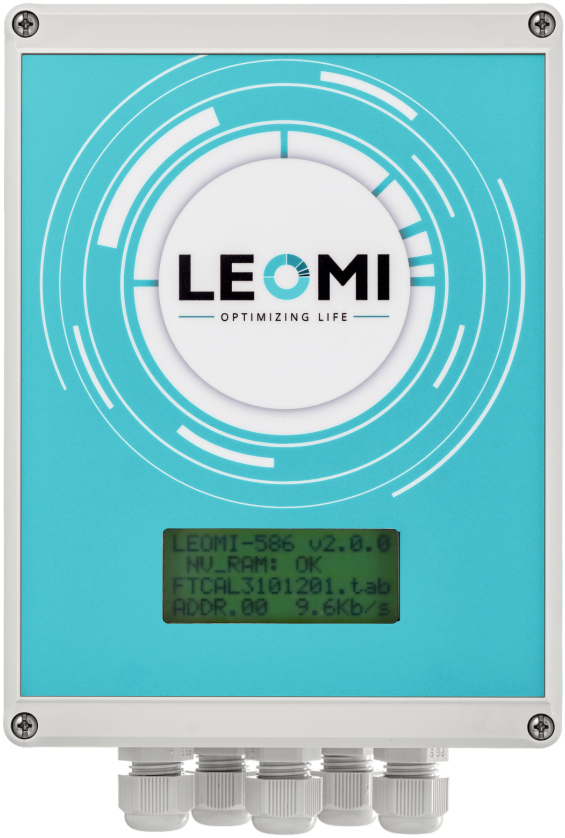
INSERTION THERMAL MASS FLOWMETER
LEOMI-586



CONTENTS

IMPORTANT NOTE

Before installation and commissioning the unit the operating instructions must be read extremely carefully to avoid possible damage which may invalidate the warranty.

The unit must only be used for the operating conditions as described in the specification.

All other usage is excluded.

The sensor, especially the ends of the probe are very sensitive detecting elements, which have to be protected against shocks or other mechanical damage.

1. FLOW METER DETAILS

1.1 LEOMI 586 SPECIAL FEATURES

Insertion Thermal Mass Flowmeter **LEOMI 586** is developed in technical collaboration with German company Softflow.de with proven track record of field performance for more than 15 years and now produced here in India assembled with all parts manufactured and tested by German vendors. LEOMI Instruments Pvt. Ltd. has newly commissioned in-house latest state-of-the-art Automatic Göettinger Wind Tunnel Certified with DKD Calibration as per ISO-17025 velocity ranges from 0.2m/s to 75m/s with Flow uniformity of ±0.2%.

This Flowmeter is most preferred by Industrial, Environmental and Commercial customers for a variety of applications such as Compressed Air, Combustion Air, Aeration Air, Flue gas, Waste-gas, Landfill gases etc.

LEOMI 586 Insertion Thermal mass flowmeter has developed a new measuring system which combines separate analogue controllers for high resolution & very fast response together with a very new and high performance digital microprocessor controllers for long-term stability & very high absolute accuracy instead of a traditional drift prone Wheatstone Bridge for controlling over temperature(ΔT). This ensures guarantee stable electronic evaluation for Thermal (Calorimetric) Probes with excellent electrical characteristics.

For service and support display menus available which give information about the important probe characteristics. (reference temperature, heater temperature, power consumption of the heater and over temperature) (refer -Software section)

For testing the electronic without sensor a simulators available.

Optionally many interfaces possible, also firmware update / upgrade is possible.

Thermal Mass Flow Meter - The General Benefits:

- Direct mass flow measurement. No temperature or pressure transmitters are necessary.
- Usable in high temperature ranges upto 400°C.
- High Accuracy and Repeatability.
- Precision measurement and excellent repeatability.
- Wide ratio measuring range 1:100.
- LEOMI calibration from 0.6 Nm/s to 65 Nm/s.
- Lower velocity upto 0.2Nm/s or Extrapolation upto 150 Nm/s. (Optional)
- Negligible pressure drop, nearly no influence to the flow.
- No moving parts. Long time accuracy and long lifetime.
- Dirt Insensitive but if needed, simple cleaning is enough.
- Easy installation and convenient mounting.
- LCD Backlit Display, 4lines X 16characters, digital contrast adjustment, temperature compensated, illuminated.

- High accuracy and high long time stability by microprocessor adjusted flow sensor with compensation of thermal conductivity over the complete temperature range.
- Microprocessor signal processing and evaluation 0/4-20mA or 0-10V analogue output.
- Relay output (change over contact) as pulse or switch point configurable.
- Interface RS232/ RS485 Modbus RTU Communication for data and configuration.
  (for other options consult factory)
- Stable, plugged spring-cage connection for easy connection and installation.
- Four-wire technique for probe connection (both sensors), complete compensation of measuring errors and high interference immunity even when using long probe connecting cable (upto100m).
- No active electronic components in the probe, there by useable in high temperature applications.
- Probe with junction box.
- Power supply 100-265 VAC, 24 VDC(18-36VDC).
- In-built data logging on PC via LEOMI Terminal Software version: 586.1.0.0 available.
- LEOMI Software firm ware update/ upgrade possible.

Optional:

- Probe for Temperature ranges up to 400°C
- Probe HALAR® (ECTFE) or PFA coated for aggressive / corrosive gases.

