs). Use only the dedicated cable provided by NIVUS for connection and / or extension purposes.
The sensor cable can be ordered from NIVUS using the respective article no. (see).

It is not allowed to use common extensions in case of different applications or to use a common signal cable to extend separate level and flow velocity measurements.

Connect sensor cables to the transmitter in the sensor terminal clamp strip. The following wiring diagram applies when connecting clamp on sensors:
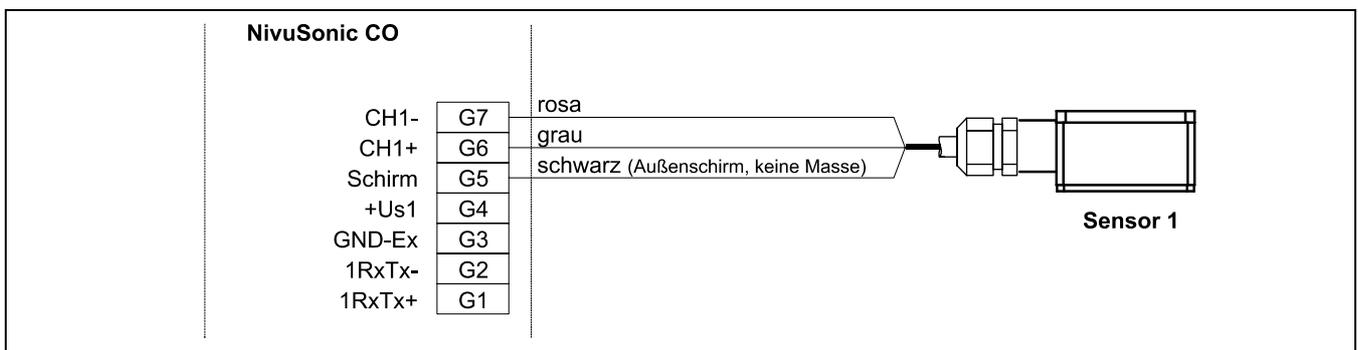

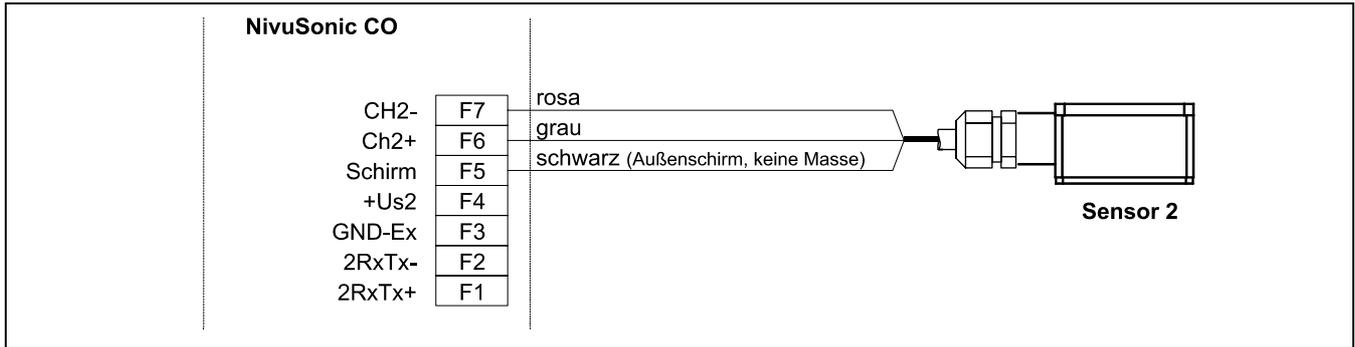**Fig. 6-13   Connection of sensor 1 to the NivuSonic CO**

NivuSonic CO

CH2-	F7	rosa
Ch2+	F6	grau
Schirm	F5	schwarz (Außenschirm, keine Masse)
+Us2	F4	
GND-Ex	F3	**Sensor 2**
2RxTx-	F2	
2RxTx+	F1	

Fig. 6-14   Connection of sensor 2 to the NivuSonic CO

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

6.4   NivuSonic CO Power Supply

Depending on the type of NivuSonic CO k used, it can be supplied with 85-260 V AC. Also possible is a 24 V DC supply (see chapter 4.4).
The two slide switches located above the terminals serve as additional power switch.
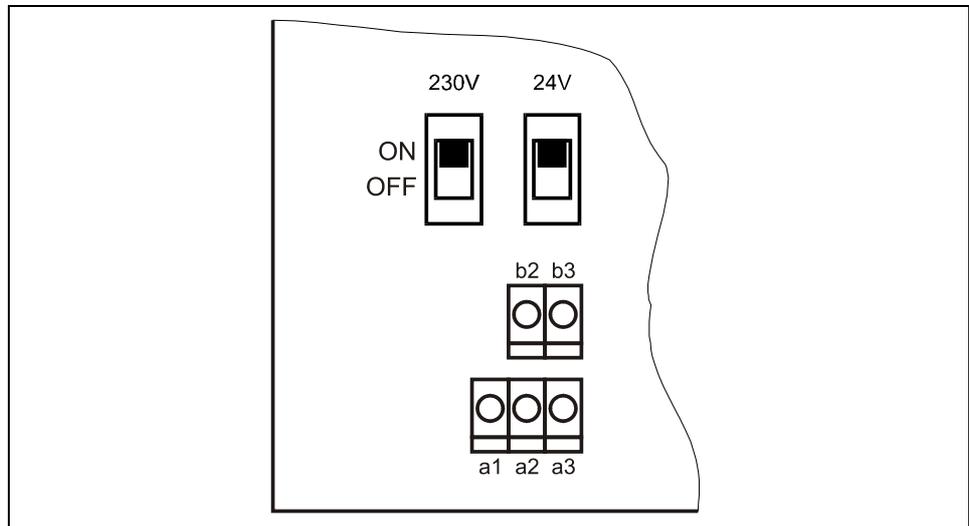
Fig. 6-15   Slide switch position on the bus board

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

During AC operation the DC supply clamps b2 and b3 provide an auxiliary voltage of 24 V DC with a maximum rating of 100 mA (turn on 24 V-switch!). If using this auxiliary voltage (e.g. for feed control signals to digital inputs) please observe not to loop it through the entire switching circuit in order to keep the risk of inductive interference as low as possible
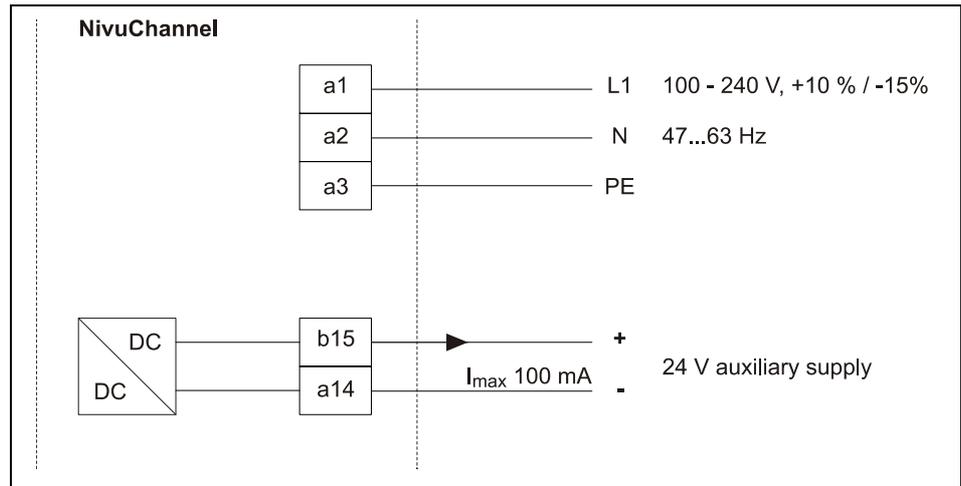
Fig. 6-16   AC model power supply
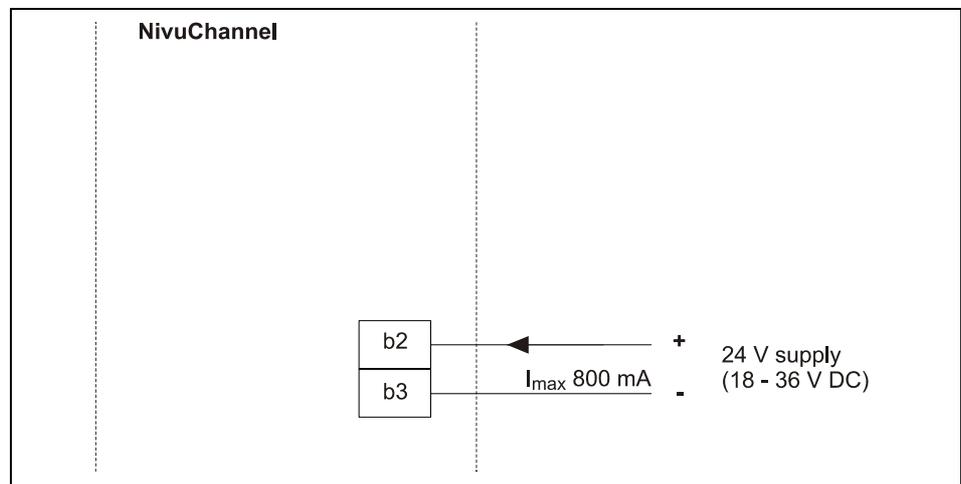
Fig. 6-17   DC model power supply

6.5 Overvoltage Protection Precautions

For effective protection of the NivuSonic CO it is necessary to protect power supply; mA-outputs and inputs
NIVUS recommends surge arrestors types EnerPro 220Tr or EnerPro 24Tr (for 24V DC) for the mains supply, as well type DataPro 2x1 24/24 Tr for mA-outputs and inputs.

Fig. 6-18   Connecting the overvoltage protection for power supply and analog inputs and outputs

6.6 Communication

6.6.1 General

The NivuSonic CO allows remote access via Ethernet. This means that the unit can be operated via internal web-server using its self-created website. Perform remote access as if being on-site.

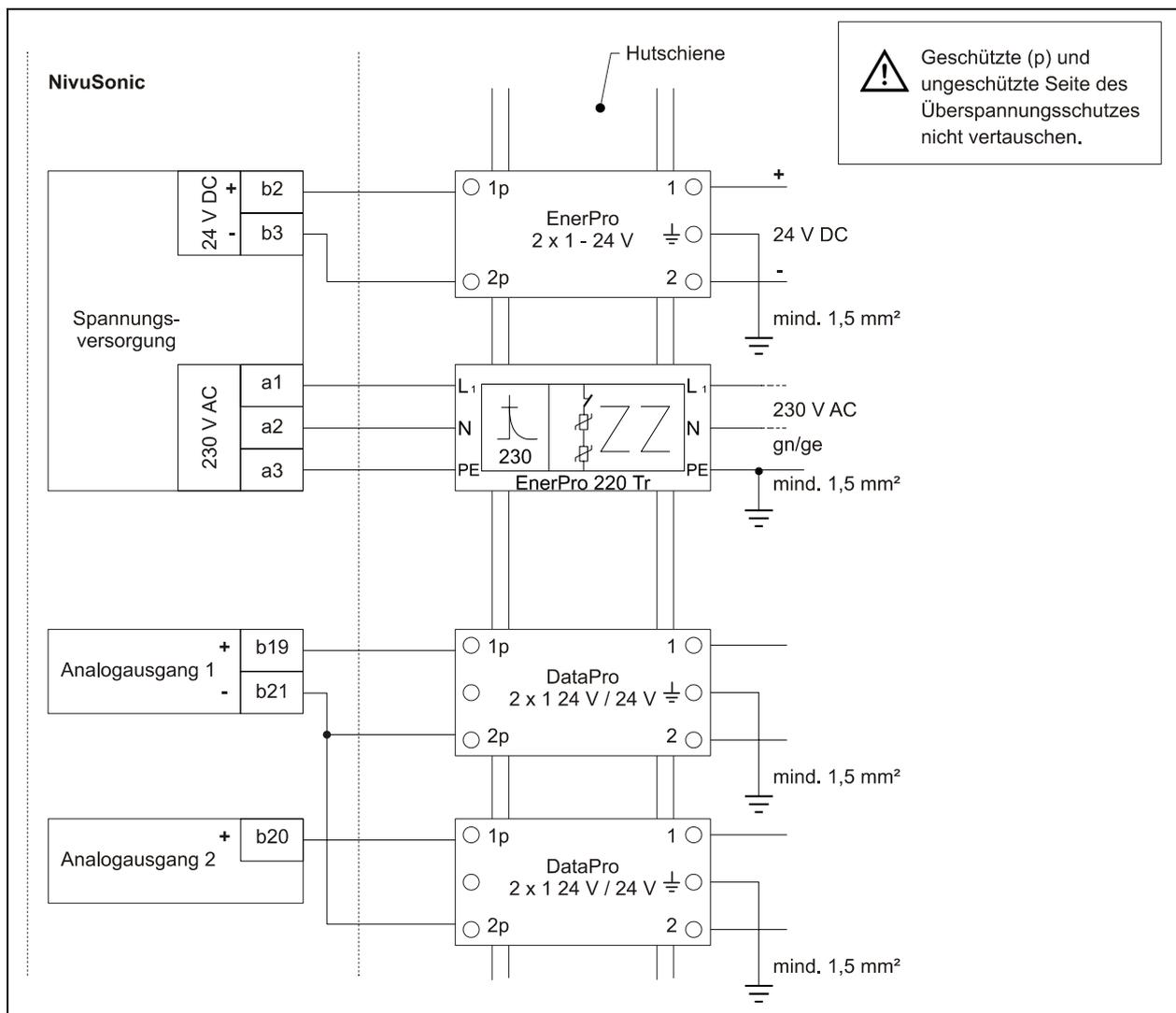Requirements:

- Intranet or TCP/IP network or:

- Internet access via provider (if connected via ISDN modem or GSM / GPRS modem)

- new Internet browser

- Java®

There is no need to install any additional software if there is the latest Internet browser and the latest Java plug-in available on your network PC/Laptop.

If you wish to access the unit via the NIVUS Internet portal it is necessary to have a permanent Internet connection established (modem or DSL). Once having programmed the NivuSonic CO and setting up data transmission the unit can be accessed from any PC in the world!

Do not confuse NivuSonic CO remote access and process conducting systems. The remote access to the NivuSonic CO requires direct dialog with the user via PC. There is no real-time access. It is not possible to carry out automatic data transmission. A separate MODBUS TCP connection to the unit is provided optionally for this purpose.

Depending on the user's status the following functions are either accessible or locked:

Viewer

- operational conditions, progress lines, sensor status etc. can be selected and viewed

- saved data and parameter files can be downloaded

- settings can be selected but cannot be modified permanently

- data files cannot be deleted

- no transmitter updates possible

Operator

- operational conditions, progress lines, sensor status etc. can be selected and viewed

- saved data and parameter files can be downloaded

- device settings can be modified permanently

- data files can be deleted

- memory card can be formatted

- device updates possible

Administrator

All rights see operator level. Additionally:

- setting up new units

- administration of unit levels, sub-users and operating levels

Depending on the type of transmitter (see chapter 4.4) there are various ways for data communication. Select from:

- Ethernet

- Analog modem

- ISDN-Modem

- GSM/GPRS modem

Remote access will cause access expenses on behalf of the unit as well as on behalf of the viewer/operator. These expenses may vary in terms of different providers, time online, flat rate or similar agreements and are not influenced by NIVUS.

The system operator is responsible for the amount of future communication expenses arising.

6.6.2 Communication Options

The following different options are available for communication with the NivuSonic CO:

- Direct Ethernet connection between PC/Laptop and NivuSonic CO using a cross-link cable.

- Ethernet level connection via TCP/IP, network connection via Ethernet hub or switch. It is required to use patch cables.

- Connection via network server using DHCP (Dynamic Host Configuration Protocol) and/or DNS (Domain Name Server).
  See a diagram depicted in Fig. 6-20 .

- Internet connection via access portal (see Fig. 6-21)
  It is required to use a NivuSonic CO equipped with according hardware such as analog modem, ISDN modem or GPRS to set up such a connection.
  The setup is described in Chapter 6.6.3.

- Connection to SCADA systems via Modbus TCP (Ethernet)

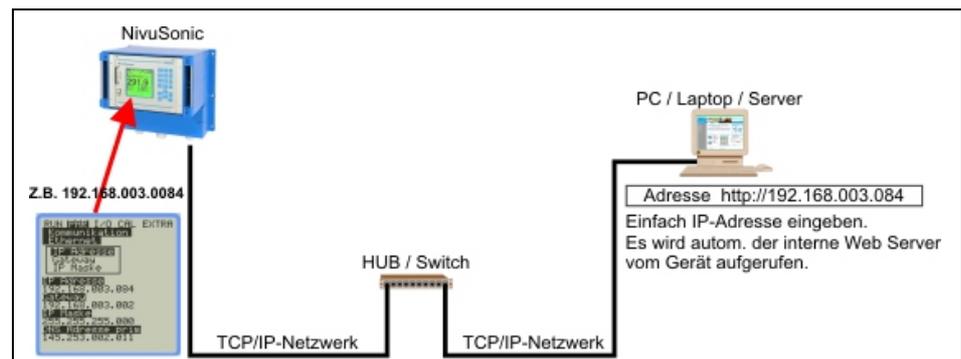- Data or alarm transmission vie e-mail or FTP server
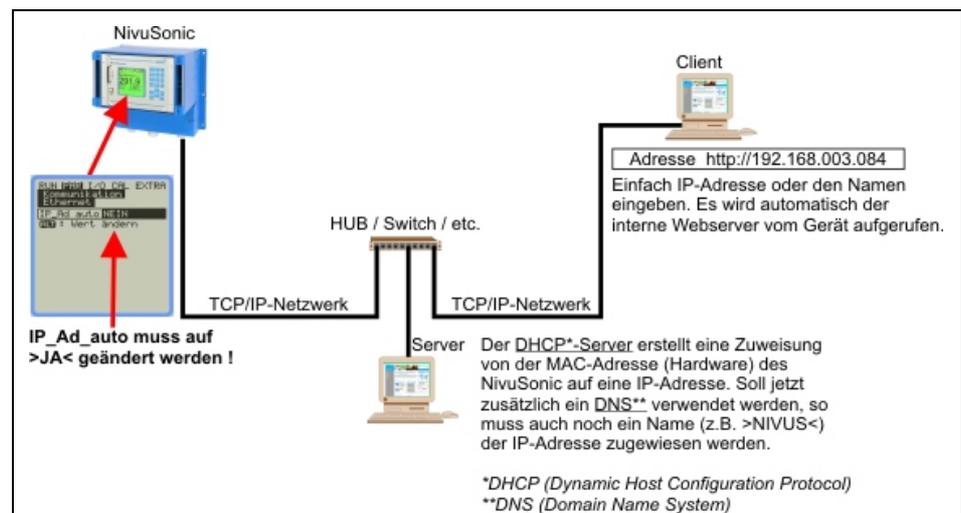

Fig. 6-19   Communication without Server

Fig. 6-20   Communication with Server

1. Select your unit on >www.nivus.com< using the access portal.

2. The portal will "wake up" the unit sending a direct call (ring).

3. The NivuSonic CO is setting up Internet access logging in to the portal subsequently.

4. The portal is going to establish a connection between unit and user using the internal NivuSonic CO web server.

Fig. 6-21   Communication via Internet

6.6.3   Communication Setup and Connection via Access Portal

Setting up an Internet communication for one or several NIVUS flow measurement units requires an initial setup by NIVUS or a company which is authorised by NIVUS

Setting up a modem connection (analog, ISDN,GPRS or similar) will cause communication expenses depending on the connection chosen. Please observe while transmitting data.

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

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

www.nivus.de or www.nivus.com

The start screen of the NIVUS homepage will appear.

On the right-hand side of the start screen you can find the **measurement online** login area with the fields „User Name" and „Password".

You are going to receive both codes after the initial setup has been carried out by NIVUS. We highly recommend to change the password during the first log-in.
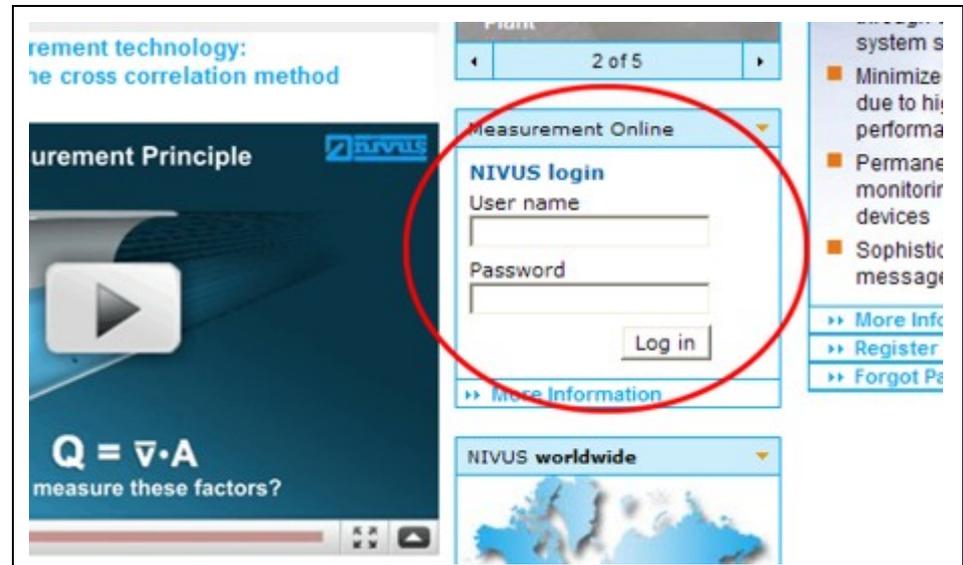

Fig. 6-22   Start of communication

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

After entering the valid user name and password a selection page will appear. This page indicates any measurement place registered for this user. The measurement places can be selected directly from here.
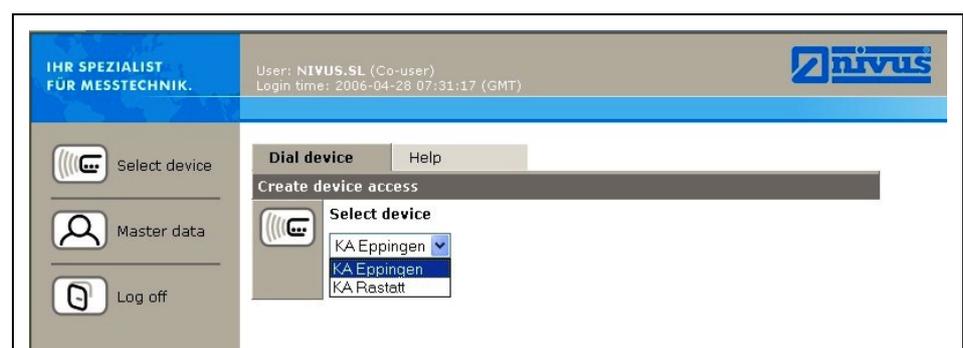

Fig. 6-23   Measurement place selection

After selecting the desired measurement place and clicking the >Connect< button communication with the selected NivuSonic CO will be established. User name and password are going to be verified again and the homepage contained in the NivuSonic CO will be transmitted.

This may take between 15 and 120 seconds depending on modem type and type or quality of connection.

Fig. 6-24   Connecting

6.6.4   Data Transmission

After connection has been established successfully, first of all a static page with current measurement values (flow rate and flow velocity) will be indicated on the right-hand side of the screen. These numeric values can be refreshed automatically in intervals of 2, 5 or 10 seconds by clicking the according field below and setting the cycle time subsequently

Fig. 6-25   Static communication page

Clicking the >Remote Control< button on the left-hand side of the screen will initially start a JAVA® applet. If the JAVA® software is not installed on the PC, it can be downloaded for free by clicking the JAVA® button (next to the word >Remote Control<) which will open up a direct link to JAVA®.

Remote control is not possible if the „JAVA®" software is not installed on the operator PC!

The Java© Applet is a third party software and NIVUS therefore cannot accept any liability of the use of it.

Download and installation of programs or software may damage your computer and is therefore completely left at user's risk!

Fig. 6-26   Java® Applet starting

After starting JAVA® successfully, the NivuSonic CO display now is indicated in the same manner as if being on-site.

The NivuSonic CO can now be operated by using the PC keyboard (arrow keys >left<, >right<, >up<, >down< and >Enter<, >ESC< and >ALT<) exactly the same way as if using the keys on the unit front board.

It is possible to operate the virtual keys on the screen by clicking with the mouse as well.

Please observe the delay occurring due to the kind of transmission (→ no quick consecutive control entries, but always one movement at a time after the previous command has been executed visibly).
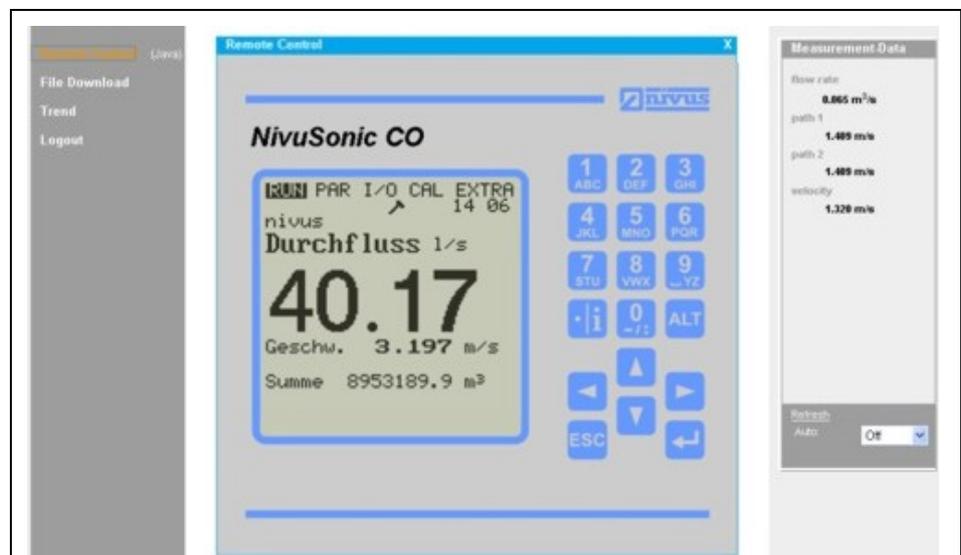

Fig. 6-27   Visualisation of online connection

By clicking the control element >File Download< underneath the >Remote Control< button it is possible to directly download data from the plugged memory card. Information on the card will NOT be deleted automatically which ensures data to be available on later downloads.

After double-clicking the desired file can be either opened directly or downloaded in uncompressed original format or as compressed gzip-file.

The .gz-files can be unpacked for further use with WinZip.

The file size will be reduced by approx. 75 % by using the .gz-format and hence is recommended particularly if large measurement place files have to be transmitted via analog modem and GPRS (reduces expenses).
You can find more information on the NivuSonic CO file structure and how to use the single files in chapter 8.5.8.

It is not possible to transfer data files if the memory card is not plugged and storage is disabled!
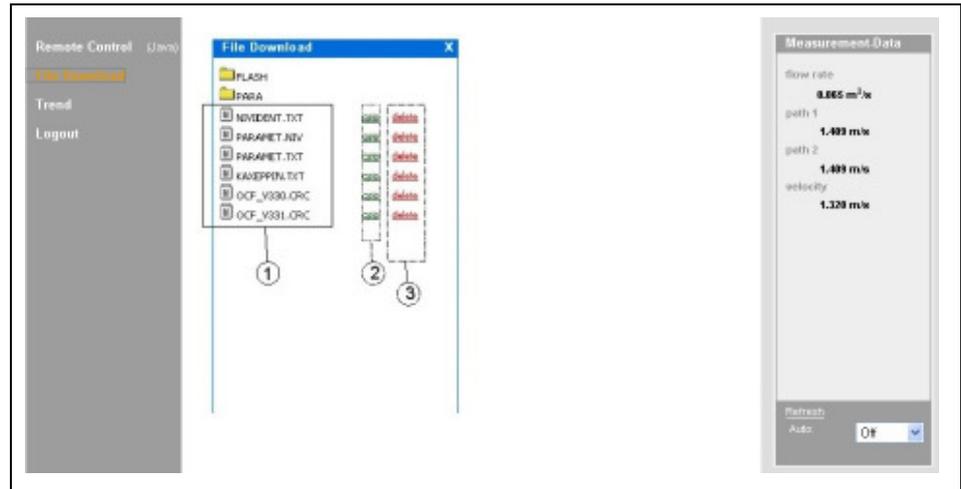
1   Uncompressed downloadable files in original format
2   GZIP-file area
3   Delete area (to be moved into backup folder)

Fig. 6-28   Selecting the file to transmit or to delete
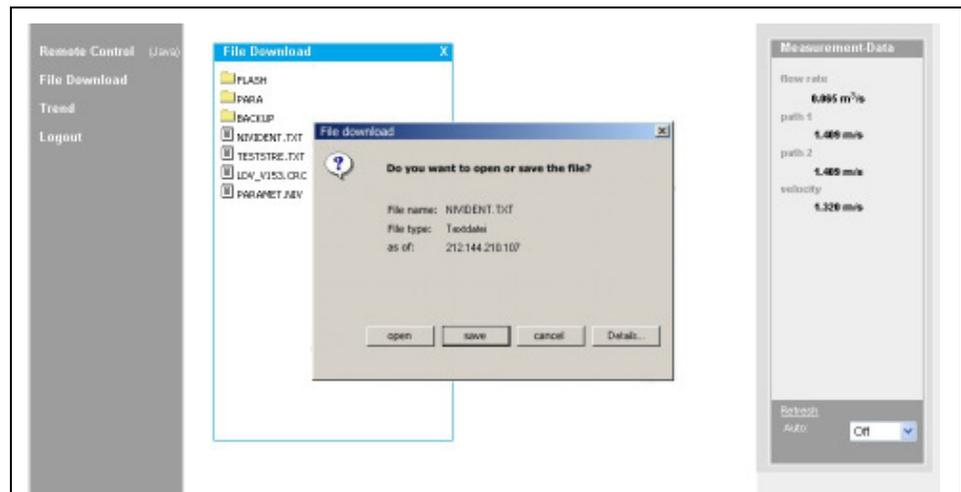

Fig. 6-29   Saving transmitted files on PC

The selected file can be deleted by double-clicking it in area 3 (see Fig. 6-29). In order to be able to read or to transmit the file later, this action will move the file into a backup folder which has been created automatically.
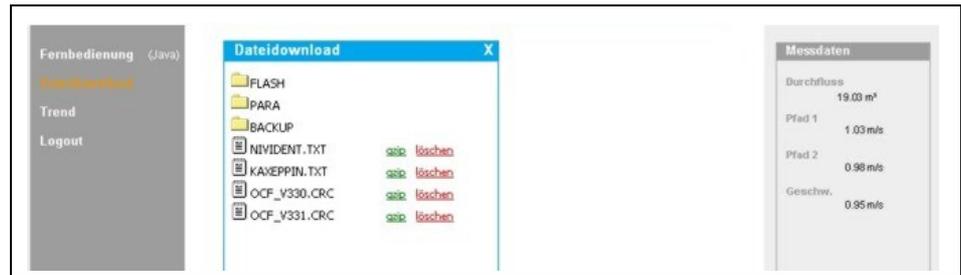
Fig. 6-30   Created backup folder

Files which have been moved into the backup folder will be deleted irrevocably and permanently from the memory card if clicked again for deleting.
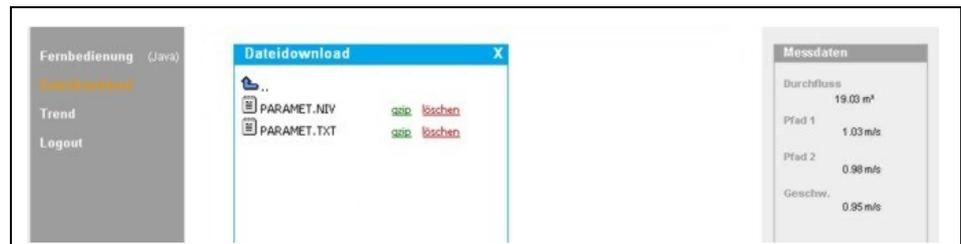

Fig. 6-31   Contents of created backup folder

**Fig. 6-32   Permanently deleting a stored file**

Transmitting the measurement place file without deleting it or moving it into the backup folder will cause to attach all future readings to the transmitted file. This is going to blow up the size of the file, as "old" data which have been transmitted before are going to be transmitted again!

Deleting a file (moving it into the backup folder) while having a file with the same name in the target folder will cause the older file to be overwritten without any additional warning!

A click on the >Trend< button on the left-hand side enables to indicate a trend graph parallel to the trend screen indicated on the NivuSonic CO to visualise data stored in the internal unit memory. The range of data to be indicated covers a maximum of 90 days.

The screen below comes up after clicking:
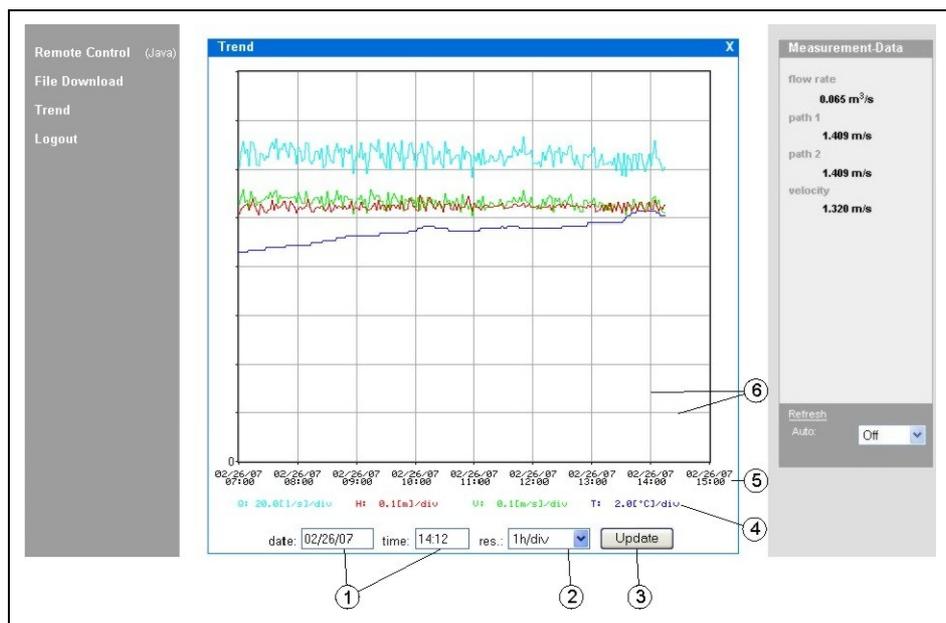
1   Display range
2   Resolution (time scale)
3   Update button
4   Scale of readings
5   Time axis
6   Scale grid

Fig. 6-33   Online trend graph

Flow volume, fill level, average flow velocity and medium temperature are going to be indicated as coloured progress lines. The units here are equal to the units indicated on the NivuSonic CO display (see chapter 8.4)

The readings on the y-axis are going to be scaled according to a grid in steps of 0,1; 0,2; 0,5; 1; 2; 5; 10 ..... up to a maximum of 10000. Here the selected scale unit is equal to a horizontal grid line (see point 6 in Fig. 6-33). Set the start point for the trend graph to be indicated under point 1. The resolution (scale of the time axis) can be set under point 2. Select here between 10 minutes, 1 hour, 6 hours or 24 hours/grid line.

A click on the >Update< button (point 3 in Fig. 6-33) will refresh the screen by the new measurement data which have been collected whilst watching.

If the selected start date/time of the trend is the current date/time or if the time axis range allows to view a greater range than selected by start date/time and resolution this will cause the screen to indicate older values than selected additionally.

Log out the on-site unit by using the >Logout< button located on the left-hand side of the screen as well. This will take you back to the NIVUS homepage.

If no data transmission has been executed for 5 minutes, the Nivu-Sonic CO will automatically interrupt the connection in order to avoid unnecessary expenses.

7 Initial start-up

7.1 General

Notes to the user

Before you connect and operate the NivuSonic CO ayou should strictly follow the notes below!

This instruction manual contains all necessary information to program and to operate the device, addressing qualified technical staffs that have appropriate knowledge about measurement technology, automation technology, information technology and waste water hydraulics.

To ensure a correct function of the NivuSonic CO this instruction manual must be read thoroughly!

The NivuSonic CO must be wired in accordance with the wiring diagram, see chapter 6.2.3!

B If any problems regarding installation, connection or programming should occur please contact our technical division or our service centre.

General Principles

The initial start-up is not allowed until the installation has been finished and checked. To exclude faulty programming this instruction manual must be read before the initial start-up. Please get familiar with the NivuSonic CO programming via display and keyboard by reading the instruction manual before you begin to program the device. After transmitter and sensors are connected (see chapters 6.2.3 and 6.3.3 the parameters must be set.

In the most cases all you need is:

- geometry of the measurement place (Type) and dimensions

- used sensors, positioning and alignment

- display units

- span and function of analog and digital outputs

The NivuSonic CO user surface was designed in a way that even unfamiliar users are able to easily set up basic settings in graphic dialog mode which ensure reliable device operation. For extensive programming, difficult hydraulic conditions, special channel shapes, in case of absence of expert staff or if a setup and error protocol is required, the programming should be carried out by the manufacturer or an expert company which is authorised by the manufacturer.

7.2 Operator Panel

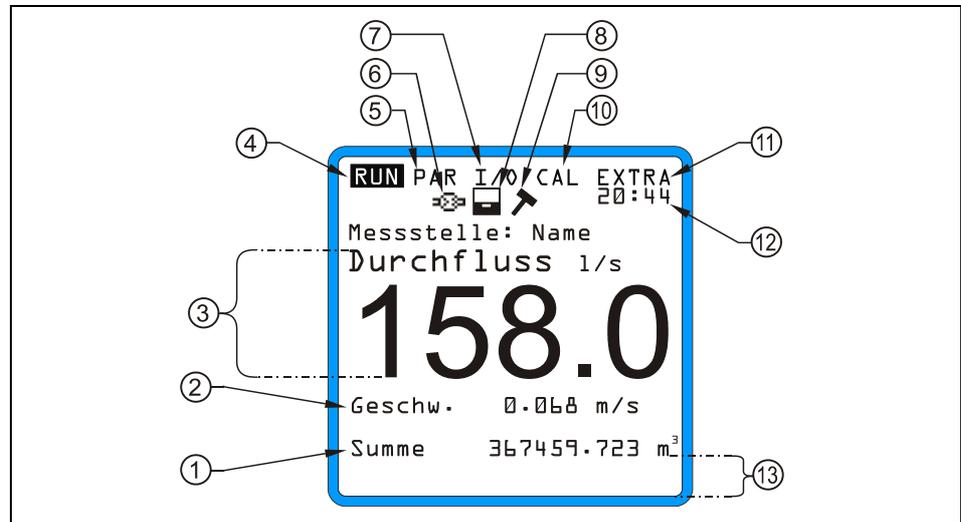There is a comfortable 18-button keypad available to input required data.
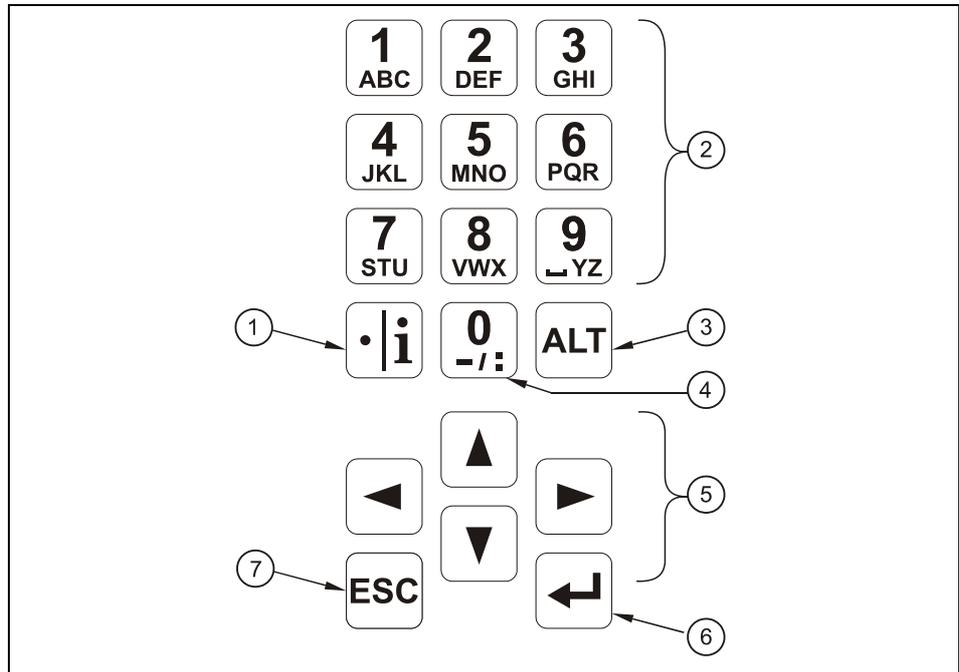
1 Comma / info
2 Figure – letter block
3 Shift key
4 0 / - navigation button
5 Control
6 Enter
7 Escape

Fig. 7-1   Operator panel

7.3 Display

The NivuSonic CO has a large back-lit graphic display with a resolution of 128 x 128 pixel. This ensures a comfortable communication mode for the user.

1 Total
2 Velocity
3 Flow measurement
4 Operating menu
5 Parameter menu
6 Indicator during communication via Internet
7 Status menu of inputs and outputs as well as sensors
8 Display activates storage mode
9 Display activates service mode
10 Calibration menu
11 Display menu
12 Current time / Medium temperature, fluctuating
13 Area for linearisation of digital outputs

Fig. 7-2   Display

Five basic menus can be selected, visible in the headline of the display. They can be selected individually. The menus are:

RUN   Standard operation mode. Apart from indicating the names of measurement places it allows to display time, flow volume, flow level and average flow velocity as well as to optionally show flow velocity, day totals error messages including a function enabling to record flow volume, flow level and average flow velocity.

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

I/O   This menu includes information about internal operation of the NivuSonic CO. All current values can be displayed, as well as the values of analog and digital outputs and relays. All current values can be displayed, as well as the values of analog and digital outputs and relays. Additionally, single velocities are displayed. It further allows to determine the remaining capacity as well as the remaining memory time on an optionally plugged memory card resulting from the cycle time.

CAL   Here it is possible to adjust height (depth) and flow velocity of analog outputs and to simulate analog as well as digital outputs.

EXTRA   This sub-menu includes basic display settings: contrast, lighting, language, units, system times and totaliser presets.

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 to select main menus.

▲ ▼   Buttons for scrolling within menus.

↵   Selected submenus can be entered, inputs can be opened. The "Enter" key further serves to confirm data entries.

ESC   Escape submenus step by step. Cancels entered data.

1/ABC – 9/YZ   These buttons are used for parameter setting and to enter digits. In some sub menus the buttons are to input letters (e.g. name of measuring point). Function compares with mobile phone or cell phone buttons: multiple quick pressing switches over to the next letter. The cursor will jump to the next digit if no key will be pressed for approx. 2 seconds.