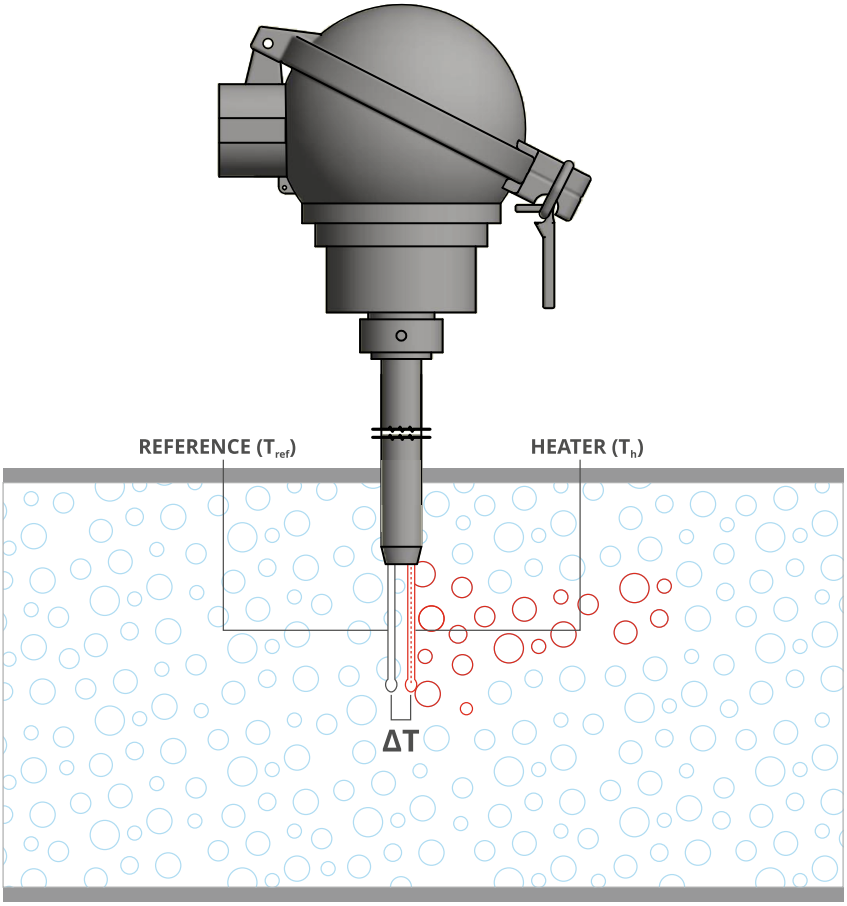
1.2 LEOMI 586: MEASUREMENT PRINCIPLE

The calorimetric measurement based on the physical principle of heat transfer from a heated element to the ambient medium (example: air). This is affected by the velocity, density (temperature and pressure) and by the characteristic of the medium.

The amount of needed energy is a function of the temperature difference Δt and the mass flow.

LEOMI 586 Thermal Mass Flowmeter is using the following method:

The temperature difference (over temperature) Δt between the reference sensor (medium temperature) and the heater sensor is controlled electrical constant by analogue / digital controller together with high power operational amplifier enables a very fast absolute precise adjustment of the needed power for keeping the over temperature constant.