·/i   The key "dot/i" serves for entering digits. In RUN-Mode it also re-calls internal information on device, software version, MEG address, serial no. of transmitter as well as the serial no. of the DSP used.

ALT   This button is to switch between uppercase and lowercase letters in text entry mode. Further it is used to delete and to insert data. In the rest of the parameter setting mode it enables/disables various functions, as well as SHIFT-key between various programming options.

8 Parameter Setting

8.1 Quick Guide Parameter Setting (Quick Start)

In case of standard applications – part filled standard channel; level and flow velocity measurement by one pair of sensors; 1x mA output for flow rate; 1x impulse output - normally just a few basic settings, such as the ones mentioned below are required:

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/height (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 channel dimensions

6. Menu: PAR – LDV Parameter – path arrangement: enter number of paths (enter number of sensor pairs) and select operating mode (v-echo).

Additional Settings

7. Menu: EXTRA – Display: adjust brightness and contrast if necessary

8. Menu: EXTRA – System time: adjust time if necessary

9. Menu: PAR – Measurement place – Name of measurement place: enter the name of the measurement place

10. Menu: PAR – analog outputs – Function: enable analog output 1 (flow)

11. Menu: PAR – analog outputs – output span: select output span

12. Menu: PAR – analog outputs – measurement span: select measurement span

13. Menu: PAR – analog outputs – error mode: define what level the analog output should take in case of error

14. Menu: PAR – Relay outputs – Function: enable relay 1 (select pos-total impulse)

15. Menu: PAR – Relay outputs – Pulse parameter: set impulse value and duration

16. Exit parameter setting. Save values by entering code number 2718 a

8.2 Parameter Setting Basics

The transmitter in the background operates with the settings which have been entered at the beginning of the parameter setting. Just after you finish the new entries, the system asks to accept the new values.
If "yes", it requires to enter the code number.

2718   Type in 2718 if prompted.

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

If a faulty code has been entered three times the parameter mode will be aborted. The unit will proceed to operate using the values set earlier. If the correct code has been entered the modified parameters are accepted and the system resets. This reset will take approx. 20-30 seconds.

Besides having the option to save modified parameters or to reject any modification by pressing >No< at the end of the parameter setting procedure, it is possible to jump back to the previous level using the >Back< function. This enables the user to modify settings which might have been forgotten without the need to buffer previously modified settings.
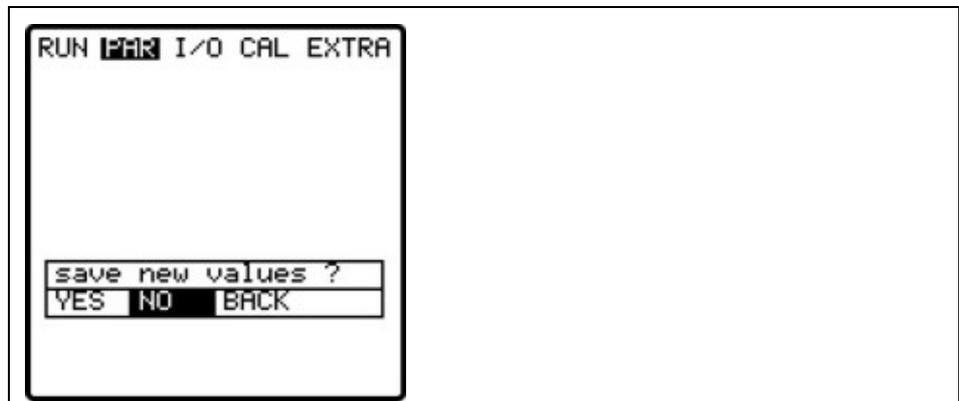

Fig. 8-1   Screen on end of parameter setting

If parameter settings are not going to be modified but just verified by selecting each parameter, there will be no request at the end of the dialog.
Modifications concerning language, units, contrast and display brightness do not require the code to be entered as these settings influence just the way of representation and not measurement or output.

This instruction manual describes all programming options of the Nivu-Sonic CO. 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 Chapter 2.3).

After mounting and installing sensor and transmitter (see previous chapters) activate the power supply.

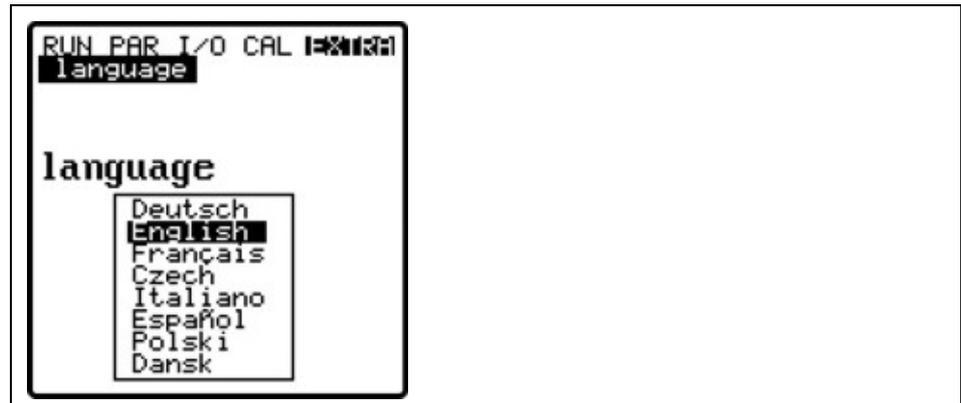The initial start-up dialog is the language selection:

Fig. 8-2   Language Selection

Select the desired language by using the arrow keys and press >Enter< to con-
firm.

Please press key once

The transmitter begins communication evaluating the flow velocity and coordi-
nates both processor programs. At the same time, you see the current versions
of CPU and sensor software on the display. This is required if problems should
arise during programming.
Due to safety reasons please reset the system afterwards (menu PAR / sub-
menu "setup parameter").
Now you are ready to begin setting your parameters.

*The system reset is allowed to be carried out only for a new unit. Custom pa-
rameters will get lost performing a reset and the unit will reset to factory de-
faults.*

8.3 Operation Mode (RUN)

This menu is a display menu for standard operation mode. Containing the following sub menus, it is not required for parameter setting:
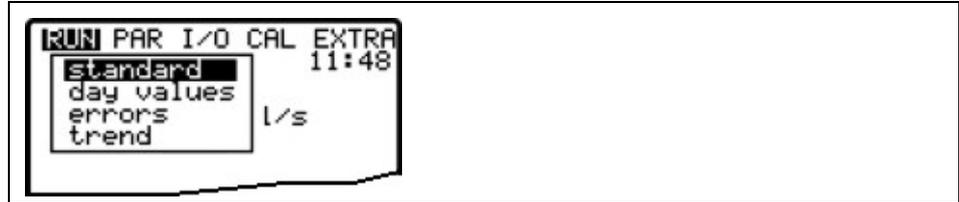

Fig. 8-3 Operation mode selection

Normal

Display (basic screen) with information about the name of measurement place, time, medium temperature, flow quantity, average velocity and total volume.

If the transmitter is disconnected from mains at the time of totalising set, it is not possible to create or to save a total for the respective day.

If the unit has been shut down temporarily between two totalising points, the flow rate missed during the inoperative period is not going to be considered for totalising. There will be no averaging interpolated replacing the lost flow rate!

Trend

Operates like an electronic writer. Average cycle values of level and average flow velocity will be recorded for the past 90 days. Values can be individually selected and viewed in a submenu.
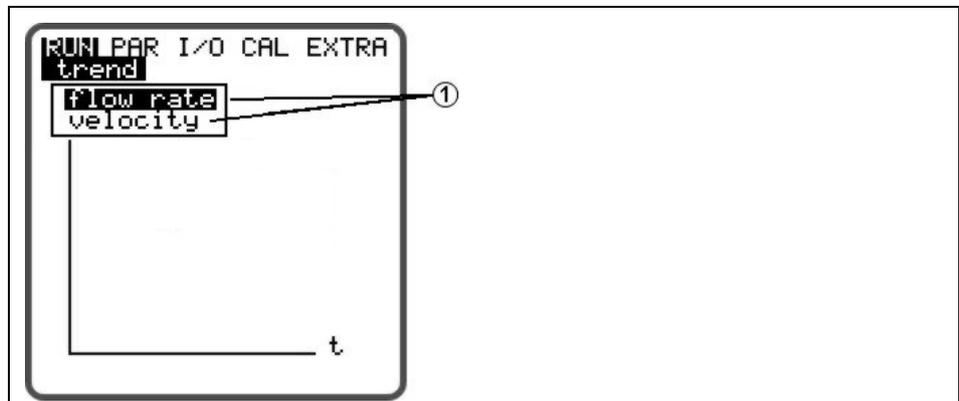
1   selection possibility of different displays

Fig. 8-4 Trend value selection

The period within which values have been averaged is indicated on the bottom line of the graphic display. New values will be added as vertical lines on the right-hand side each time after the programmed storage interval has expired (see Fig. 8-5). This is why the oldest value moves to the left-hand side of the display and from there into the internal memory area.
By using the arrow keys >left< and >right< you can scroll within the time axis in order to view older data sets. Browse through day values (steps of 24 hours) using the arrow keys >up< and >down<. This enables to determine and to evaluate previous measurements, trends, dry weather periods as well as possible measurement problems which have been occurred some days before.

The internal memory has a capacity of 90 days. Subsequently, saved data will be overwritten erasing the oldest data sets first.

Indicated measurement values will be scaled automatically during scrolling and therefore might change in order to ensure the best reading available.

The memory time interval can be set in the PAR - Memory Mode - Interval menu. The factory default setting is set to an interval of 2 minutes.
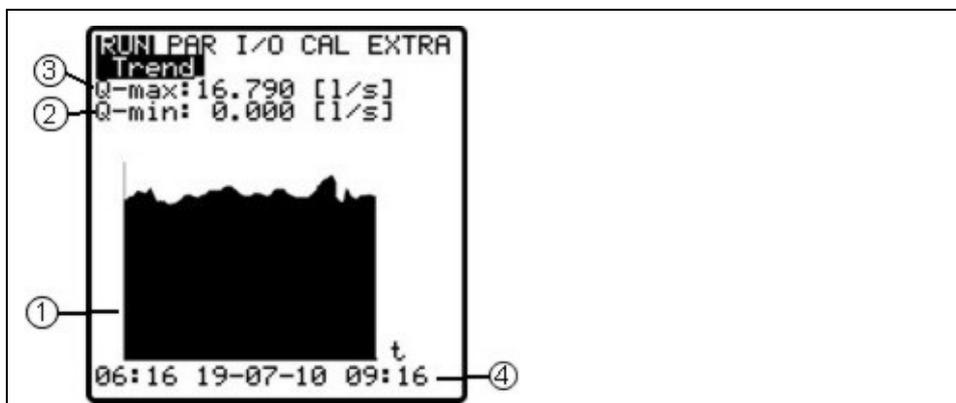
1 Graphic
2 Minimum value
3 Maximum value
4 Indicated period

Fig. 8-5   Trend graphic example

All trend graphic values saved previously will get lost if the memory interval or another parameter is going to be modified.

8.4   Display Menu (EXTRA)

This menu allows to modify settings such as basic screen, units, language as well as the display itself. The following submenus are available:
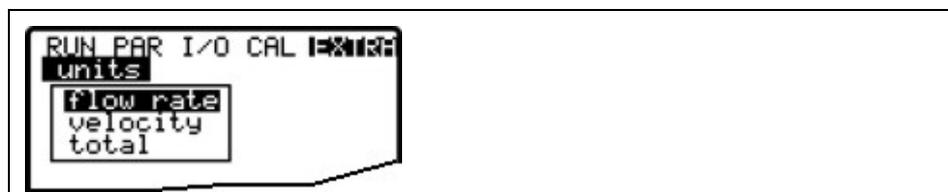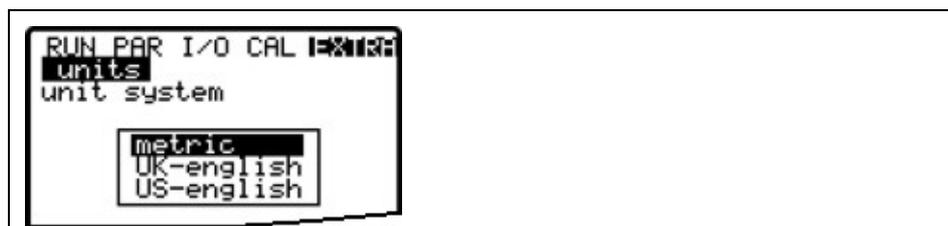

Fig. 8-6   Extra submenus
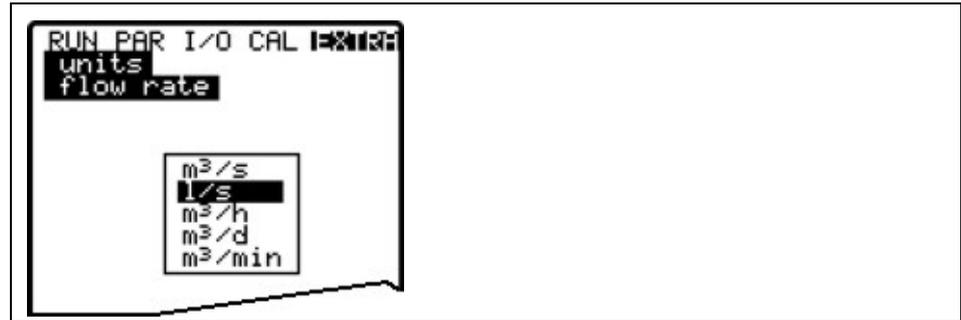

Fig. 8-7   Unit system selection

Fig. 8-8   Selection of individual units

Units

This menu contains the following sub menus:
- Flow
- Velocity
- Total

For each of these 3 measured values you can select a unit which appears on the display. Depending on the unit system selected, there are various units available.

Unit System

Here you can select between metric system (litre, cubic meters, cm/s etc.), English system (ft, in, gal/s, etc.) and American system (fps, mgd etc.).

Language

select from German, English, French, Czech, Italian, Spanish, Polish and Danish.

Display

allows to adjust display settings regarding contrast and brightness. Use ▼ and ◄ to decrease; ▲ and ► to increase values. ► and ◄ modify values in 5 % steps, ▲ and ▼ in steps of 1 %

System Time

In order to perform various control and memory functions, the unit includes an internal system clock saving dates of year, weekdays and week numbers. The clock settings can be modified if required (different time zones, summer time / winter time etc.).
First select the menu point "Info":
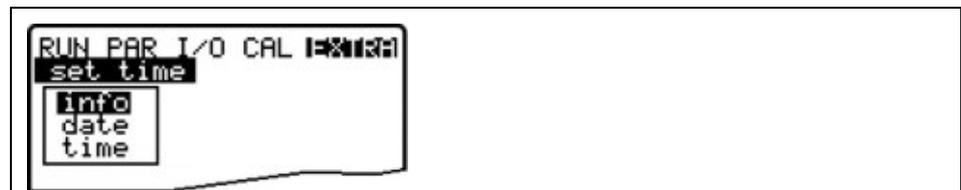
First select the Info submenu:#

Fig. 8-9   System time submenu

The complete system time is indicated after the settings have been confirmed:

1 Date
2 Week number
3 Time

Fig. 8-10   Complete system time

This menu point is for indicating purposes only. Hence the system time cannot be adjusted here. Modifications can be carried out in the individual menus "Date" and "Time". The according week number will bet set automatically as soon as the date has been set.

Total counter

This menu allows to newly set the totaliser indicated on the main screen. This feature is normally going to be performed in case of replacing a transmitter which has to indicate the same value as before replacement.
After the new value has been set confirm twice using the "Enter" key and type in the code number "2718" (up to 2 faulty entries possible). Otherwise the new value will not be accepted.
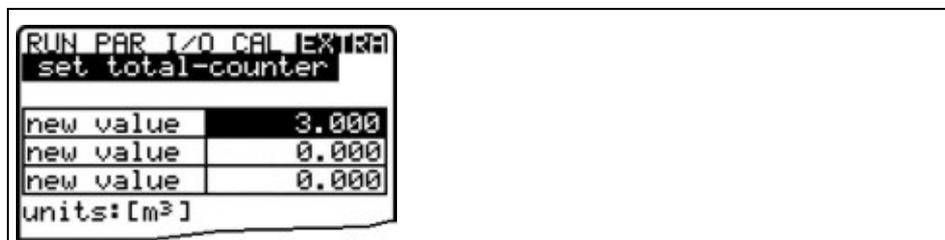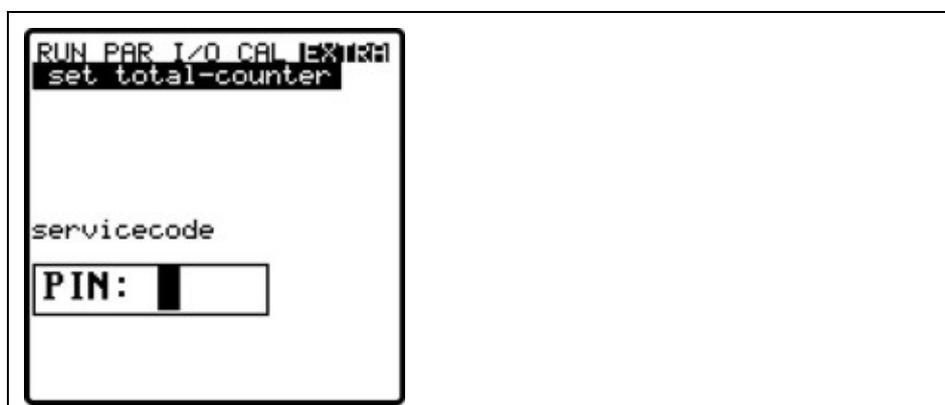

Fig. 8-11   Totaliser modification

Fig. 8-12   Service code request
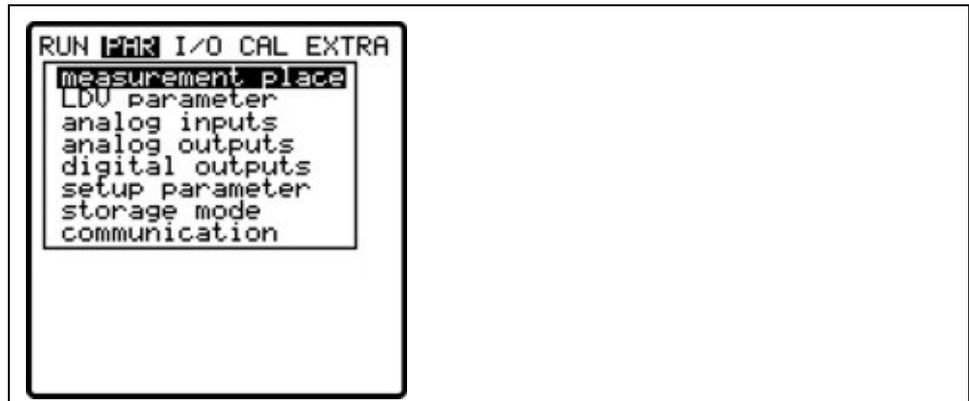
8.5 Parameter Menu (PAR)

Fig. 8-13   Selecting the measurement place

This menu is the most extensive and most important regarding the NivuSonic CO settings. It nevertheless is sufficient in most cases to set only some essential parameters, which usually are:

- name of measurement place

- channel profile

- channel dimensions

- sensor arrangement

- analog output (function, measurement range and measurement span)

- relay output (function and values)

All other functions are additions which are required in special cases only (special channels, storage mode or for special hydraulic applications).

These settings are normally made with the help of our service personnel or by an authorised expert company.

This instruction manual describes all programming options of the Nivu-Sonic CO. 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.

The parameter menu >PAR< includes eleven partially very extensive submenus which are described individually on the following pages.

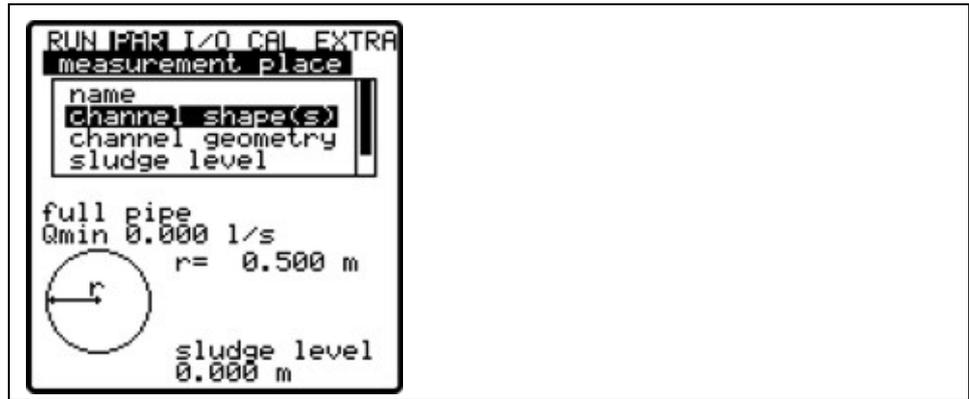### 8.5.1 Parameter Menu „ Measurement Place"

Fig. 8-14   Submenu measurement place

The menu cannot be indicated completely due to restricted display space. Similar to many well-known PC applications, this is readily identifiable from the black bars on the right-hand side of the screen.

▲ ▼   Use "Up" and "Down" keys to scroll the menu

Name (of measurement place)   NIVUS recommends to coordinate and to define names according to names stated in the respective documents. Names may contain up to 21 letters. Setting the name is quite similar to operating a mobile phone:
After the submenu >Name< has been selected the basic setting "nivus" will come up. Toggle between uppercase and lowercase letters by using the >up< or >down< keys.
Pressing the "Alt" key will either turn on or off a selection of special characters. The special characters can be selected individually with the >left< or >right< arrow keys, confirm your selection with "Enter".

Fig. 8-15   Setting the name of the measurement place

Enter the desired name with the keypad, where each key has assigned three letters and a number (see Chapter 7.2). Select between these four characters by briefly pressing a key several times. The cursor will jump to the next character if a key has not been pressed for two seconds.

Description of Keys:

◄ ►   Moves the cursor to the left-hand or the right-hand side.

◄   Moving the cursor to the left-hand side will delete the character left of the cursor.

►   Moving the cursor to the right-hand side creates a space character.

▲ ▼   Toggle between uppercase and lowercase letters.

▲   Shift to uppercase letters.

▼   Shift to lowercase letters.

↵   Confirm the entered name with "Enter" and exit the menu.

Channel shape(s)   You will be prompted to enter if the shape is a full pipe. The selected profile is accepted and will be indicated in the programming mode. You can select between following standard profiles:
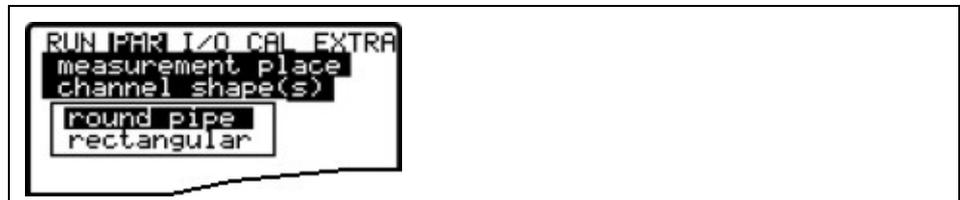
- Round pipe
- Rectangle

Fig. 8-16   Channel shape selection

Channel dimensions   Type in the respective channel dimensions depending on the profile (shape) chosen before.
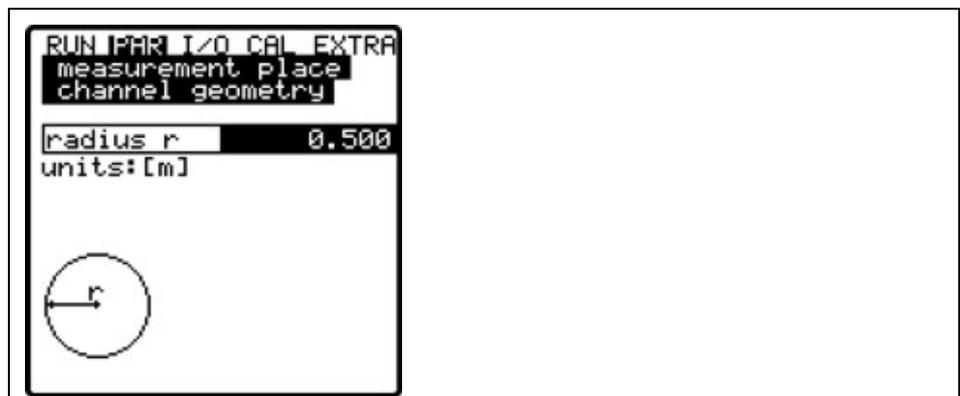
Round pipe:

Fig. 8-17   Channel dimensions for Pipe

Enter the pipe radius here.
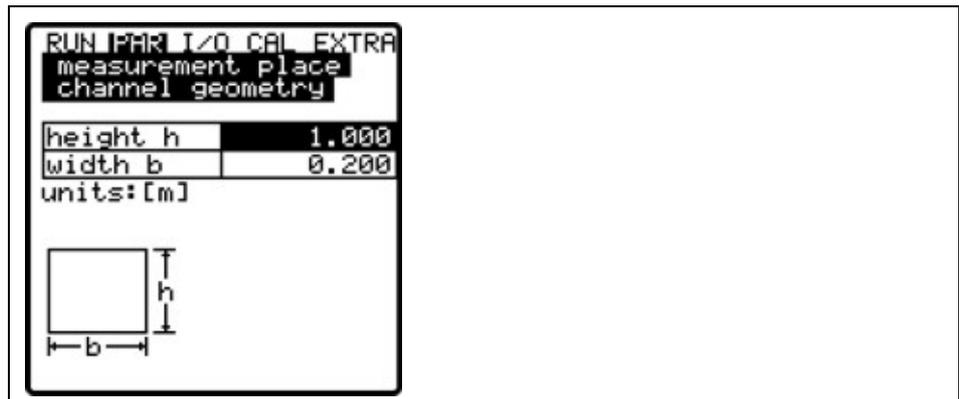
Rectangle:

Fig. 8-18   Channel dimensions for Rectangle

Enter the dimensions of rectangular channels here.

Sludge level

The sludge level set is going to be calculated as non-moving channel sub-area with horizontal surface and will be subtracted from the wetted total hydraulic area prior to performing flow calculation.

Q_{min} (Low flow)

This parameter serves to suppress lowest movements or apparent volumes arising. Used mainly to measure overflow volumes in constructions which are permanently flooded by receiving water.

Q_{min}: measurement values lower than this one will be set to >0<. Only positive values are allowed to be set. These values are going to be considered as absolute values and therefore have positive as well as negative effects.

V_{min}: low-flow volumes in applications with large profiles and filling levels can be suppressed by means of this parameter. Lowest velocity fluctuations within longer periods of time may cause apparently large volume fluctuations which cannot be gated by using the value of Q_{min}.

Flow velocities below this value will be set to „0" which will set the calculated volume to „0" as well. Only positive values are allowed to be set. These values are going to be considered as absolute values and therefore affect positive as well as negative velocities!

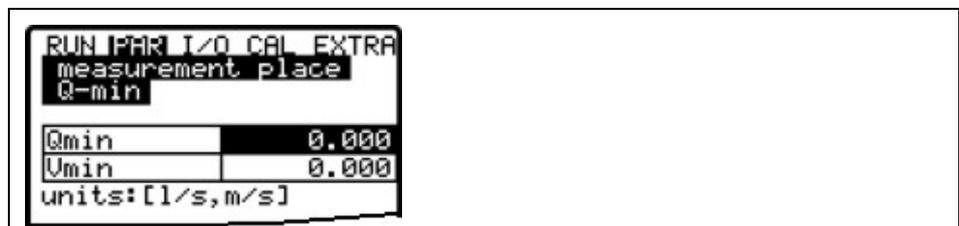Both setting options of low-flow suppression have an OR relation between each other.

Fig. 8-19   Selection Q-min

*The suppression of low-flow volumes is **no** offset but a limit value as from which the reading is detected as valid.*

8.5.2 Parameter Menu „LDV"

The parameter settings made here are extremely important regarding the geometry of the measurement paths. Number as well as positions of single paths (up to 2) can be set here. These settings determine the functionality of the entire measurement.
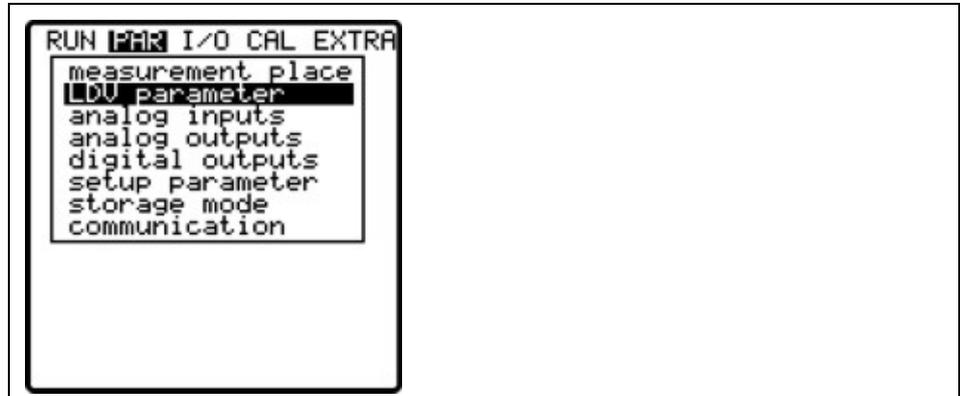

Fig. 8-20   Selection of LDV Parameters

Path number

Firstly determine how many paths are required for measurement (1 or 2).
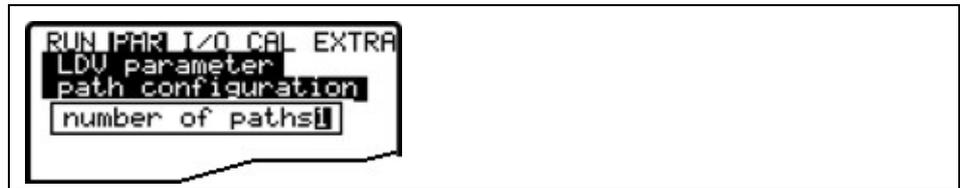Each path needs 2 sensors.

Fig. 8-21   Path number entry

The next menu is to determine if the paths are to be used in V-arrangement or in diagonal mode for measurement.
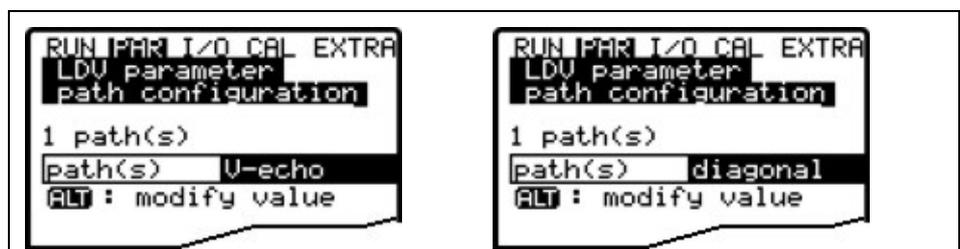
Path configuration

Fig. 8-22   Entering active measurement paths and measuring orientation

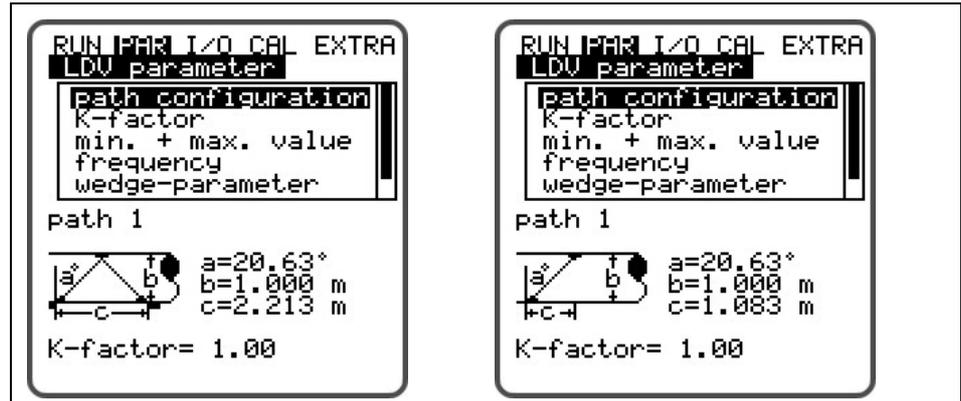This menu is to enter the number of active measurement paths (up to 2 paths).

Fig. 8-23   Path configuration "v-echo" or "diagonal"
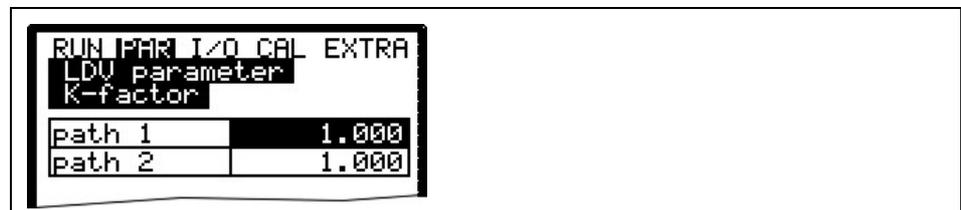
K-Factor

Fig. 8-24   K-factor entry

Thanks to the K-factor it is possible to adjust and to correct the average velocity within the measurement path by utilising an externally measured velocity. Normally the factor shall be set to 1 however.

Min. + max. value
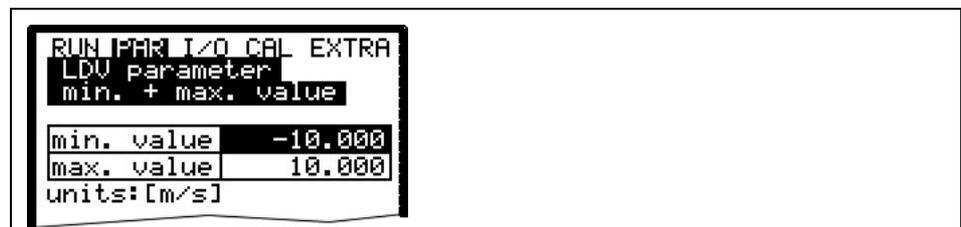
Fig. 8-25   Entering min. + max. value

Use min. and max. value to determine minimum and maximum velocity in the measurement path (in m/s)allowed for flow measurement.
If you wish to not detect negative velocities (such as movements due to high / low tide) set the min. value to 0. This will cause unit to use only positive velocities for flow calculation.

Wedge-parameter entry

At this point you can select between two sensor types. The settings are adjusted to these types and cannot be modified.

Pipe-parameter entry

In this submenu you can either select from pre-defined pipe materials or (if the material properties are known) enter the values for sound velocity as well as pipe strength.
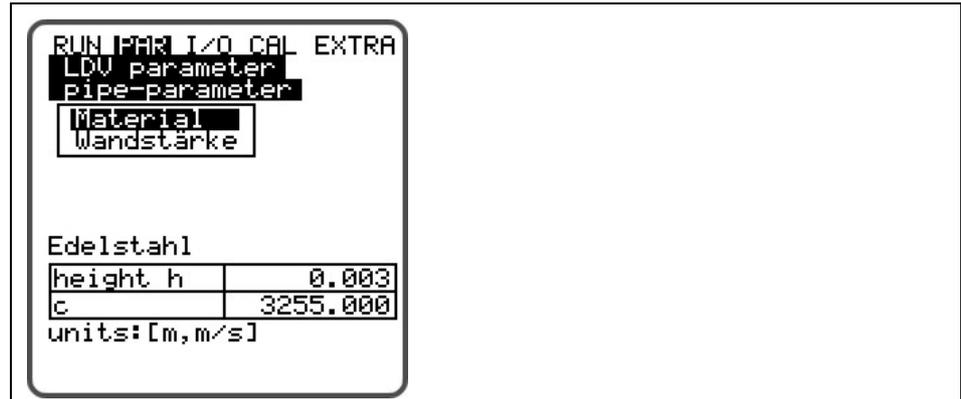
Fig. 8-26   Pipe parameters

8.5.3   Parameter Menu "Analog Inputs"

This menu allows to use up to 4 analog inputs for the recording of external signals. The signals are not going to processed in any way but can be merely saved to be available for communication purposes (ModBus or similar, 0-100 %).

Fig. 8-27   Analog inputs – submenu

8.5.4   Parameter Menu „Analog Outputs "

Fig. 8-28   Analog outputs – submenu

Define functions and measurement ranges of the discrete analog outputs in this menu.

Channel number   Select from analog outputs 1–4 which one is to be set by using the following parameters.

Name   No entry required. Setting a name here is helpful only if the analog output is to be saved on memory card. This name will be saved on the storage medium exclusively. The procedure is the same as described in >PAR/Measurement Place/Name of Measurement Place<.

Function   Functions are going to be assigned to the analog output which has been chosen by entering the >Channel Number<.
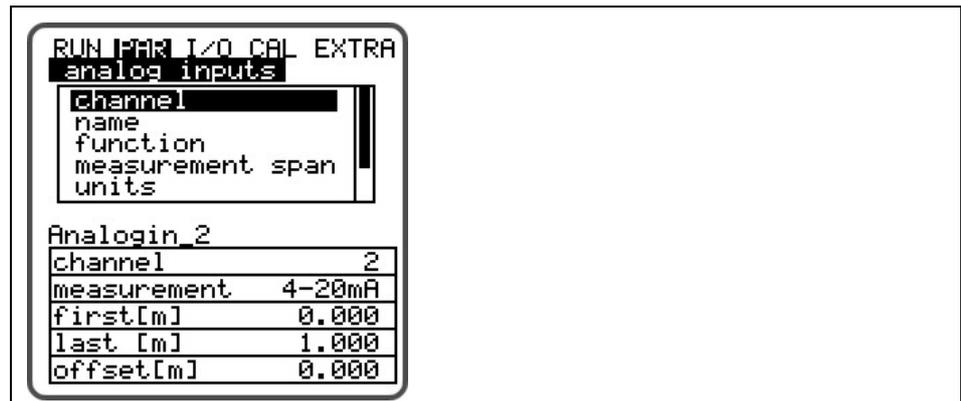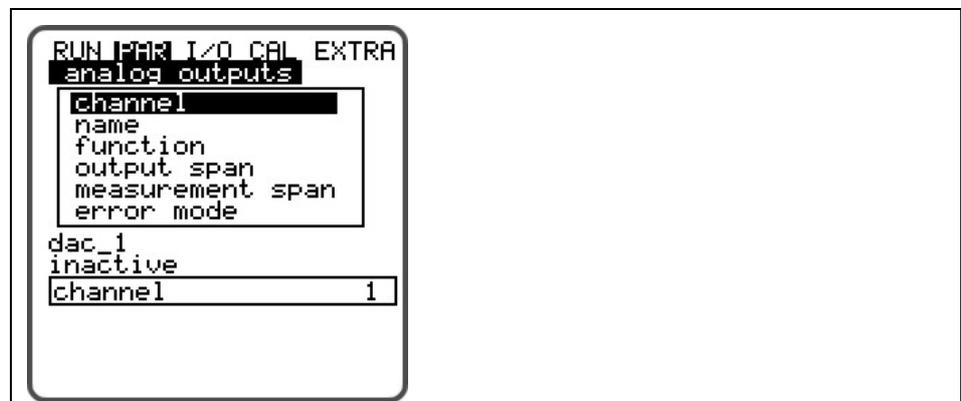Select:

- inactive (no analog signal output)
- Flow rate output (output of analog signal which is proportional to calculated flow volume)
- Velocity output (output of analog signal which is proportional to mean flow velocity averaged from measured individual velocities)
- Temperature water (output of measured water temperature as analog signal)
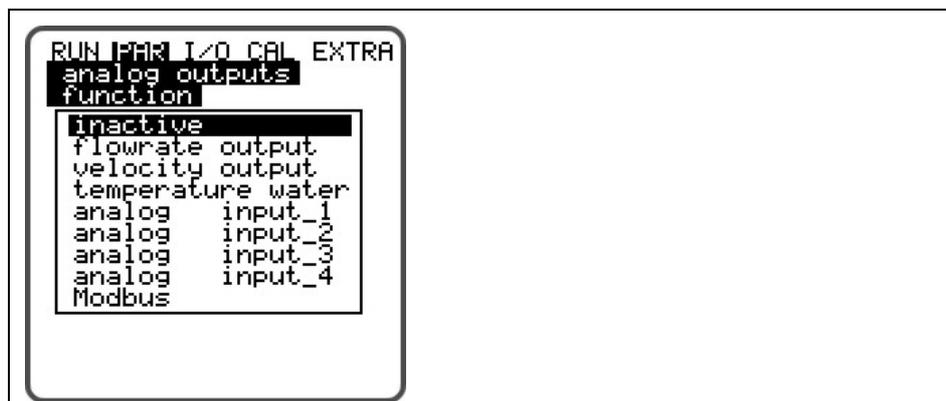
Fig. 8-29   Selection of analog output functions

Output range   If desired toggle between measurement ranges of 0-20 mA or 4-20 mA here.

Measurement span   Define the span of the enabled analog output here. **Negative values** can be entered as well!
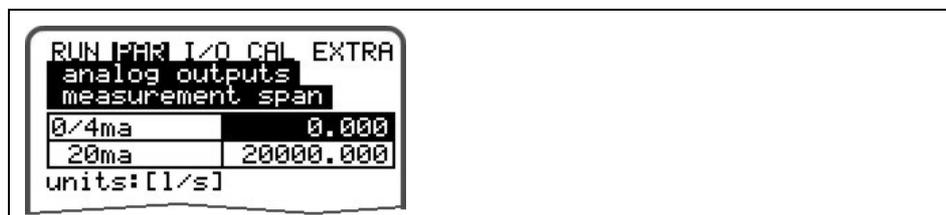
Fig. 8-30   Measurement span

Example:

A measurement place is partially tending to backwater formation. Negative values shall be recorded as well, the following recording or process conducting system however has only one analog input left available. In this case the analog output signal is set to have a "floating" behaviour.

This means that flow = 0 is going to output a mA signal in the middle of the measurement span.

Example:

4 mA   = -100 l/s

20 mA   = 100 l/s

In this case the signal output is 12 mA if flow = 0. Backwater will cause the analog signal to decrease, positive flow will cause the signal to increase.

Error mode   This parameter is to define the desired analog output condition if an error (such as cable break, CPU failure or similar) should occur.