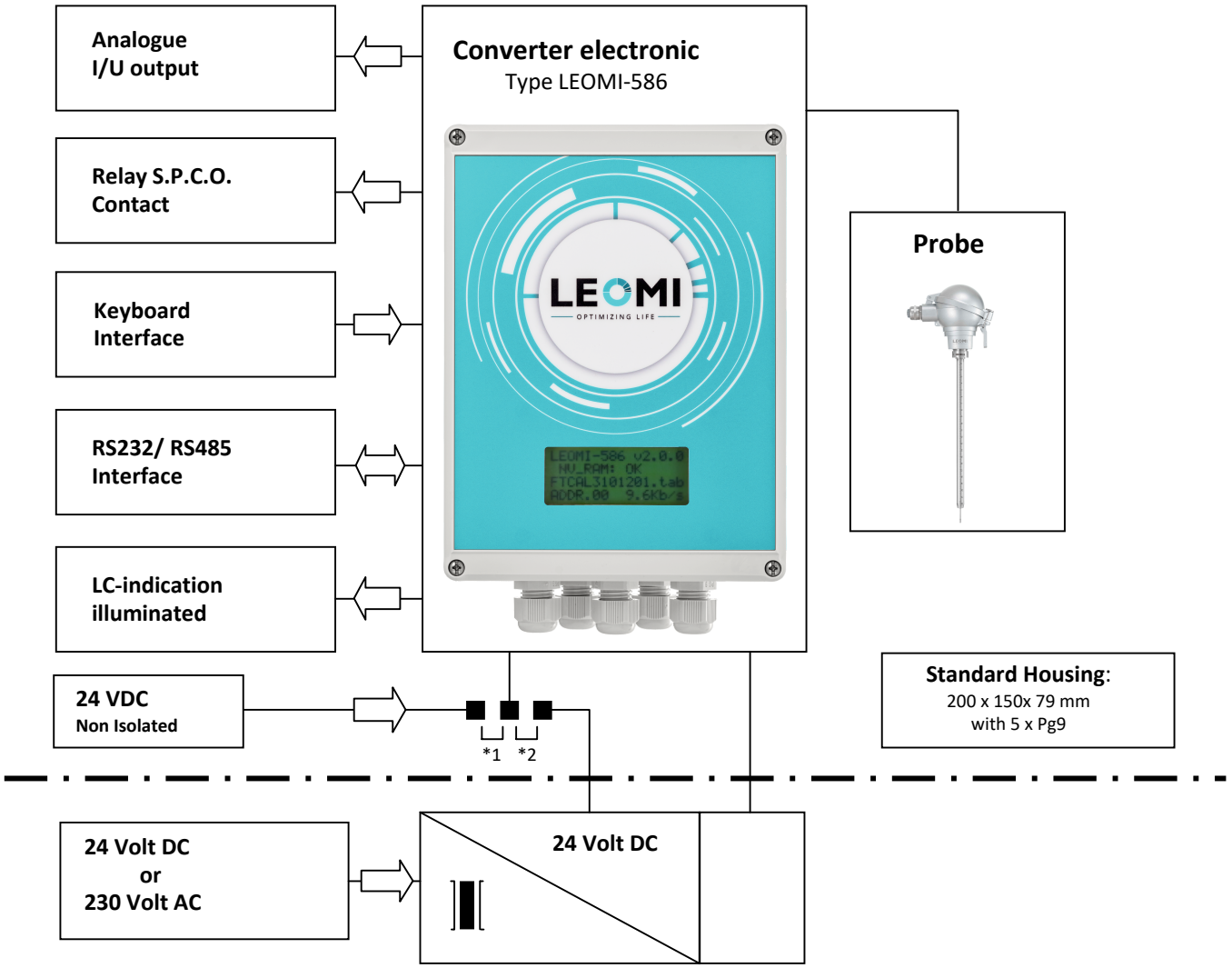


Constant Temperature Anemometry (CTA)
(Digital controlled Circuit not Wheatstone bridge)

1.3 GENERAL

The unit comprises of a probe-type sensor for installation in the line with separate converter electronics. Both parts are interconnected by cable. The cylindrical shape of the sensor allows ease installation into the pipe line.

The unit utilizes the heat dissipation principle and supplies a primary output signal proportional to the density of the medium and the flow velocity.



1.4 SERIAL NUMBER

The sensor is calibrated together with the electronic converter. The calibration curve is stored in a non-volatile storage (nvSRAM) in the electronic converter. When installing it is important to use always the parts of sensor and electronic that belongs together.
On the electronic housing you can find a calibration table with information about the sensor and the electronic. In the second line are the electronic number (58604190101A) and the sensor number (58604190101B). The sensor number is short below the cable protection on the upper end of the sensor.

LEOMI®
OPTIMIZING LIFE

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TYPE	LEOMI 586
SR NO.	58604190101A
MEDIUM/PRESSURE/ TEMPERATURE	AIR / max 16 bar / -40^C to +100^C
RANGE / AIR. O^C. 1013.25 hPa	0.6 – 150 N m/s
POWER SUPPLY	24 VDC

2. SENSOR

2.1 TECHNICAL DATA

Operating principle:	Calorimetric, primary signal proportional to mass flow (moisture must be avoided)
Medium:	Compressed air, gases dry (normal density 0°C/1,013bara)
Measuring range:	0.6 - 65m/s (with reference to normal conditions) (Higher upon request)
Accuracy:*	±1.5% reading (-40°C-100°C); ±2.0% reading (0°C-200°C / 300°C / 400°C) at reference calibration conditions upto 75 m/s
Repeat accuracy:	±0.5% of measured value
Operating pressure:	Maximal 16bar absolute (higher upon request)
Warming up time t:	About 5 minutes after power on
Operating temperature:	Standard –40°C to +100°C, maximum upto 400°C (set by order)
Surrounding temperature:	-40°C to +80°C
Installation position:	Any
Steadying distance:	*Minimum 20D* upstream,5D downstream Steadying distance depends upon the applications Longer steadying distances recommended for upstream installation of valve, bends or elbows or mechanical obstructions see also DIN EN ISO 5167-1:2004 (refer: Installation)
Process connection:	*Compression Ferrule* with G½“ external thread
Pressure range:	PN16 (higher on request)
Wetted parts:	SS-316Ti (DIN1.4571), HALAR® & PFA Coating for corrosive gases (optional) (Other consult factory)
Protection class:	IP67
Connecting cable:	Standard 5m. (higher upon request)
Sensor lengths:	250mm, 500mm, 1000mm (other upon request)

*Calorimetric flow sensors normally needed no service, but however, electronic components get under influence of growing older and changing its electrical characteristics. Changing of the coating by corrosion and pollution could also influence the accuracy. So it is necessary, from time to time (recommendation: about every 2 years) to check the calibration.

Measuring range limits (referred to air under normal conditions 0°C/1,013 bara) with inner diameter

mm	15-25	32	40	50	65	80	100	200	300	3000
Nm^3/h	100	170	260	410	700	1000	1700	6800	15200	1500000