[ALT]   Pressing this key will select between the following functions:

- 0 mA
- hold (will hold the latest valid signal value until the error has been removed or the error is no longer existent)
- 4 mA or
- 20.5 mA

8.5.5 Parameter Menu „Digital Outputs"
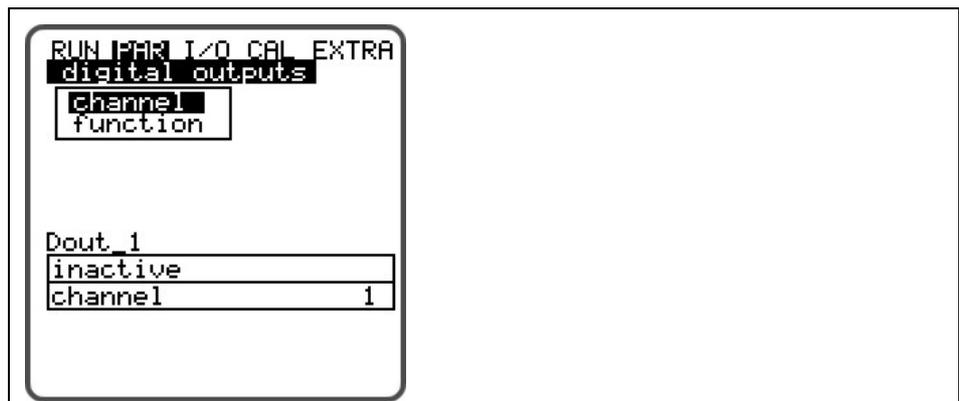
Fig. 8-31   Digital outputs – submenu

This menu allows to define both functions as well as accompanying parameters (such as limit values, duration of impulse and more) of individual relay outputs.

Channel number   Select from relays 1–5 which one is to be set by using the following parameters.

Name   This menu is visible only if a function has been enabled. The menu name refers to the name of the relay output selected before. It is not required to enter a name here as it currently is used for internal unit functions only.
The procedure is the same as described in >PAR/Measurement Place/Name of Measurement Place<.

Function

Functions are going to be assigned to the relay which has been chosen by entering the >Channel Number<.

Available are:

- inactive

- (relay will energise if a flow limit value [to be set] has been exceeded and will de-energise if flow falls below a second limit value [to be set])

- Velocity output (relay will energise if a velocity limit value [to be set] has been exceeded and will de-energise if velocity falls below a second limit value [to be set].)

The functions below can be set only once:

- *Total positive impulses (relay will output volume-proportional impulses if the flow direction is positive. Weighting and impulse duration are free programmable)*

- *Total negative impulses (relay will output volume-proportional impulses if the flow direction is negative [= backwater]. Weighting and impulse duration are free programmable)*

- *Error messages (relay will energise in case of error messages such as sensor error, cable break, power failure, processor failure or similar))*
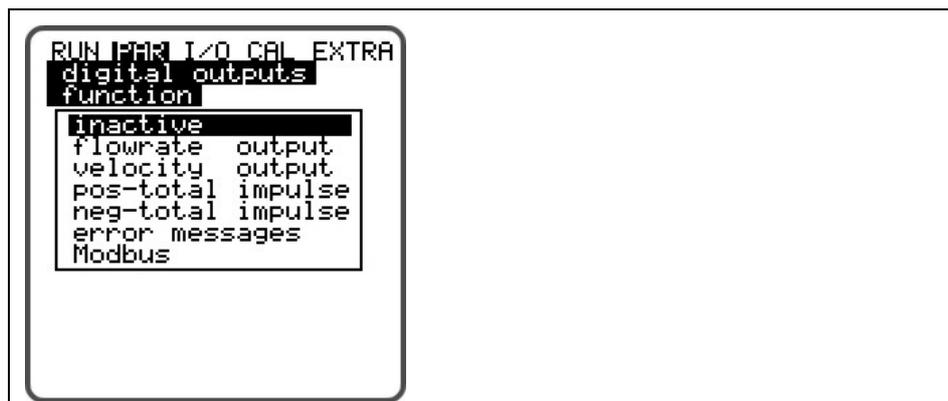
Fig. 8-32   Defining the relay function

Logic

Pressing the >ALT< key enables to select between >normally open< and >normally closed<. The relay is going to energise if >normally open< has been selected and the according value has been reached, if >normally close< has been selected the relay will energise immediately after the parameter has been set and will de-energise as soon as the according value has been reached.

Trigger Levels

This menu will be indicated only if the function >Limit contact< has been chosen.
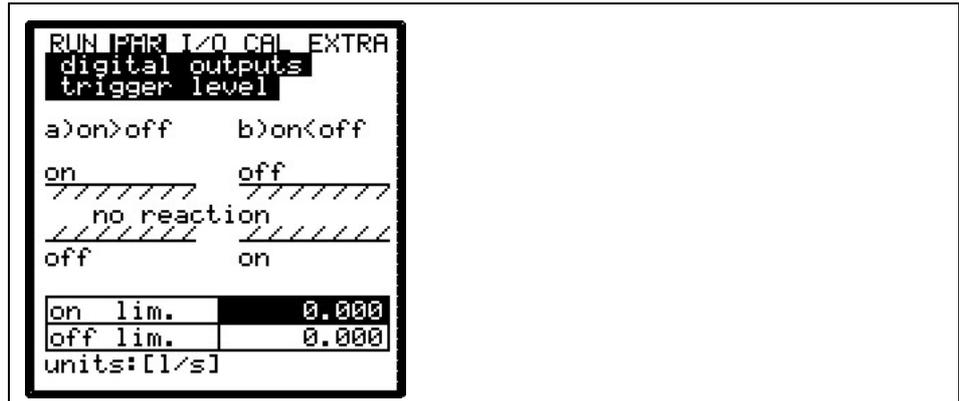
Fig. 8-33   Setting the trigger levels

Depending on the settings (start point higher than stop point or vice versa), the according switching behaviour can be considered as switching threshold (ON>OFF) or as in-bounds alarm (ON<OFF).

Pulse parameter   This menu will be indicated only if the function >Impulses< has been chosen.
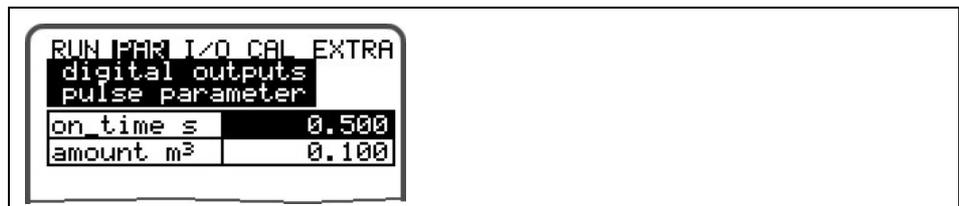
Fig. 8-34   Pulse parameter setting

Select from the options below:

- On-time (select an impulse duration between 0.01 and 2.0 seconds. The ratio between impulse and break is 1:1. It is useful to increase the impulse duration beyond the 0.5 sec. default setting if slow PLC inputs or mechanic counters are in use).

- Amount (defines the impulse weighting. The measured amount is going to be integrated internally until the selected value has been equalled. An impulse signal with the previously programmed duration will be emitted afterwards and the integrated internal value is going to be set to 0 again. This procedure will restart subsequently.)

8.5.6 Parameter Menu "setup parameter"
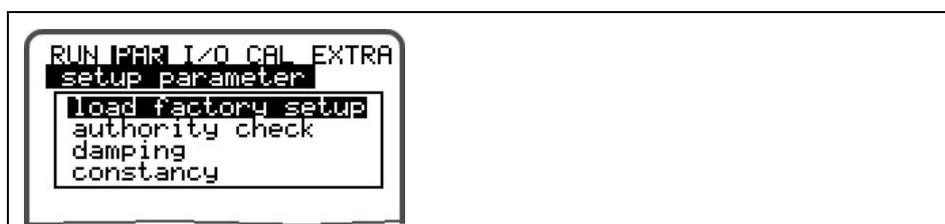
Fig. 8-35 Setup parameter – submenu

This menu allows to either modify or to reset the following basic settings of the system.

Load factory setup Enables a general reset of the measurement transmitter. Selecting this point will bring up the screen below:
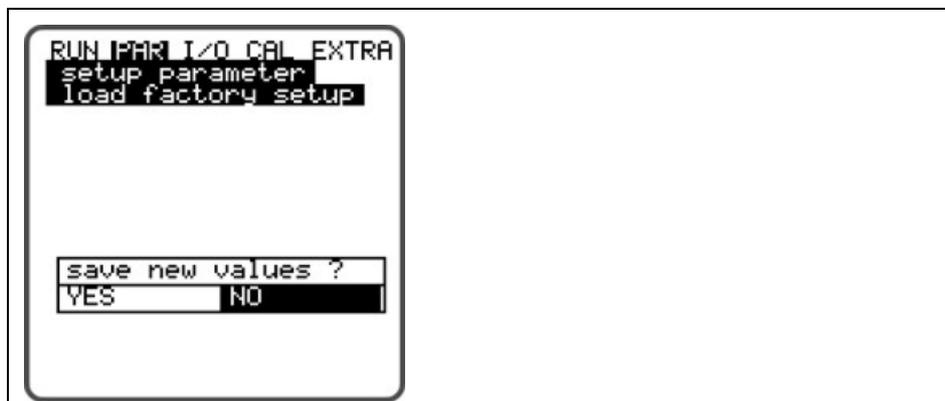
Fig. 8-36 Executing a general reset

Selecting "YES" is going to reset the system to the basic parameter settings. The default settings are going to be restored and all customer modifications will be set to default condition (system general reset.)

Service code

Additional system setting options are going to be revealed as soon as a special code has been entered. It is possible to modify e.g. transmit voltages or special adjustments regarding the transmitter crystal drive. These settings are reserved to used by the NIVUS initial start-up service as these modifications require comprehensive expert knowledge and do not need to be adjusted during standard use.

Damping

This menu enables to adjust the display and analog output damping between 20 and 600 seconds. This means that a 0 to 100 % jump of the calculated volume is going to require the time set to be indicated either on the display as well as on the output.

Stability

The period within the NivuSonic CO operates without a valid velocity signal. The NivuSonic CO falls to the value >0< using the damping previously set as soon as this period will be overshot without detecting a correct velocity value.

Damping, example 1:

Damping 30 seconds, jump from 0 l/s to 100 l/s (=100 %) – unit requires 30 seconds to run from 0 l/s to 100 l/s.

Damping, example 2:

Damping 30 seconds, jump from 80 l/s to 100 l/s (=20 %) – unit requires 6 seconds to run from 80 l/s to 100 l/s.

8.5.7   Parameter Menu "Storage mode"
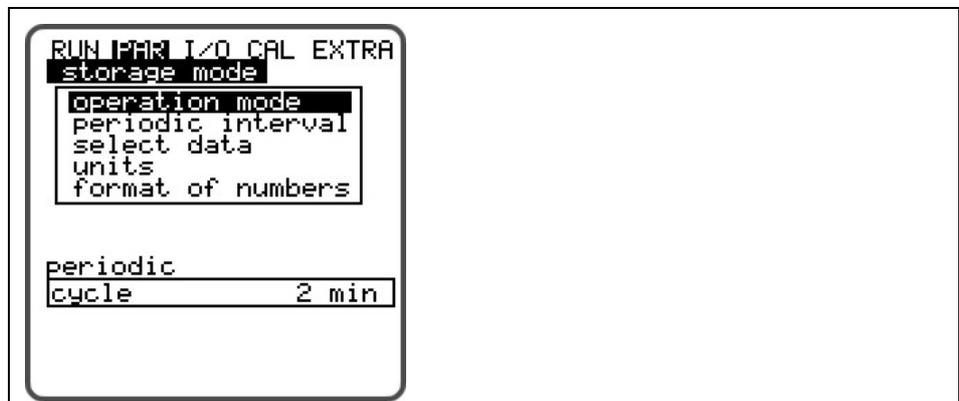
Fig. 8-37   Storage mode - submenu

Before enabling this menu plug in a NIVUS compact flash card with a capacity of 16 .... 128 MB. This card is available from your NIVUS representative if required.

Use memory cards purchased from NIVUS only. Other manufacturer's cards may lead to irreversible loss of data or measurement failure (e.g. permanent transmitter reset).

Please plug the card into the labelled slot (>MemoryCard<) on the unit faceplate in a way that the side identified by the numerous small holes is plugged in. Make sure that the card is fitting tightly.
The card can be inserted in one way only, incorrect plugging is going to be avoided due to mechanical construction. Please do not apply any force but rotate the card into the correct position.

Fig. 8-38   Memory card slot

After a new memory card has been plugged and the storage has been enabled in the programming menu, the NivuSonic CO will prompt a >Format card< request.
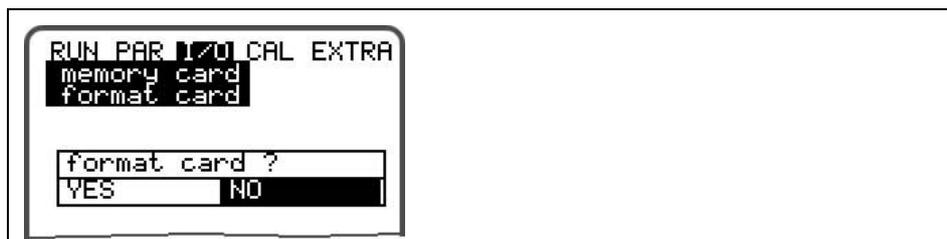
Fig. 8-39   Card formatting request

Card formatting is going to be executed in the menu I/O – Memory Card – Format card (see also Chapter 8.6.5)

Due to the card's technically restricted number of storage cycles (approx. 100.000 writing events), the NivuSonic CO does not constantly save upcoming data on card but only each full hour. This interval is pre-set by the internal system time (exceptions: in case of very high data density and if a data volume of approximately 3000 - 4000 Byte has been cumulated data will be saved on card as well).

The data will be saved in a special NIVUS format. The name is „Name of measurement place set".TXT<. This file can be read and processed either using Excel spreadsheet application or by using >NivuDat32< bzw. NivuSoft I which is remarkably more convenient and comfortable.

(see also Chapter 8.5.8)

Never format memory cards on PC but always on NivuSonic CO. The NivuSonic CO is not capable of using formats created by PC and therefore does not accept the cards formatted on PC.

Data will be saved as mean values averaged over the memory interval set, not as current values at the moment of saving.

Operation mode

```
RUN PAR I/O CAL EXTRA
storage mode
operation mode
mode        periodic
ALT: modify value
```
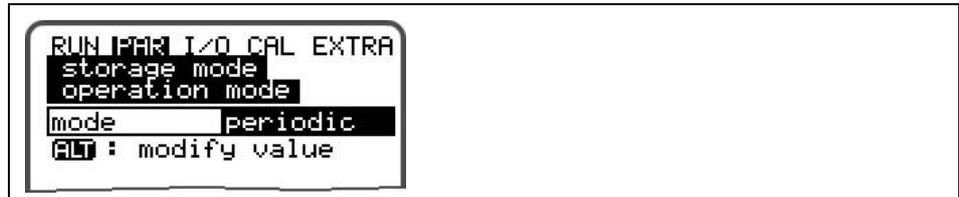
Fig. 8-40   Activating operation mode

Mode

ALT Pressing this key toggles between:

off   = no data saving
periodic   = cyclic storage of fill level, flow velocity and volume

Periodic interval   This parameter is to set the memory cycle. Select from settings between 1 min-ute and 1 hour. It is possible to set values between 1 minute and 1 hour. There are only exact fractional amounts of 1 hour allowed to be set (1 min.; 2 min.; 3 min.; 4 min.; 5 min.; 6 min.; 10 min.; 15 min.; 20 min.; 30 min. or 60 min.). Entering other values is going to cause the NivuSonic CO to set the next lower interval value.

```
RUN PAR I/O CAL EXTRA
storage mode
periodic interval
cycle               2
units:[1-60 min]
```
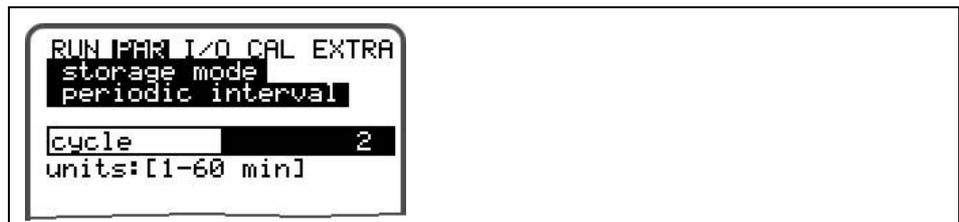
Fig. 8-41   Entering the storage cycle

Select data   This parameter point is to define which data sets are to be stored in addition to the automatic storage of average flow velocity, volume and medium tempera-ture.

```
RUN PAR I/O CAL EXTRA
storage mode
select data
analog I 1 yes
analog I 2 no
analog I 3 no
analog I 4 no
system     no
↑ ↓ ALT: modify value
```
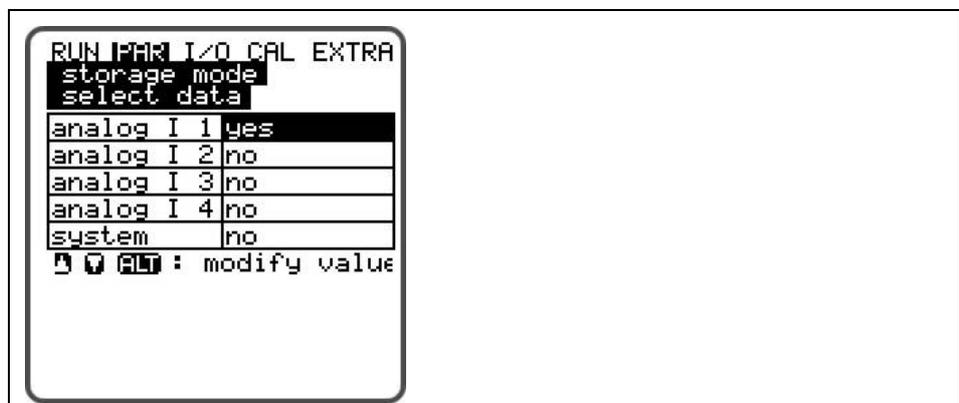
Fig. 8-42   Select data table

System

ALT Use this key to toggle between:

NO   = system parameters will not be saved and

YES = system parameters will be saved (system errors, error messages, system ON and OFF events etc.)

Unit system   Select between data storage in metric system (e.g. litres, cubic metres, cm/s etc.), English system (ft, in, gal/s, etc.) or American system (fps, mgd etc.). The setting of this parameter does not influence the indication on the display.
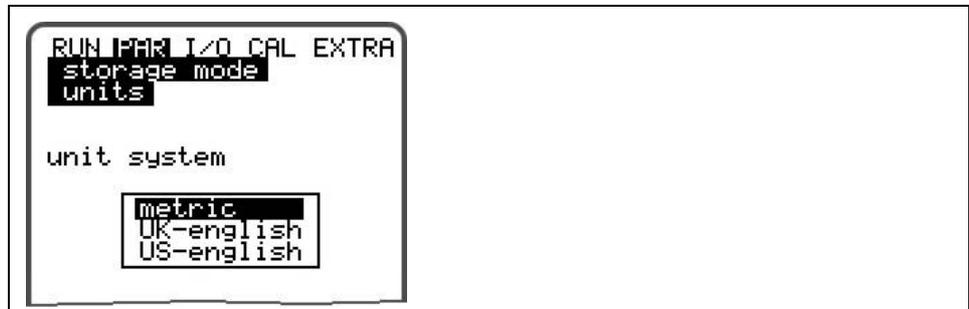
Fig. 8-43   Selecting the unit system to be saved

Units   Set the desired storage units for the 3 main memory parameters "Flow", "Filling level" and "Velocity". Depending on the setting chosen previously various options are available (see also >Unit system<).
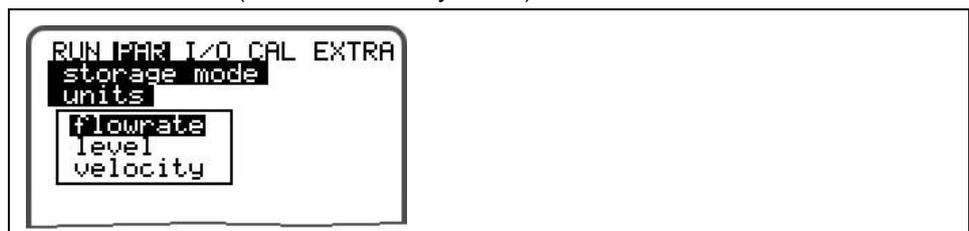
Fig. 8-44   Unit selection

Format of numbers   Here you can choose if data are to be saved with commas or dots as decimal points (a comma is normally being used in Europe, dots are used in other regions).
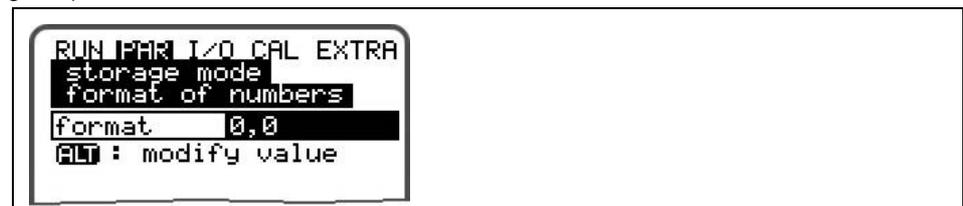
Fig. 8-45   Selecting the format of numbers

8.5.8 Data Structure on Memory Card
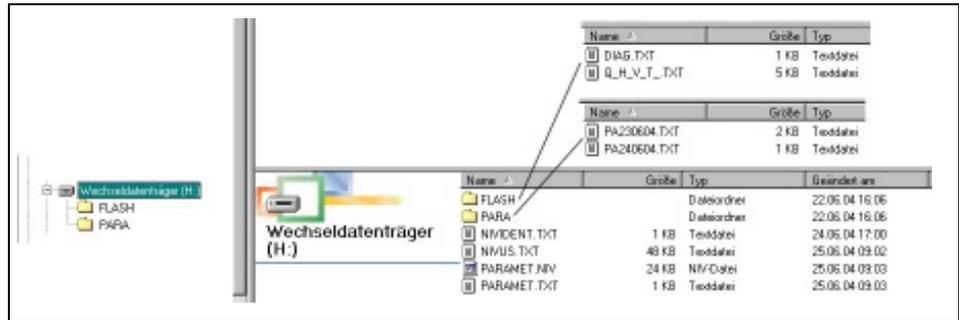
Fig. 8-46   Data structure on memory card

Flash

This is the folder where the backup file is being saved (to execute select I/0 – Memory Card – Save backup).
The name of the saved file is always >Q_H_V_T.TXT<. It contains the internal memory values on level, velocity, flow and temperature.
The file >DIAG.TXT< contains all messages including error messages which might have been occurred during measurement operation. These might be start and end of Internet communication, modem restart, CPU restart after system reset or after reprogramming.
The respective message is labelled with date and time:
>: received error/message
<: reason of error/message cleared
The DIAG file is going to be saved only if you proceed as follows: I/0 – Memory Card – save backup.

PARA

This folder includes all parameter files with a date stamp.
The content of this folder allows to retrace transmitter settings regarding the measurement place as well as parameter settings which might have been modified.
The latest modification within the course of a day will be saved.
The file name is: PA TT MM JJ .TXT
(TT = day, MM = month; JJ = year)

NIVIDENT

The name of the measurement place.
If the name of the measurement place saved on card does not comply with the name of the measurement place saved in the NivuSonic CO, the unit will prompt to format the card. The NivuSonic CO will create a new file for measurement values with the newly entered name as long as the card is not going to be formatted.

Name of measurement place.TXT

This is the file where the measurement values are saved. It is going to be saved using the name of the measurement place set.

PARAMET.NIV
PARAMET.TXT

These files are created as soon as parameters are being saved on the memory card. The file PARAMET.NIV is required in order to upload data to NivuSonic CO. PARAMET.TXT is the print version of PARAMET.NIV as text file.

Use memory cards purchased from NIVUS only. Other manufacturer's cards may lead to irreversible loss of data or measurement failure (e.g. permanent transmitter reset).

STOP *Never format memory cards on PC but always on NivuSonic CO. The Nivu-Sonic CO is not capable of using formats created by PC and therefore does not accept the cards formatted on PC.*

8.5.9   Parameter Menu "Communication"

Modifications in this menu are required only as long as you wish to access the unit via Internet or a local network.

Depending on the type of transmitter (see chapter 4.4) communication via local Intranet, analog modem, ISDN modem or GPRS modem is available. Direct data exchange via Ethernet / Modbus TCP is possible as well.

If no other NIVUS device has been connected to Internet at the moment of initial start-up, it is indispensable to have the customer gate initialised by the NIVUS service. Due to this reason please complete the form which can be found in annex 11 and return it to NIVUS in order to prepare initialisation. Please fill out the form as complete as possible.

The form however does not have to be completed if you do not wish to access the unit via Internet or if required technical prerequisites are not established (no intranet; no telephone connection).

*Please fill out the fields marked with * in Chapter 11 completely. The Internet connection cannot be set up by NIVUS without these details!*
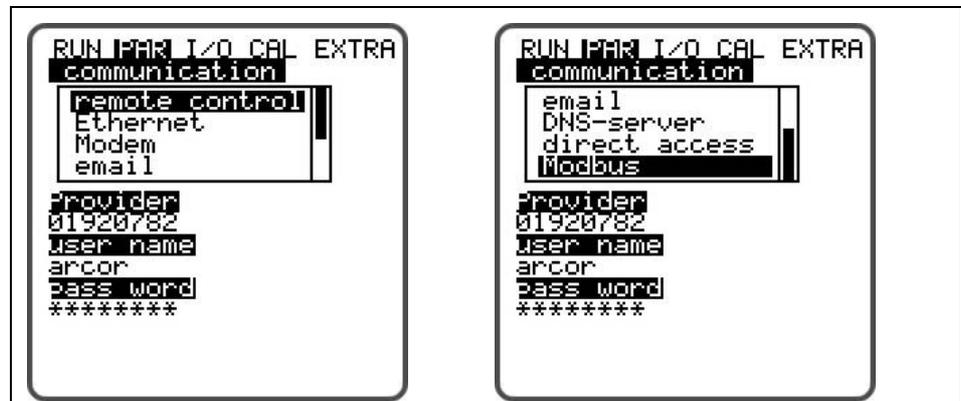
Fig. 8-47   Options of Internet connection

Remote access   Select from the following options for remote access:

Off:	no remote access possible
Modem:	connection via built-in modem (GPRS, analog or ISDN)
Ethernet:	communication via local network (Ethernet)
Mod.→ Eth.	the unit is going to be called/enabled via the built-in modem. The following communication will be performed via local network such as WLAN and/or Ethernet

Any variation is possible to be chosen theoretically. In practical use however it is possible to use only options the unit has been equipped with. The respective configuration is indicated by the device ID which can be found on the unit (see also Chapter 4.4)
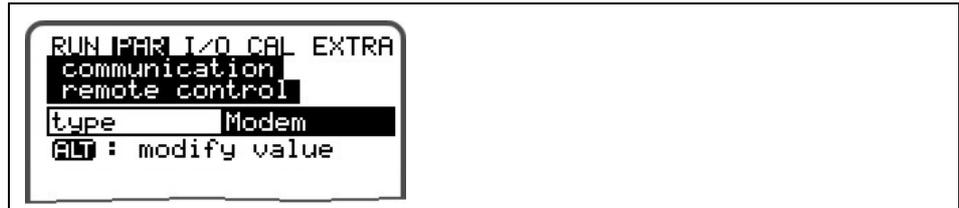
Fig. 8-48   Remote access

Ethernet

By selecting this point it is possible to define if the IP address (required for unit access) is to be assigned automatically or manually.

If >YES< the assignment will be executed by DHCP routine (similar to Internet PC setting „Get IP address automatically").

If >NO< enter the unit IP address manually. For this purpose use a free network address.

→ Observe current network configuration!!!
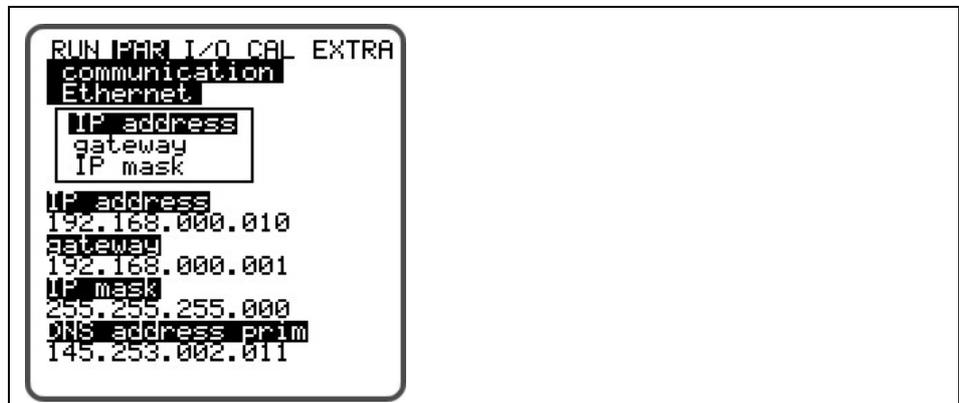
Fig. 8-49   IP address assignment

If manual IP address assignment has been selected enter IP address, gateway (optional, in case of interdigitated subnets) as well as IP mask.

The default setting (255.255.255.000) is normally suitable for most connections.
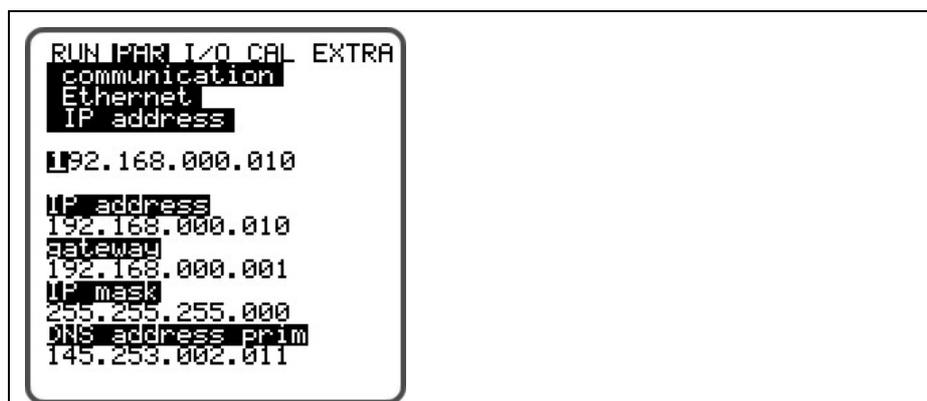
Fig. 8-50   Manual setting of IP address

If in doubt please consult your responsible system administrator or use the NIVUS initial start-up service

Modem

If connection type >Modem< or >Mod → Eth.< has been selected enter the type of integrated modem here.

The built-in modem can be specified from the device ID which can be found on the unit (see also Chapter 4.4).

Choose between the following options:

off: no modem enabled
analog: integrated analog modem
ISDN: enables built-in ISDN modem
GPRS: internal GPRS modem is going to be used.
GPRS perm. The internal GPRS Modem is permanently online

Fig. 8-51   Selecting the modem type

According to the type of modem selected adjust the settings below:
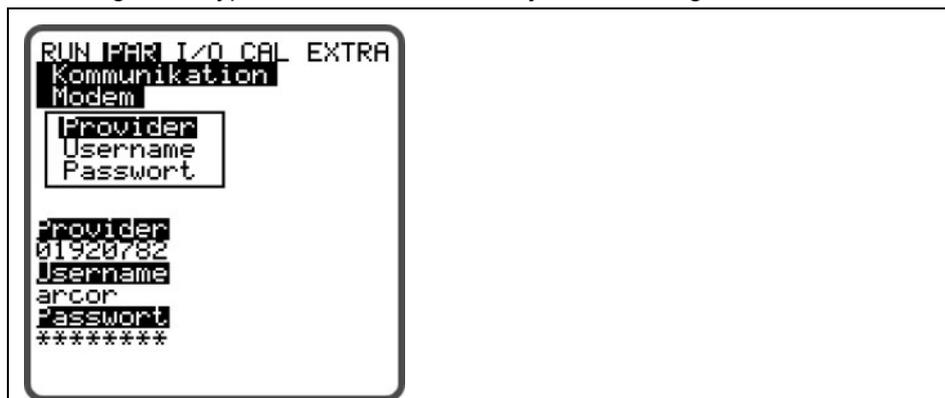
Fig. 8-52   Einstellung Parameter Analogmodem

Analog modem:

- Provider dial-up: you are free to select from any provider available.
  In case of using a Call-by-Call service we recommend to choose a provider offering a constant rate all over the day without additional dial-up fees (of course any other free available local provider can be chosen however).
  If there are agreements on flat rates or similar available it makes sense to use the according connections.

- User name: to be assigned by the provider and hence depends on provider dial-up selected. The provider will refuse service in case of faulty entry.

- Password: to be assigned by the user and hence depends on user name. The provider will refuse service in case of faulty entry.
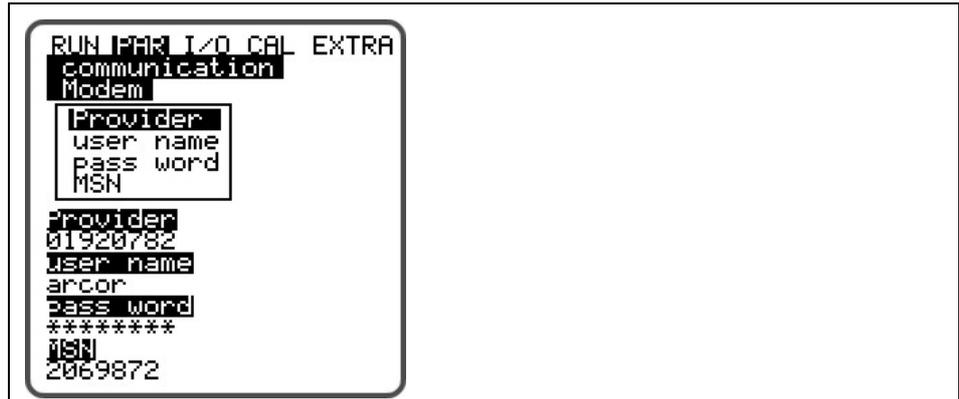
Fig. 8-53   ISDN modem parameter settings

ISDN modem:

- Provider dial-up: see analog modem

- User name: see analog modem

- Password: see analog modem

- MSN: **M**ultiple **S**ubscriber **N**umber – the ISDN number assigned to the user by the telecommunication provider (normally there are 3 numbers min. and 10 numbers max. available per subscriber).
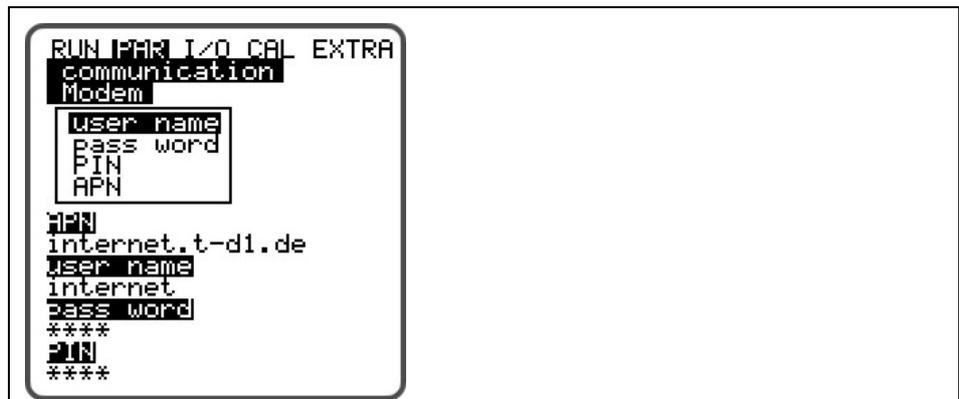
Fig. 8-54   GPRS modem parameter settings

GPRS modem:

- User name: to be assigned by the provider

- Password: password associated with account

- PIN: with SIM module associated PIN (Personal Identification Number)

- APN: name supplied by provider / address of access (Access Point Name)

GPRS modem perm.

Same settings as GPRS modem, however the modem remains to be connected with the provider permanently. The connection will be interrupted briefly every night at 02:00 AM. The modem then is reconnecting automatically with the provider and is provided with a new IP address.

E-Mail   This option allows to send received data to up to 4 recipients.
To achieve this select "active".
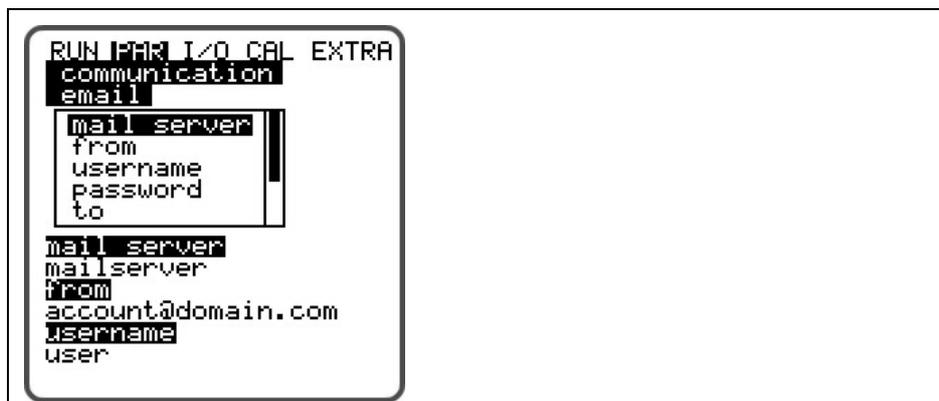
Fig. 8-55   E-Mail parameter settings

E-mail:

- Mail Server: Enter the server address of your email account here)e.g. smtp.gmx.net)

- From: Enter a valid email address of the smtp-server mentioned above here. This ist he unit's sender address.

- Username: Enter the user name of the aforementioned email account

- Password: : Enter the password of the aforementioned email account

- To: Here it is possible to determine up to 4 email addresses the mail is to be sent to at the same time.

- Data format: Select between text file and binary file. Binary files are for integration of the unit into the "NICOS" process conducting system by NIVUS.

- Cycle: This defines the cycle to send the data mails (e.g. every 24 hours)

- Delay: The delay entered here refers to the transmission cycle set. The mail will be sent using the determined delay (example: cycle 24 h. Delay 07:00 causes the mail to be sent each day at 07:00 AM.

DNS Server   This point will be indicated only if remote access has been enabled and >Ethernet: IP_Ad aut = ON< has been set.
Normally it is useful to set >DNS auto< to >ON<. This setting allows the provider or the local network to assign the DNS automatically. If >NO< has been set it is required to enter primary and secondary DNS subsequently (available from provider or system administrator of the local network).

Fig. 8-56   Manually entering DNS

Direct Access Required only if a direct 1:1 connection to the NivuChannel is desired to be set up via Laptop/PC, network cable and the internal RJ45 interface. In this case determine both; password as well as user name for this internal connection on PC/Laptop.
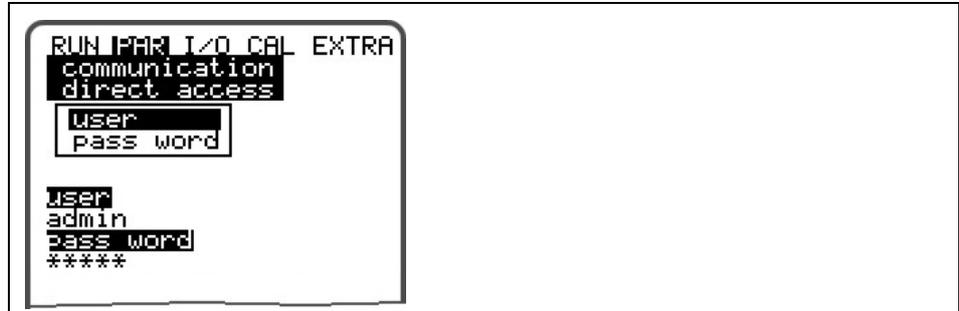
Fig. 8-57   Enabling direct unit access

Modbus This menu determines communication to a master via Modbus TCP. The connection is made on the Ethernet interface.
The respective interface settings (such as IP address etc.) shall be carried out according to the network topology.
Please see Appendix X.X (Modbus protocol)

Modbus

Measurement span: here you can modify pre-determined measurement spans of analog signals which are to be transmitted via Modbus. It is however not recommended to do so since modifying the measurement span here will have an effect on the length and the contents of the protocol to transmit.
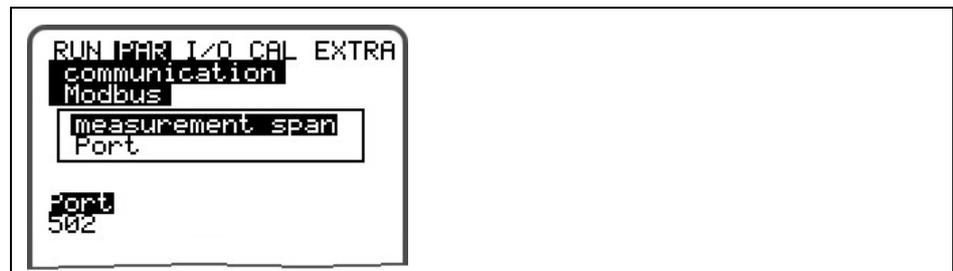
Fig. 8-58   Port registration

Port: Enter the interface port used for protocol transmission here. Please observe the port to be unlocked at the master (e.g. PC) and contact your responsible system administrator if required.

8.6 Signal Input/Output Menu (I/O)

This menu includes several submenus which both serve to assess and to check sensors as well as to control signal inputs and outputs. It allows to indicate various values (current values of inputs and outputs, relay conditions, echo profiles, individual velocities etc.), however does not enable to influence signals or conditions (offset, adjustment, simulation or similar). The menu therefore primarily serves in order to assess the parameter settings and for error diagnosis.
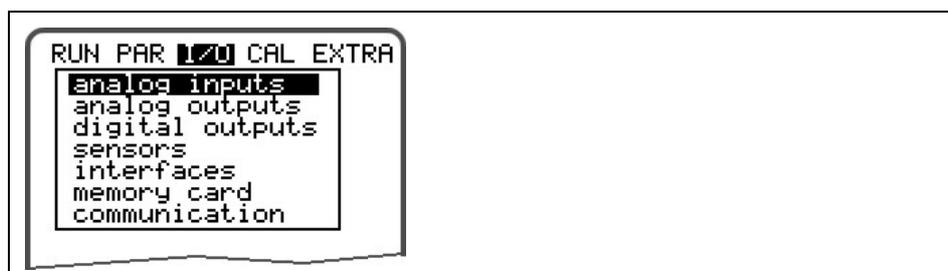
Fig. 8-59   I/O submenu

The menu basically allows to indicate any input and output theoretically possible even if it might not be connected or available.

8.6.1 I/O Menu „Analog outputs"
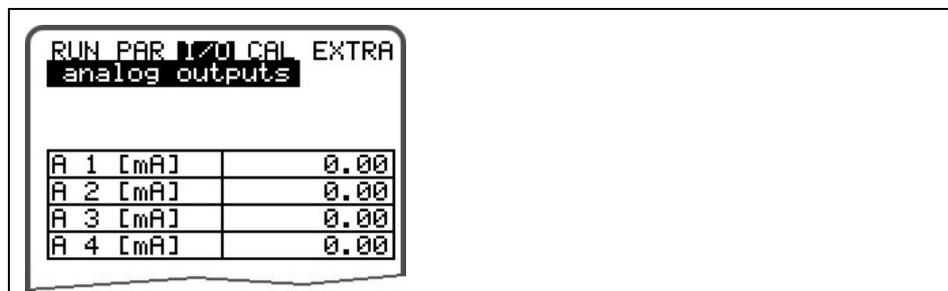
Fig. 8-60   Screen analog values

This menu indicates the calculated values which have to be sent to the analog converter as mA signals.