2.2 INSTALLATION & ORIENTATION OF CALORIMETRIC SENSOR

2.2.1 Installation:

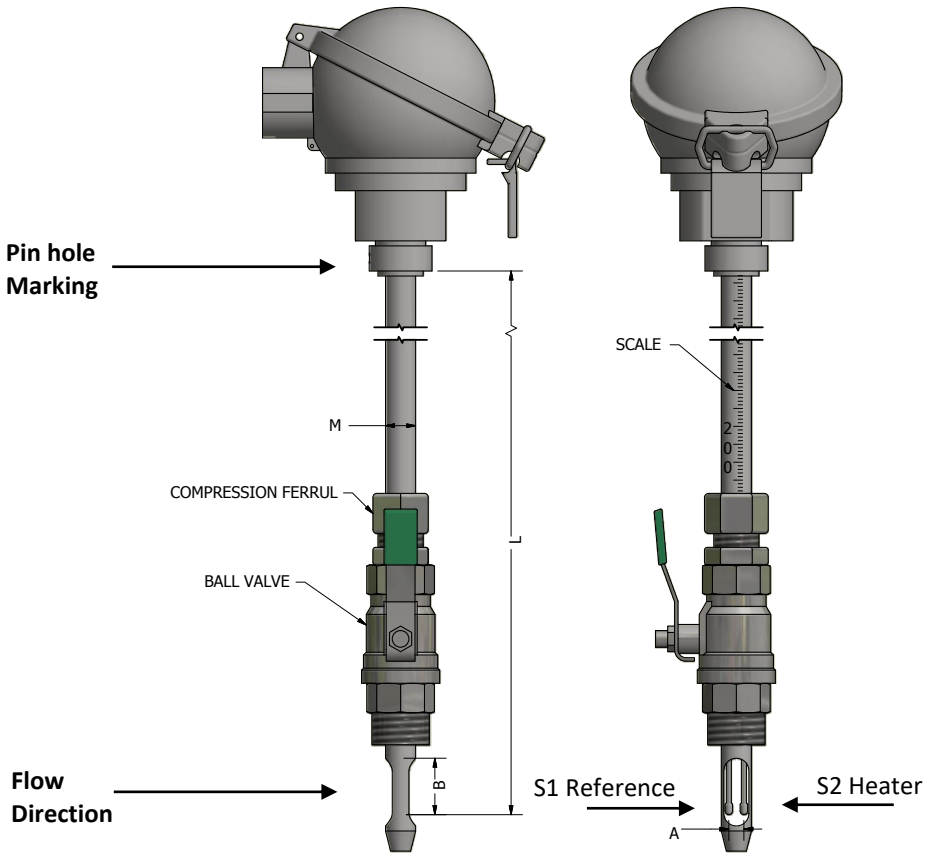
The sensor consists of a cylindrical shaft. At the lower end are Pt-100 thermal measuring sensors. The sensor element **S1 (Reference)**registers the actual medium temperature.

The sensor **S2(Heater)**is controlled via the converter electronics to a constant temperature of max. 40°C above medium temperature.

The passing medium causes of loss of energy at sensor **S2.**

The difference in the supplied energy amounts is in direct ratio to the mass flow.

Sensor head junction box consists of cable terminals for **S1**&**S2**. Small Pinhole on probe indicates marking for direction of the sensor while mounting inside the Pipe or Duct.



2.2.2 Orientation of Sensor:

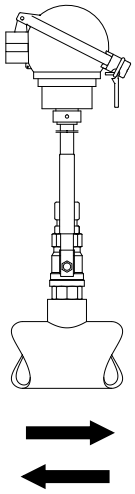
Insertion Thermal Mass Flow meters require a fully developed flow profile as a pre-requisite for correct flow measurement.

For this reason, please note the following points when installing the device.

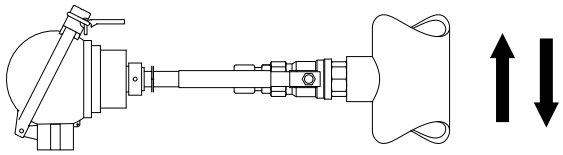
The Sensor can generally be installed in any position in the piping. In the case of wet / dirty gases, upward flow is preferred in vertical pipes to minimise condensation / contamination on or around the sensing element. In particular, where free condensation can occur (ex: Biogas) the sensor should be orientated to prevent water collecting on or around the sensing elements (e.g. do not install the sensor at a low point in the installation without adequate drainage).

Make sure that the direction arrow on the sensor matches the direction of flow (direction of fluid flow through the pipe).

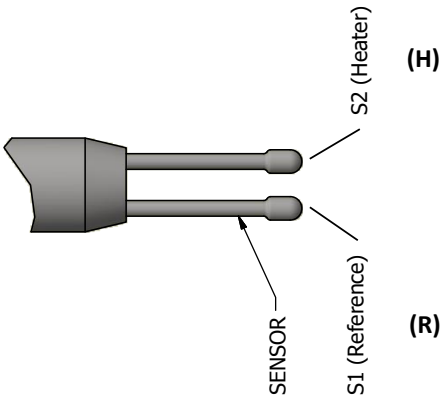
Horizontal Orientation



Vertical Orientation



Caution: Heater **(H)** must be above while mounting sensor horizontal from side in pipe section. Observe **H & R Indication** below**.**



2.2.3 Installation and Starting of the Sensor

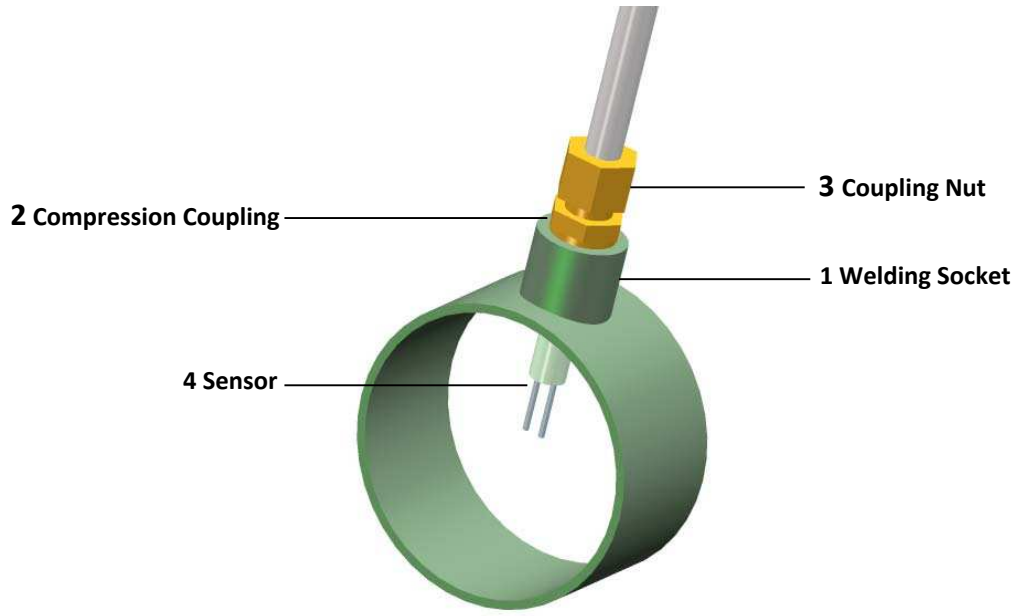
Before installation a bore in the pipe of Ø16mm has to be provided. On top of this bore a welding socket has to be welded exactly vertical to the pipe axis. The welding socket with internal thread G1/2 (BSPT 1/2”) is used to connect the sensor.