The actual currents fed to the output clamps will not be indicated. The only signal visible is the signal the analog output converter receives for output. This menu cannot be used to detect or to indicate faulty wiring.

8.6.2 I/O Menu „Digital outputs"

This submenu indicates the calculated conditions to be output on the relay. We distinguish between logically "OFF" or "ON".
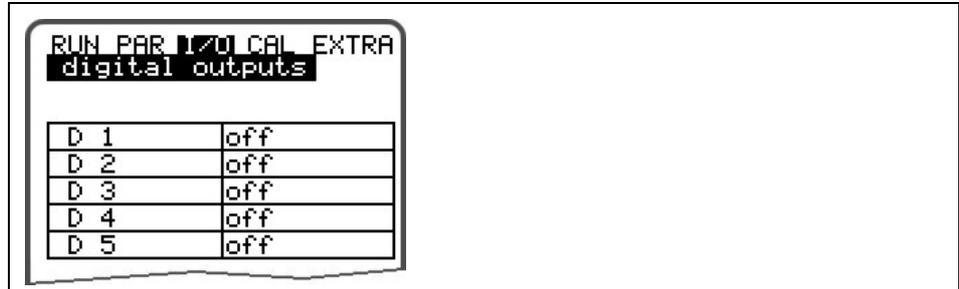
Fig. 8-61 **Screen digital values**

The actual currents fed to the digital output clamps will not be indicated. The only signal visible is the signal the analog output converter receives for output. This menu cannot be used to detect or to indicate faulty wiring.

8.6.3 I/O Menu "Sensors"

This menu, including the respective submenus, allows to view and to asses the most important sensor conditions. It hence provides information on the quality of the measurement place, cable layout and many more parameters.
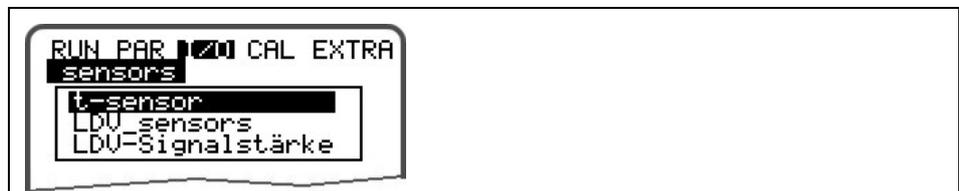
Fig. 8-62 **Basic selection menu**

T-Sensor This screen allows to view the water temperature based on the measured velocity of sound. Invalid values indicate faulty geometry settings (mounting position) or incorrectly clamped connections.
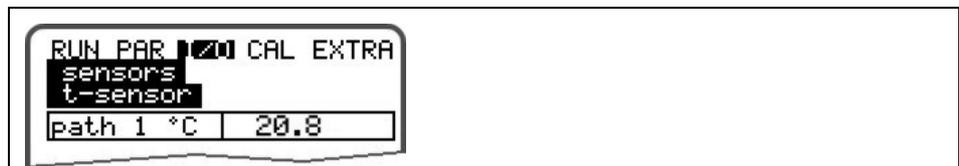
Fig. 8-63 **Temperature screen**

LDV_Sensors This submenu indicates the investigated flow velocities of the single paths. The overall velocity required for flow calculation will be derived from these single velocities.
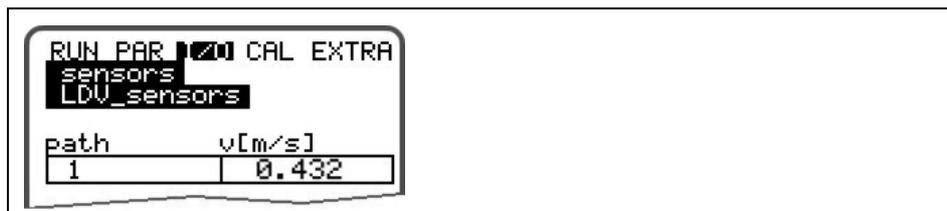
Fig. 8-64   Velocity screen

Missing velocities indicate that e.g. there is no more water in the measurement path which interrupts signal transmission between the sensors. Please also check additionally if the sensors have been connected correctly.

LDV signal strength   This submenu indicates the signal strength of the transmission between both sensors. Range: 0 to 60 dbmV
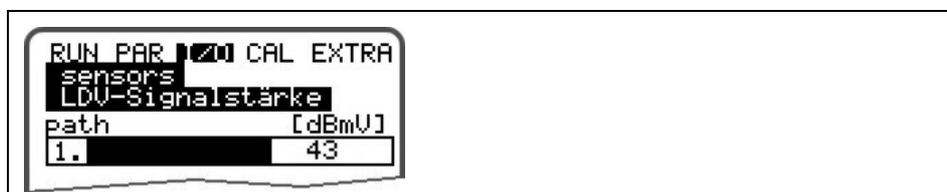
Fig. 8-65   Signal strength screen

This menu allows to check how the sensors are adjusted to each other and to improve the respective alignment if required. To obtain proper results the signal strength should be between 30 and 55 dbmV.

8.6.4 I/O Menu "Interfaces"

The menu includes the transmission speed of the internal interfaces. It has no meaning for users and is going to be used for service purposes only.

8.6.5 I/O Menu "Memory Card"

This menu enables to view various information regarding the memory card. Additionally it is possible to save data as well as to read out and to load the parameters set.
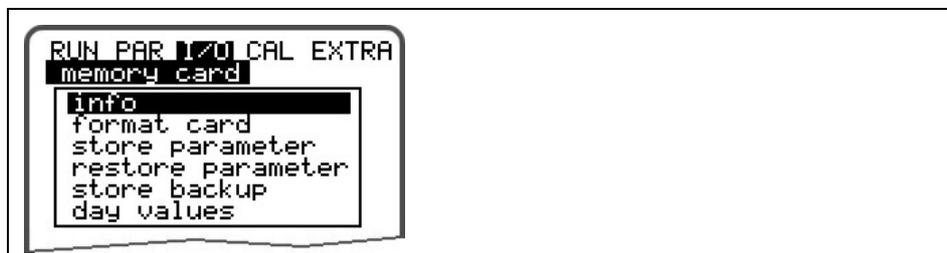
Fig. 8-66   Memory card menu

Info   Information on the remaining card capacity and the remaining storage time is available here.

```
RUN PAR I/O CAL EXTRA
memory card
 info
 SanDisk SDP 5/3 0.6

MFS-version: 0x21000
memory(bytes)
free : 18153472
total: 32018432
```

Fig. 8-67   Card information

Information can be recalled only if the memory card is plugged. To be able to in-dicate the remaining capacity time the card has to be plugged one hour at least

The card can be replaced at any time unless the display indicates >Memory Card active< (approx. 1 second each full hour).

The card can be formatted in the following menu. This procedure should be car-ried out after each data transfer as well as if the card is being used for the first time. Formatting process will take 10 – 60 seconds depending on card capacity and is finished if the main screen appears again.

Do not press any keys and do not turn the unit off as long as the card is being formatted. Otherwise the card might be irreversibly damaged.

```
RUN PAR I/O CAL EXTRA
memory card
format card


format card ?
YES          NO
```
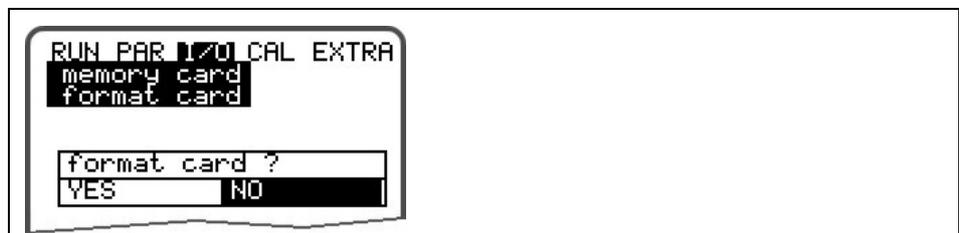
Fig. 8-68   Card formatting request

All data saved on the card will get irreversibly lost during the formatting proc-ess.

NivuSonic CO parameter settings can be saved for backup purposes or in order to transfer the settings to similar measurement places. Select „Save parameters" to write the parameters on memory card. This procedure will take approx. 30 se-conds.

The progress is going to be indicated by a corresponding bar:
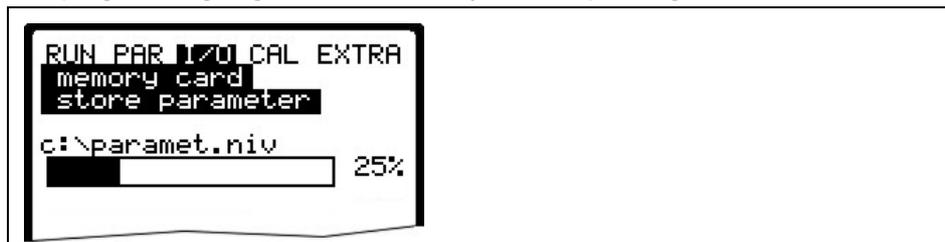
Fig. 8-69   Saving parameters on memory card

The menu point „Load parameters" first of all shows all programming files available on the card. The file is going to be transmitted to the NivuSonic CO after the point has been selected.

The name of the required file is „PARAMET.NIV".

save   = NivuSonic CO → card
load   = card → NivuSonic CO

Data which have been stored within the past 14 days in the NivuSonic CO can be saved in case of data loss due to faulty data readout, defect cards, unintentional formatting or similar. Use the menu >Store backup<.
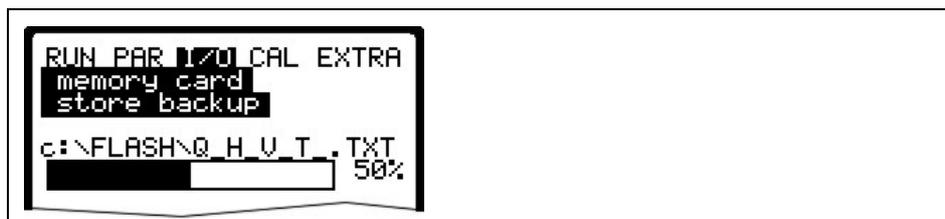
Fig. 8-70   Data backup

8.6.6 I/O Menu Communication

This menu currently only contains the Modbus submenu and serves to recall the points "Read Input Register" and "Read Holding Register" for verification purposes.
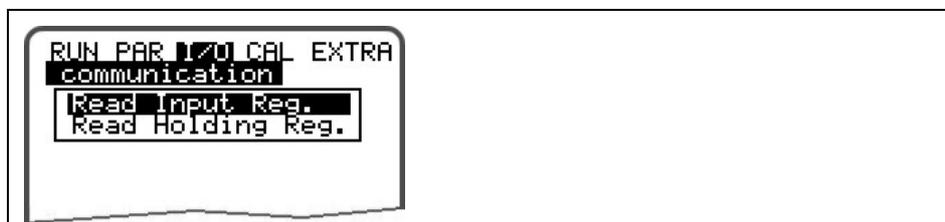
Fig. 8-71   „Read Input Register" / „Read Holding Register"

8.7   Calibration and Calculation Menu (CAL)

This menu allows to adjust level measurements, to adapt analog outputs to following systems and to emulate relay switching events and analog outputs. Furthermore it is possible to perform a temperature and flow velocity adjustment. This adjustment should be necessarily carried out after installing the measurement.

```
RUN PAR I/O CAL EXTRA
analog outputs
digital outputs
simulation
transit time
```
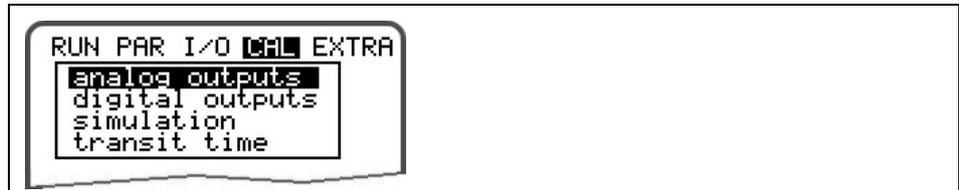
Fig. 8-72   Menu selection if fixed value is set to height

Basic Hints on Simulation:

The simulation of NivuChannel outputs will access any following facility areas __without any safety locking measures__!

Simulations are allowed to be executed exclusively by NIVUS expert personnel or by expert companies trained by NIVUS in cooperation with experienced users.

NIVUS herewith refuse in advance to be responsible for any possible damage to persons or objects at any extent due to the extremely high risk of danger and unforeseeable consequences in case of incorrect or faulty simulation!

*The simulation of analog inputs and outputs is allowed to be carried out by specialist electricians only which have sound knowledge on the control system of the facility. This requires detailed preparation. **It is absolutely necessary to have a safety person available!***

The following system must be set to manual operation mode. Actuators or similar have to be disabled if possible or have to be functionally restricted in a way not to cause any damage.

Operate only equipment within your visibility range.

analog Outputs   This parameter allows to simulate the NivuSonic CO output signals. After selecting >analog Outputs< the PIN must be entered once again. This ensures to keep unauthorised persons away from executing simulations during operation.
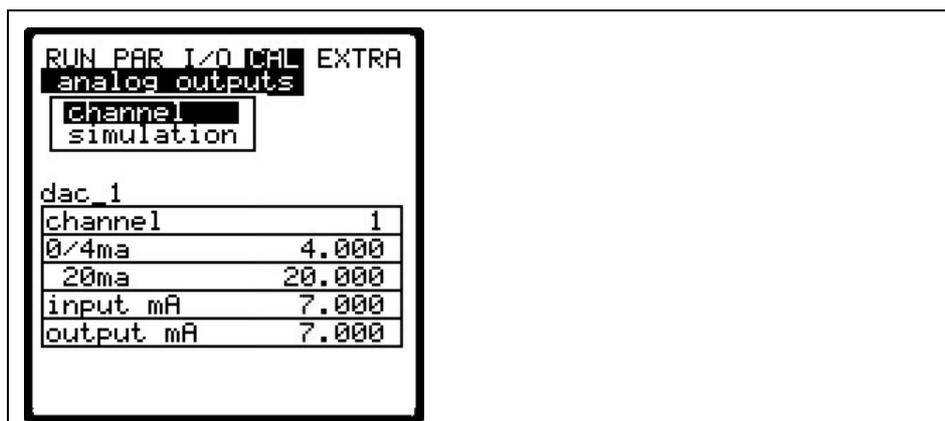
Fig. 8-73   Selecting the analog output simulation

Channel number   Choose the analog output which is to be simulated by entering the respective number from 1 – 4 or by using the >left< or >right< arrow keys in the simulation main menu.

Simulation   Enter the desired value in mA and confirm with Enter in order to directly output it on the according clamp.

Fig. 8-74   Executing the simulation

Digital outputs   Select the desired relays to be simulated by pressing the >left< or >right< arrow keys. The relay number chosen is going to be indicated in the first line of the output table.
The arrow keys >up< or >down< will either directly enable or disable the relay selected previously.
After selecting >Digital Outputs< the PIN must be entered once again. This ensures to keep unauthorised persons away from executing simulations during operation.

Fig. 8-75   Relay simulation

Simulation

This function allows to simulate a theoretical flow by entering supposed level and velocity values without having these values actually available. The NivuChannel is going to calculate the current flow value by using the simulated values based on the channel dimensions set. The results are going to be sent to the respective outputs (analog + digital).

Simulate the desired flow velocity by pressing the >left< or >right< arrow keys. Using the >up< or >down< keys will simulate the desired flow level.

Both values simulated are going to be indicated in the table. The calculated flow value can be seen above the table.

Transit time

The transit time submenu allows to adjust temperature and velocity


```
RUN PAR I/O CAL EXTRA
 transit time
 T-adjustment

set point        15.000
units:[°C]
```
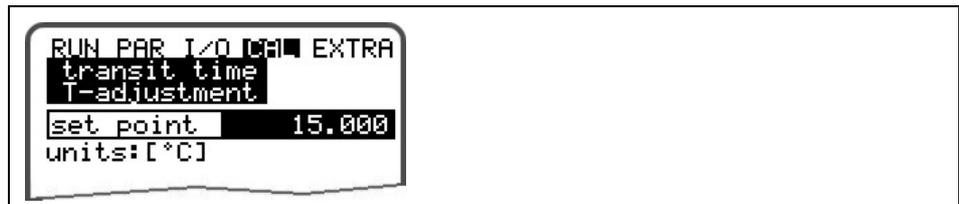
Fig. 8-76   Temperature adjustment

If you wish to adjust the temperature use this submenu to enter the temperature you have been measuring.

External temperature measurement should be always executed in or close to the measurement path.

This however is required only after the initial start-up or if sensor positions have been modified (e.g. maintenance works). Subsequently the temperature is computed in the course of further measurements and will be indicated in the main screen.

9   Parameter Tree

Operation Mode (RUN)

```
RUN
 ├─── standard
 ├─── day values
 │         ├─── info
 │         └─── interval
 │              erase memory?
 ├─── errors
 └─── trend
           ├─── flow rate
           └─── velocity
```

Parameter menu (PAR)   part 1

```
PAR
 ├─── measurement place
 │         ├─── name                                          nivus
 │         ├─── channel shape(s)
 │         │         ├─── round pipe     radius               pipe
 │         │         └─── rectangle
 │         ├─── channel geometry              radius
 │         ├─── sludge level                                  0
 │         └─── Qmin
 │                   ├─── Qmin                                0
 │                   └─── Vmin                                0
 │
 └─── LDV_parameter
           ├─── path arrangement    number of paths           1
           │              ├─── v-echo                          v-echo
           │              └─── diagonal
           ├─── K-Factor            correction factor for the  1
           │                        selected path
           ├─── min. + max. value   velocity limits of the     from - 10
           │                        selected path              to + 10
           ├─── wedge-parameter
           └─── pipe-parameter
                      ├─── material     material selection      stainless steel
                      └─── wall thickness
```

Parameter menu (PAR)   part 2

```
├── analog inputs
│                                                                    1
│         ├── channel number
│         ├── name                                                   dac_1
│         ├── function
│         │         ├── inactive                                     x
│         │         └── archived value
│         │
│         ├── measurement range
│         │         ├── 0-20mA
│         │         ├── 4-20mA                                       x
│         │         ├── 0-10V
│         │         └── 0-5V
│         │
│         ├── unit                                                   0/4mA: 0.0
│         │                                                          20mA: 20.0
│         ├── linearisation
│         │         └── fix points                                   x
│         │
│         └── offset
│
├── analog outputs
│                                                                    1
│         ├── channel number
│         ├── name                                                   dac_1
│         ├── function                                               inactive
│         ├── output range                                           4-20 mA
│         ├── measurement span          0/4 ->0
│         │                             20 ->20.000
│         │
│         └── error mode                                             out
│
├── digital outputs
│                                                                    1
│         ├── channel
│         ├── function
│         │         ├── inactive                                     x
│         │         ├── flowrate output
│         │         ├── level output
│         │         ├── velocity output
│         │         ├── pos-total impulse
│         │         ├── neg-total impulse
│         │         └── error message
│         │
│    following par. only at active function
│         │
│         ├── logic                                                  n.o.
│         ├── trigger level                                          ON: 0.0
│         │                                                          OFF: 0.0
│         │    or:
│         │
│         └── pulse parameter                                        duration: 0.5
│                                                                    volume: 0.1
```
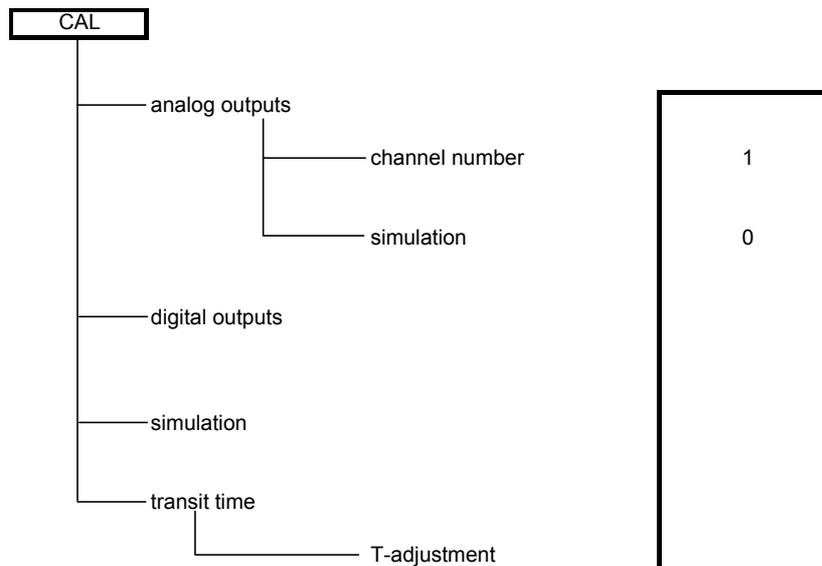
Parameter menu (PAR)   part 3

```
├──── setup parameter
│         ├────── load factory setup
│         ├────── load factory setup
│         │              └────── code no.
│         │
│         ├────── damping                                    30
│         │
│         └────── constancy                                  60
│
└──── storage mode -> if "periodic" is selected
          ├────── cycle interval                             inactive
          │              └────── periodic                    1-60 Min
          │
          ├────── select data
          │              └────── system                      no
          │
          ├────── unit
          │       unit system                                metric
          │              ├────── flowrate
          │              │          ├── m³/s (ft³/s, cfs)
          │              │          ├── l/s (gal/s, mgd)      x
          │              │          ├── m³/h (ft³/h, gpm)
          │              │          ├── m³/d (ft³/d, cfh)
          │              │          └── m³/min (ft³/min, cf/min)
          │              │
          │              ├────── level
          │              │          ├── m (ft)                x
          │              │          ├── cm (in)
          │              │          └── mm (in/10)
          │              │
          │              └────── velocity
          │                         ├── m/s (ft/s, fps)       x
          │                         └── cm/s (in/s)
          │
          └────── format of numbers                          0
```

Parameter menu (PAR)   part 4

```
        communication

                remote access
                        modem                           inactive
                        port                            active

                Ethernet                                no

                Modem       with remote access only modem active

                        provider                        01920782
                        user name                       arcor
                        password                        internet

                email
                        email                           inactive
                                aktive
                                mail sercer
                                from
                                username
                                password
                                to
                                data format             text file
                                transmission cycle      1 h
                                transmission delay

                DNS-Server
                        DNS address prim.               145.253.002.011
                        DNS address sec.                193.254.160.001

                direct access
                        user                            admin
                        password                        nivus

                ModBus
                        measurement span
                        port                            502
```

Calibration Menu (CAL)

```
        CAL

                analog outputs
                        channel number        1
                        simulation            0

                digital outputs

                simulation

                transit time
                        T-adjustment
```

Signal Input/Output Menu (I/O)

```
┌─────┐
│ I/O │
└─────┘
    │────── analog inputs
    │              │────── values in [mA/V]
    │              └────── calc. Values
    │
    │
    │────── analog outputs
    │────── digital outputs
    │────── sensors
    │              │────── t-sensor(s)
    │              │────── LDV_sensor
    │              └────── LDV signal strength
    │
    │────── interfaces
    │
    │────── memory card
    │              │────── info
    │              │────── format card
    │              │────── store parameter
    │              │────── restore paramenter
    │              └────── store backup
    │
    └────── communication
                   │────── Modbus
                               │────── Read Input Reg.
                               └────── Read Holding Reg.
```

Display Menu (EXTRA)

```
Extra
  │
  ├── units
  │   unit system
  │       ├── metric
  │       ├── UK-english
  │       └── US-english
  │               ├── flow rate          l/s
  │               ├── velocity           m/s
  │               └── total              m³
  │
  ├── language
  │       ├── Deutsch             x
  │       ├── English
  │       ├── Français
  │       ├── Czech
  │       ├── Italiano
  │       ├── Español
  │       ├── Polski
  │       └── Dansk
  │
  ├── display
  │       ├── contrast           50%
  │       └── backlight          75%
  │
  ├── (*)load CPU32-progr.
  │
  ├── (*)load DSP-progr.
  │
  ├── set time
  │       ├── info
  │       ├── date
  │       └── time
  │
  └── set totalizer             0
```

10 Troubleshooting

Error	Possible Reason	Correction
No indication of flow (>0< or. >----<)	Connection	Check connection between sensor cable and terminal strip. Check connection boxes, connections for sensor cable extension for correct connection or moisture.
	Sensor	Check sensor installation for correct installation and adjustment / alignment.
		Check sufficient signal strength (I/O Menu). Apply coupling paste to the sensors if required.
	Transmitter	Call up error memory. J Depending on error messages take the respective measures (check cables, plug and socket connections, sensor installation). f >CPU Error< is indicated consult NIVUS service personnel. Investigate the moment of failure in menu RUN – Trend.
	Negative flow direction	Sensors shifted during connection? ➔ Check individual path velocities. → exchange sensor connections of the respective path
	Programming	Completely check the transmitter parameter settings.
No screen (black / flickering)	Connection	Check power supply connection.
	Power supply	Check power supply voltage.
		Check switch position on connection board.
		Compare power supply (AC or DC) with transmitter type.
	Memory card	Unauthorised manufacturer → use NIVUS memory card.
		Improper memory size? → use card with permissible maximum capacity
		Card formatted on PC? → send card to NIVUS.
Display Error Sensor >X<	Connection	Check cable connection. Wiring on terminal strip switched? Cables firmly connected to plugs (re-tighten screws, pull at cable ends)? Insulation of single wires unintentionally clamped in?
	Communication	Communication to DSP sensor evaluation disturbed. Can be checked by pressing the I-key. DSP Sensor should be indicated in the third line of the following screen. Contact manufacturer service.

Unstable measurement values	Disadvantageous hydraulic conditions on measurement place	Verify the quality of the measurement place by utilising the graphic flow velocity profile indication. Relocate sensors to a place with better hydraulic conditions (extend calming section).
		Remove soiling, sedimentation or obstructive constructions upstream of sensor.
		Straighten the flow profile by installing appropriate baffle plates and calming elements, flow straighteners or similar upstream of measurement.
	Sensors	Increase damping
		Check correct sensor installation
		Check coupling paste and sensor alignment and add coupling paste if required
Unplausible measurement values	Hydraulically unsuitable measurement place	See "Unstable measurement values".
	Sensors	Check for correct connection (polarity).
		Check if cables are crushed / for extensions/cable types, short circuits, surge arresters or improper resistive loads.
	Programming	Check cable connections and temperature in I/O menu.
		Check if the correct shape of measurement place has been set, check dimensions (observe units), sensor installation height etc.
Faulty relay output	Connection	Anschluss auf Klemmleiste überprüfen.
		Check power supply of external control relays
		In I/O menu check signals to be output.
		Check output control function in calibration menu.
	Transmitter	Check relay outputs under "Simulation"! ATTENTION! Necessarily observe safety regulations!
	Programming	Check if relay outputs are enabled.
		Check if outputs are correctly assigned to respective output channels.
		Check additional values such as impulse parameters, limit values, logic etc.
Faulty mA output	Connection	Check connection clamps for correct wiring and polarity
		In case of using several outputs: check following systems/indicators if they are potential-free. Two analog outputs at a time have a common ground.
	Programming	Output activated?
		Check if functions have been assigned to correct output channel
		Check output range (0 or 4-20 mA)
		Check output span
		Check offset
		Check Offset
		Check output signal in I/O menu
	Following systems	Check cables and connections as well as input and output clamps

		Check input range (0 or 4-20 mA) of following system.
		Check input span of following system.
		Check offset of following system.
No / incomplete data on memory card	Memory Card	Memory card defect. To be checked in menu: I/O – MemoryCard – Info
		Unauthorised manufacturer → use NIVUS memory card.
		Memory card with more than 128 MB capacity cannot be used currently!
		Memory card formatted on PC. Send card to NIVUS.
		Memory card not firmly plugged (not deep enough).
		Memory card not plugged for a sufficient period of time (min. required: 60 minutes! Data will be saved every full hour).
	Programming	Storage not enabled in Memory Mode – Operation Mode – Mode

11   Internet Connection Questionnaire

There are several options to set up an Internet connection for the NivuSonic CO. Basically all units can be connected to a local area network (Intranet). J Depending on the type of transmitter used (see chapter 4.4) it is optionally possible to set up connections of transmitter via analog or ISDN modem as well as DSL or GPRS modem.

Prior to entitling NIVUS to set up the connection it is required to specify several technical details. If you wish to set up several units please fill out one questionnaire per unit.

Please copy the questionnaire below, fill out and return by fax or post to:

NIVUS GmbH, Department "Data Technology"

Im Taele 2 • 75031 Eppingen, Germany • Fax: +49 (0)7262/9191-999.

*Mandatory specifications. ① Request from user system administrator if required.			

Requesting Company:

*Contact Person:	*Phone:
*Street:	Fax:
*Postal Code, City:	E-mail:
Transmitter Art. No.:	Transmitter Serial No.:

Location : (if not as stated above)

Postal Code, City:	Country:
Contact Person:	Phone:

* Set up Internet connection as described below:

☐ **LAN/Ethernet**	☐ **Analog Line**	☐ **ISDN Line**	☐ **GPRS (TD1)**
Fill out respective column only if checked above			
- *IP to be assigned① .... - *Gateway IP ① .... - *Subnet Mask ①	- *Direct access ☐ yes ☐ no - *Terminal is part of a telephone system ☐ yes, Type: .... ☐ no - *Additional units to be operated on same line (Telephone, Fax or similar) ☐ yes ☐ no - *Telephone number of terminal .... - Telephone line socket available ☐ Type TAE ☐ Type Western ☐ none - Outward dialling ☐ >>0<< ☐ none, direct extension ☐ other	- *Additional units to be operated on same line ☐ yes ☐ no - *Telephone number of terminal .... - Telephone line socket available ☐ Western RJ45 ☐ Western RJ11 ☐ none	- *Number of unlocked GPRS SIM .... - *PIN .... - *TD1 service available on desired location? ☐ yes, service o.k. ☐ yes, service weak ☐ not checked ☐ other ....

LAN/Ethernet	**Analog Line**	**ISDN Line**	GPRS (TD1)
	* Internet Provider ☐ Provider agreement available Provider: .... Dial-up: .... User Name: .... Password: .... ☐ Internet by Call (established or desired provider) Provider: .... Dial-up: .... User name: .... Password: .... ☐ Internet by call – to be set up by NIVUS upon request		

* Gate Access
☐ previously set up by NIVUS
☐ not yet set up
 	
   desired main user name:
    (suggested: company.admin)
 	
   ....
   Password desired:
 	
   ....
   (may be customised later)
	* Java Run Time Environment ①
	☐ available
	☐ not available
	
	* Browser ①
	☐ Explorer, Version:
	
	....
	☐ FireFox
	☐ Opera
	☐ other:
	
	....

....

Date   Signature

12 Maintenance and Cleaning

The device Type NivuSonic CO is designed to be virtually maintenance-free and free of material wear and does not need to be calibrated.

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

If you wish to clean the enclosure surface with a damp cloth please disconnect the unit from mains before.

No hard objects such as wire brushes, rods, scrapers or similar shall be used to clean the sensors.

Never use scrubbing, scouring cleansing agents or other tools / media which might have abrasive effects or organic solvents to clean sensor cables and sensors.

Using a high pressure cleaner may lead to measurement failures and thus is not allowed.

The use of high pressure cleaners may damage the sensors and hence may lead to measurement failures. Therefore it is not allowed to use such cleaners.

The measurement place must be recalibrated (see chapter 7) after the sensors have been removed from the holders for cleaning purposes.

13 Emergency

In case of emergency

- press the emergency-off button of the main system or

- set the slide switch (see Fig. 6-15) a on the unit to OFF.

14 Dismantling/Disposal

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

15 Table of Pictures

16 Index

17   Appendix

Settings and verification of MODBUS TCP data transmission

It is recommended to save the unit parameters prior to activation of the Modbus transmission protocol.
The unit parameters must be set anew after a general reset has been carried out. Please use the parameters from the previously saved listing.

Menu PAR

Submenu Communication => Ethernet

Submenu IP_Ad_auto => No

Subitem IP address => xxx.xxx.xxx.xxx

Subitem Gateway => xxx.xxx.xxx.xxx

Subitem IP Mask => 255.255.255.0
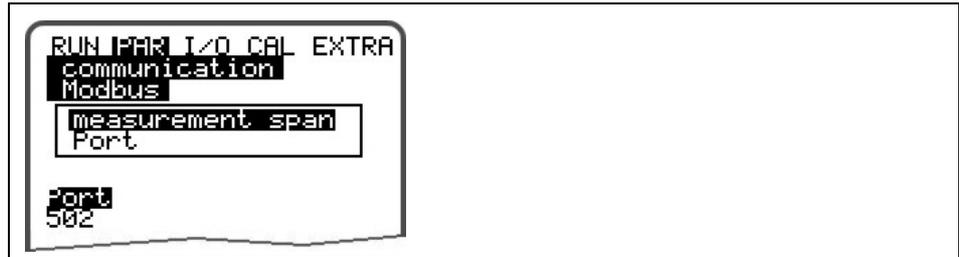
Submenu Communication => Modbus
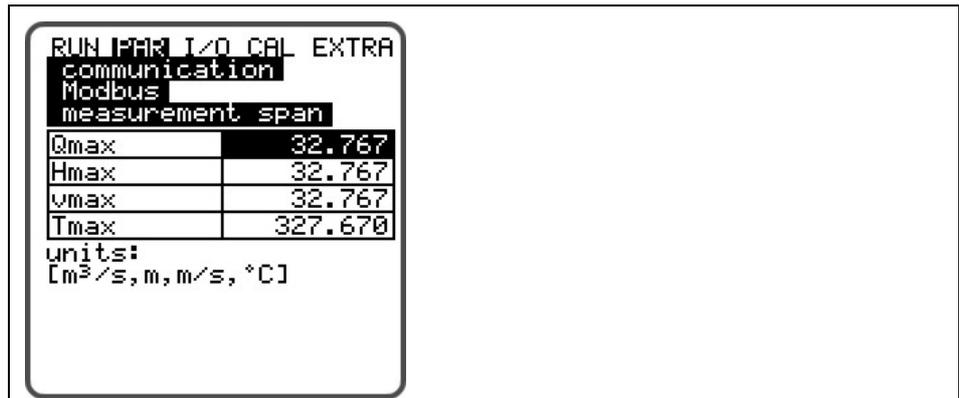
Submenu Modbus => Measurement Span
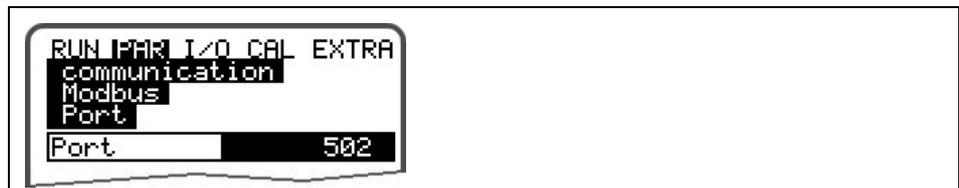
Submenu Modbus => Port

Menu I/O
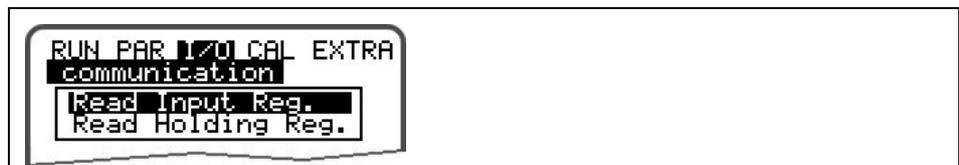
Submenu Communication => modbus

Set a fixed IP address as described.
It is possible to use a dynamic address. However the master then is forced to recall the protocol (Request) by using the same name.
Verify the IP address by triggering the master to send a PING.
The Ethernet interface has been properly set and initialised as soon as a response from the unit has been received within the pre-determined period.
Set the master's port to the port entered in the unit (standard 502). Make sure that the port has been unlocked at the master or set the port at the unit to an unused port under **PAR > Communication > Modbus > Port**. Contact your responsible system administrator if required.

The measurement spans of the values Q, h, V and T can be modified under
PAR > Communication > Modbus > Measurement span.

Important:

Modifying the scale at this point results in a different bit resolution within the protocol.

The standard settings here are:

Q_{max} +- 32,767 [m³/s]
H_{max} +- 32,767 [m]
V_{max} +- 32,767 [m/s]
T_{max} +- 327,67 [°C]

Input Registers

Function Code(s):

- "Read Input Registers" (0x04)

The Master sends „Read Input Registers" (Function code **0x04**):
The following values can be found in the addresses stated below within the register.
The data format is integer (signed 16 Bit).

- 1:   Flow rate (scaled)

- 2:   Level (scaled)

- 3:   Velocity (scaled)

- 4:   Water temperature (scaled)

- 5:   Air temperature (scaled)

- 6:   Status bits to 1-5

- 7-14:   Analog Inputs 1-8 (scaled)

- 15-22: Analog Outputs 1-8 (scaled)

- 23:   Status bits to 7-22

- 24:   Digital Inputs 1-16

- 25:   Digital Outputs 1-16

- 26-27: Error messages 1-32

- 28:   Level pressure (scaled)

- 29:   Level Water ultrasonic (scaled)

- 30:   Level Air ultrasonic (scaled)

- 31:   Level Extern (scaled)

- 32:   Status bits to 28-31

- 33-48: Sensor1 Gate 1-16 (scaled)

- 49: Status bits to 33-48

- 50-65: Sensor2 Gate 1-16 (scaled)

- 66: Status bits to 50-65

- 67-82: Sensor3 Gate 1-16 (scaled)

- 83: Status bits to 50-65

- 84-99: Sensor4 Gate 1-16 (scaled)

- 100: Status bits to 84-99

- 101-108 average velocities V1-4 or (path 1-8 (scaled))

- 109 Status bits to 101-108

Example:

Address 1
Flow [m³/s]
Scaled from –32767 to +32767 corresponds to 1 Digit = 1 l/s

Address 2
Level [m]
Scaled from –32767 to +32767 corresponds to 1 Digit = 1 mm

Address 3
Velocity [m/s]
Scaled from –32767 to +32767 corresponds to 1 Digit = 1 mm/s

Address 4
Temperature [°C]
Scaled from –32767 to +32767 corresponds to 1 Digit = 0.01 °C

Addresses 7 – 14
Analog Inputs [%]
Scaled from –10000 to +10000 corresponds to 1 Digit = 0.01 %

Addresses 15 – 22
Analog Outputs [%]
Scaled from –10000 to +10000 corresponds to 1 Digit = 0.01 %

The status registers (addresses 6, 23, 32, 49, 66, 83, 100) indicate the validity of the according measurement values. The value is invalid as soon as the bit is set at the relevant place.

Example (Address 6):

- Bit0 → Status Flow

- Bit1 → Status Level

- Bit2 → Status Velocity

- Bit3 → Status Water temperature

- Bit4 → Status Air temperature

Holding Registers

Function Code(s):

- "Read Holding Registers" (0x03)

- „Write Single Register" (0x06)

- „Write Multiple Registers" (0x10)

Address:

- 1-8:   Analog Outputs 1-8 (scaled)

- 9:   Digital Outputs 1-16

Note:

A write operation on these addresses has an effect on the respective output only if the output parameter has been set to "Modbus" under **PAR > analog Outputs > Function** on the unit previously.
A read operation will return the status previously set, which however not necessarily must correspond with the physical output status.

Discrete Inputs

Function Code(s):

- "Read Discrete Inputs" (0x02)

Addresses:

- 1-16: Digital Inputs 1-16

- 17-32: Digital Outputs 1-16

- 33-64: Error messages 1-32

Note:

Reading the addresses 17-32 returns the physical state of the digital output.
Importance of the several error messages (Addresses 33-64):

- 1:   real time clock

- 2:   serial interface

- 3:   analog inputs

- 4: analog outputs
- 5: Memory1
- 6: Memory2
- 7: digital inputs
- 8: digital outputs
- 9: Totaliser
- 10: DSP
- 11: Program memory
- 12: data storage
- 13: Operational error
- 14: sensor1
- 15: controller
- 16: Compact-Flash Card
- 17: sensor2
- 18: sensor3
- 19: sensor4
- 20: buffer battery
- 21: Ethernet
- 22: Modem
- 23: PC diagnosis
- 24: GPRS / GSM-Pin
- 25-32: not connected

Coils / Outputs

Function Code(s):

- "Read Coils" (0x01)
- „Write Single Coil" (0x05)
- „Write Multiple Coils" (0x0f)

Addresses:

- 1-16: Digital Outputs 1-16

Note:

A write operation on these addresses has an effect on the respective output only if the output parameter has been set to "Modbus" under **PAR > analog Outputs > Function** on the unit previously.
A read operation will return the status previously set, which however not necessarily must correspond with the physical output status (see above).

```
typedef struct scalar {
        float min;
        float max;
}
```

The data type "float" corresponds to the "IEEE-Single"-Definition, transmission is executed in "big-endian".
Array member "min" represents the corresponding value for 0 digits, "max" represents the measurement value at 32767 digits.

Verification of registers

The registers "Read Input Register" and "Read Holding Register" can be verified directly on the unit under **I/O > Communication > Modbus > Read Input Reg.** (or Read Holding Reg.)

Pressing the "ALT" key allows to toggle the screen from decimal to hexadecimal representation.

NIVUS GmbH
Im Täle 2
75031 Eppingen

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

EU Konformitätserklärung

EU Declaration of Conformity

Déclaration de conformité UE

Für das folgend bezeichnete Erzeugnis:

For the following product:

Le produit désigné ci-dessous:

Bezeichnung:	**Durchflussmesssystem, Serie NivuSonic CO100 für Laufzeitdifferenzmessung**
Description:	*flow measurement system, series NivuSonic CO100 based on transit time*
Désignation:	*Système de mesure de débit, série NivuSonic CO100 pour mesure par différence de temps de transit*
Typ / Type:	**NBM0CO100...**

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

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

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

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

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

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

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

- EN 61326-1:2013
- EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019
- EN 302372 - V2.1.1
- EN 302729 - V2.1.1

Diese Erklärung wird verantwortlich für den Hersteller:

This declaration is submitted on behalf of the manufacturer:

Le fabricant assume la responsabilité de cette déclaration:

NIVUS GmbH
Im Taele 2
75031 Eppingen
Germany

abgegeben durch / *represented by / faite par:*
Ingrid Steppe (Geschäftsführerin / *Managing Director / Directeur général*)

Eppingen, den 24.10.2022

Gez. *Ingrid Steppe*

NIVUS GmbH
Im Täle 2
75031 Eppingen

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

UK Declaration of Conformity

For the following product:

Description:	Flow measurement system, series NivuSonic CO100 based on transit time
Type:	NBM0CO100...

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

- SI 2016 / 1091 The Electromagnetic Compatibility Regulations 2016

- SI 2016 / 1101 The Electrical Equipment (Safety) Regulations 2016

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

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

- BS EN 61326-1:2013
- BS EN 302372 - V2.1.1
- BS EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019
- BS EN 302729 - V2.1.1

This declaration is submitted on behalf of the manufacturer:

NIVUS GmbH
Im Taele 2
75031 Eppingen
Germany

represented by:

Ingrid Steppe (Managing Director*)*

Eppingen, 24/10/2022

Signed by *Ingrid Steppe*