2.2.4 Installation with Compression Ferrule

On standard circular pipes the boss can be situated in any position. Please avoid to install the sensor to the bottom of the pipe, it might happen, that condense influences the measurement. Please proceed as follows:

- Screw the compression coupling **2** into the welding socket **1** (use suitable sealing). **Attention!** Do not tighten the coupling nut **3** in this stage.
- Insert the sensor **4** in axial direction until the required insertion depth is reached.
- Align the sensor into direction of flow. The marking point at the upper end of the sensor shaft marks the upstream direction of flow.
- Now fix the coupling nut **3** to the compression coupling.

Attention! After that the axial position of the sensor remains fixed.



2.2.5 Installation with Compression Ferrule Connection and Ball Valve

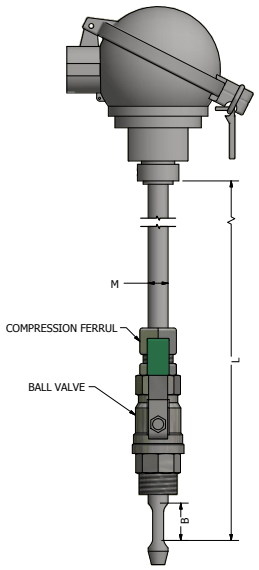
Attention! Never move lever of ball valve when sensor is inserted.

The sensor comes supplied with compression ferrule connection and ball valve.

Please proceed as follows:

Fix Ball Valve with welding socket & Open Ball. With this assembly a change of the insertion depth or mounting, of the sensor is possible at any time even with pressurized pipes.

Please always consider that when mounting or demounting the sensor in pressurized pipes shear forces up 6 to about 12Kp are acting!!!



2.3 UPSTREAM AND DOWNSTREAM LENGTHS DETAILS

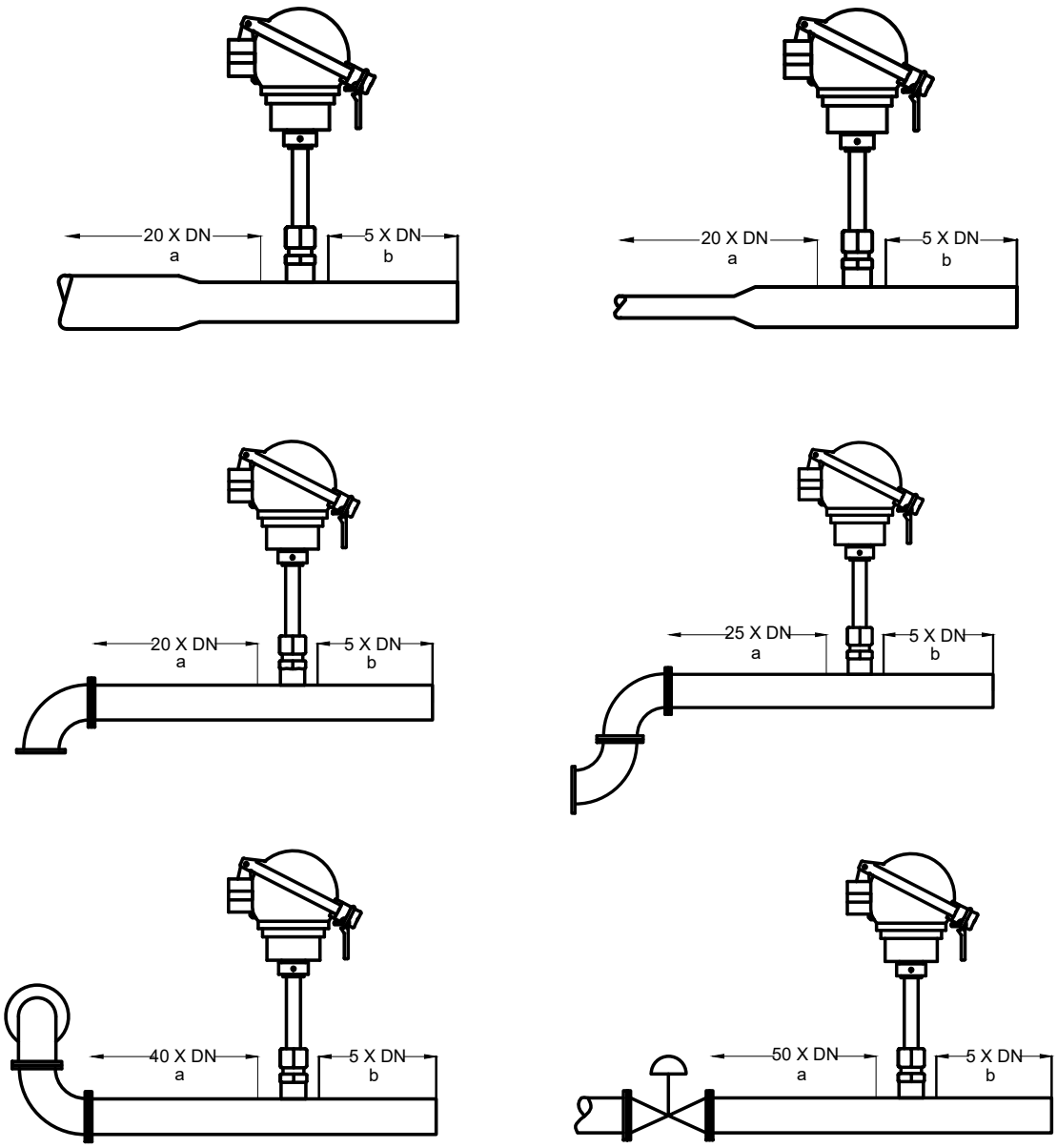
The principle of thermal Mass flow measurement is very sensitive against disturbances. Therefore, it is necessary to ensure the recommended upstream and downstream lengths.

2.3.1 Table for Upstream and Downstream Lengths

Upstream/ Downstream Length Table

Flow obstruction before the measurement section	**Min Length Upstream (a)**	**Min Length Downstream (b)**
Reduction (Pipe narrows to the measurement section)	**20 x D**	**5 x D**
Expansion (Pipe expands to the measurement section)	**20 x D**	**5 x D**
90° elbow or T-piece	**20 x D**	**5 x D**
2x elbow 90°	**25 x D**	**5 x D**
2x elbow 90°, 3-dimensional	**40 x D**	**5 x D**
Control valve	**50 x D**	**5 x D**

2.3.2 Schematic Diagram for Recommended Straight Lengths



The values represent the minimum recommended lengths. In case the min. upstream /downstream lengths could not be ensured, there might be significant increase in errors in measurement.

2.4 CALCULATION

2.4.1 Calculation of Sensor Surface and Insertion Depth

E (Install Length) when using seamless steel tubes for DIN2448

Nominal Diameter	Outer Ø (mm)	Inner Ø D (mm)	Wall S (mm)	X* (mm)	E for Probe 250 mm	Probe Surface A mm²	E for Probe 120 mm	Probe Surface A mm²	Max volume flow at 60m/s Nm³/hr.
DN 50	**60.30**	**54.50**	**2.90**	**6.30**	**235**	**45**	**105**	**45**	**504**
DN 65	**76.10**	**70.30**	**2.90**	**8.10**	**234**	**52**	**104**	**52**	**839**
DN 80	**88.90**	**82.50**	**3.20**	**9.50**	**232**	**57**	**102**	**57**	**1155**
DN 100	**114.30**	**107.10**	**3.60**	**12.30**	**229**	**69**	**99**	**69**	**1947**
DN 125	**139.70**	**131.70**	**4.00**	**15.10**	**225**	**81**	**-**	**-**	**2944**
DN 150	**165.10**	**156.10**	**4.50**	**18.00**	**222**	**115**	**-**	**-**	**4135**
DN 200	**219.10**	**206.40**	**6.30**	**23.70**	**214**	**184**	**-**	**-**	**7230**
DN 250	**273.00**	**260.40**	**6.30**	**30.00**	**208**	**259**	**-**	**-**	**11508**
DN 300	**323.90**	**309.70**	**7.1**	**35.6**	**202**	**327**	**-**	**-**	**16278**

***** Measure **x** shows the Aichelen point (position of the averaged flow velocity) at turbulent flow.

For calculation the following dimensions must be known

D = Inner pipe diameter [mm]
S = Wall thickness of the pipe [mm]
L = Sensor length [mm]

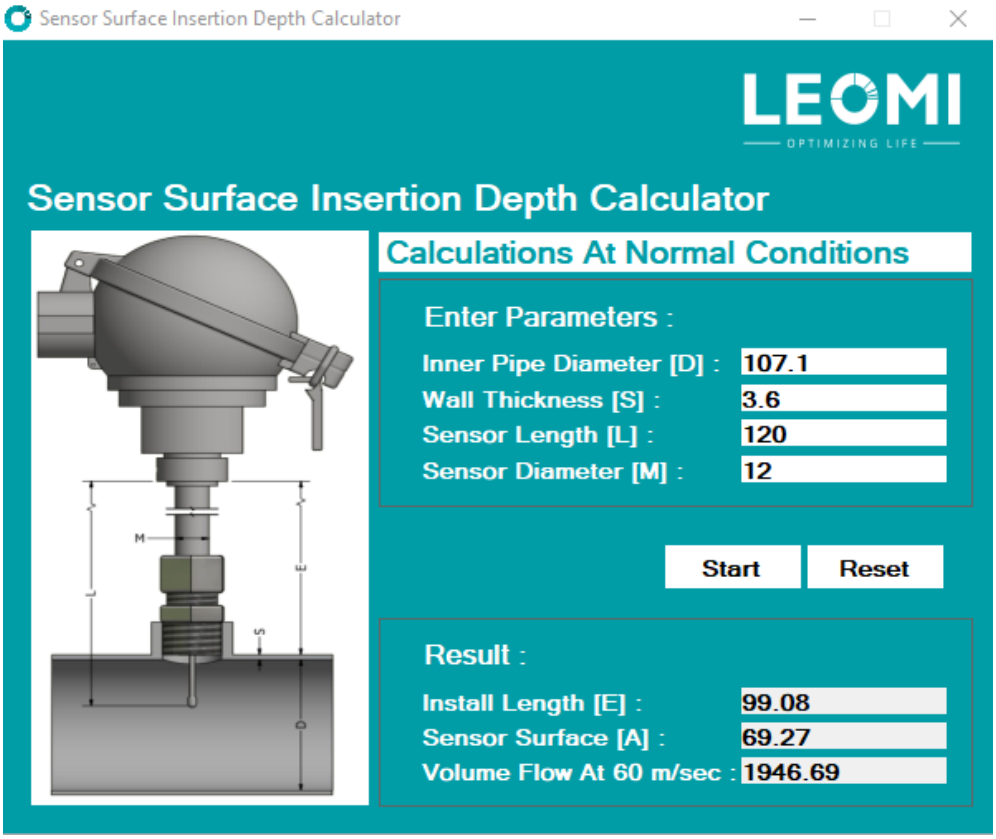
For the Aichelen point is valid:

Z = (0.115 x D) – 15 inner length of the sensor housing [mm]

if Z ≥0 then A = 80 + (12 x Z) surface of housing and both sensors [mm²]
if Z < 0 then A = 80 + (4 x Z) surface only of both sensors [mm²]

E = L – Z – S – 20 install length according to the drawing [mm]

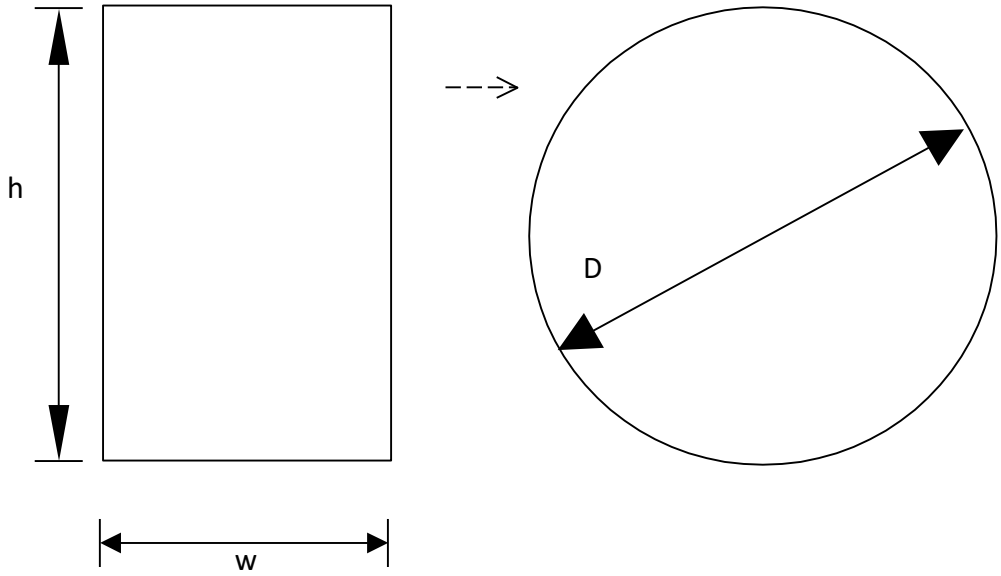
NOTE: FOR AUTOMATIC CALCULATION OF INSERTION DEPTH, USE CALCULATOR.



2.4.2 Calculation of Hydraulic Diameter for Rectangular Duct

For the calculation from a rectangle surface into a circular surface with the correct flow profile

The following formula is valid:



Dh= $\frac{4A}{P}$ (Dh= Hydraulic Diameter; A = Area of cross-section; P = Perimeter of wetted parts)

Dh = $\frac{2 \times w \times h}{w + h}$

IMPORTANT NOTE: Calculate Hydraulic Diameter for all other than Square and Circular Pipe / Duct Sections.

EXAMPLE:
Duct Size: w = 1000 mm and h = 1600 mm

Dh = $\frac{2X1000 \times 1600}{1000 + 1600}$

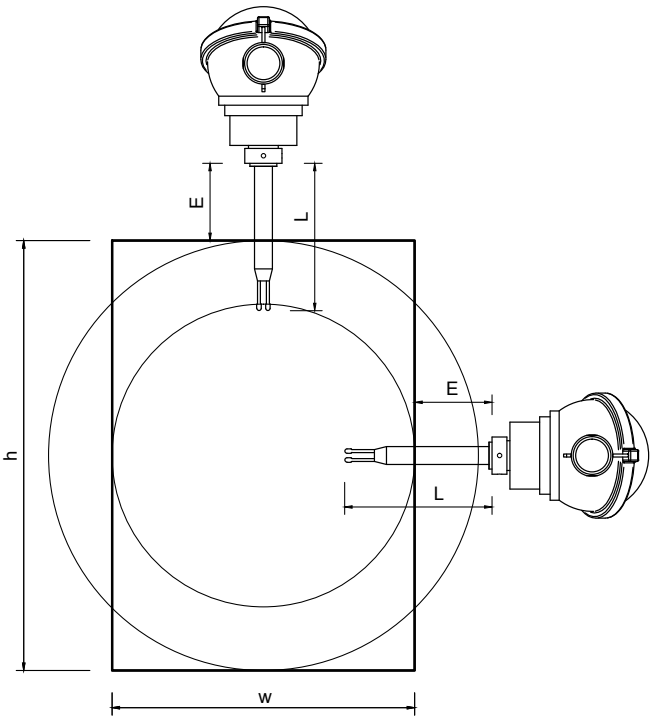
Dh = 1230.7mm (Enter it in LEOMI Terminal programme in configurations)

CONFIGURATIONS Enter ← → DIAMETER OF PIPE

DIAMETER OF PIPE Enter + - ← → * 1230.0 mm

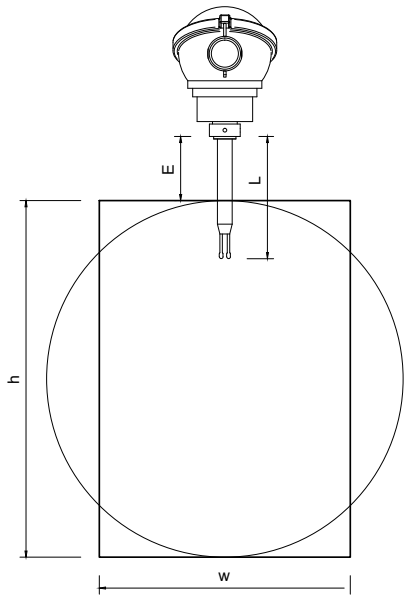
2.4.3 Calculation of Sensor Surface and Insertion Depth for Rectangular Duct

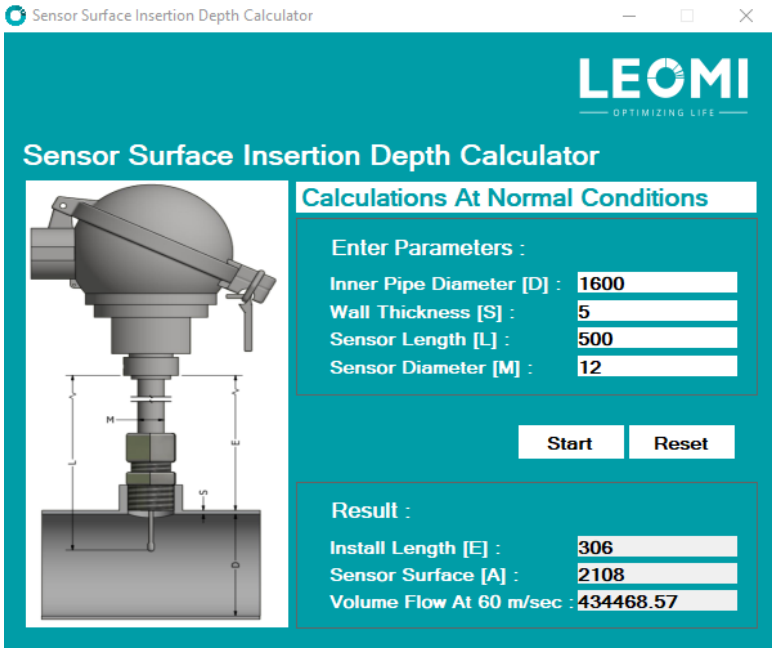
When using a rectangle profiled tube, some calculations for the configuration of the LEOMI-586 are necessary. For better understanding we use the following *test-channel*.



Calculating the install length (example):

1. <u>Installing on the small side (W) - 1000 mm</u>
   Diameter of h - 1600mm insert in Calculator
   install length (E) = 306 mm
   Sensor surface (A) = 2108mm²
   The 2108 mm² is the input for the SENSORAREA-menu in the Leomi-586

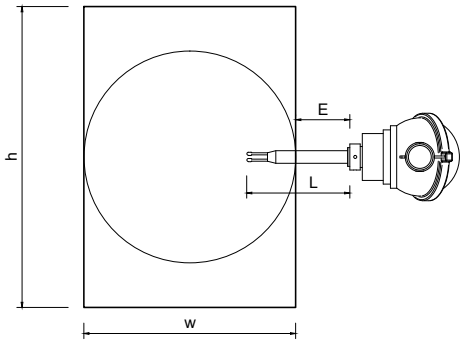


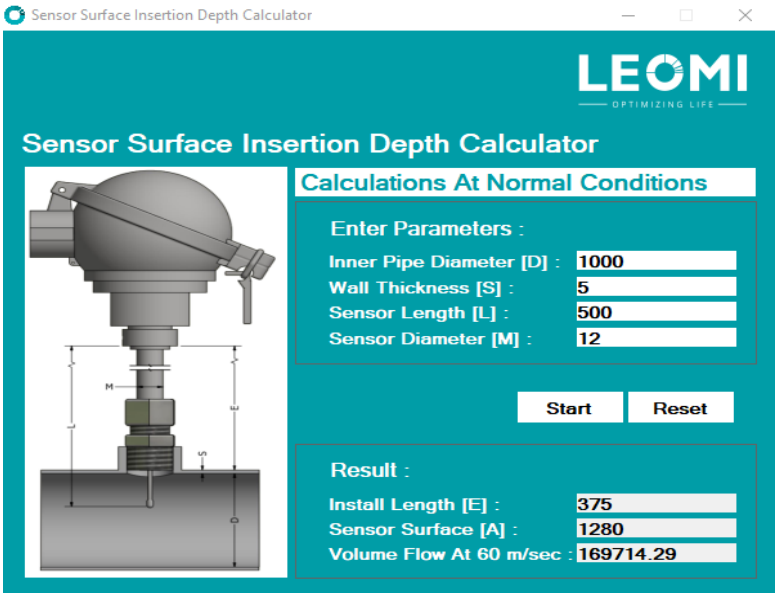


CONFIGURATIONS Enter ← → SENSORAREA

SENSORAREA Enter + - ← → * 02108 mm²

2. <u>Installing on the long side (h)– 1600 mm</u>
   Diameter of w 1000mm insert in calculator
   Install length (E) = 375 mm
   Sensor surface (A) = 1280 mm²
   The 1280 mm² is the input for the SENSORAREA-menu in the Leomi-586.





CONFIGURATIONS
Enter ← →
SENSORAREA

SENSORAREA
Enter + - ← → *
01280 mm²

2.5 SPECIAL SENSORS (OPTIONAL)

2.5.1 HALAR® Coated

SAFECOAT 786 is a corrosion protection coating with good insulating properties, based on a copolymer of ethylene and mono-chlorotrifluoroethylene (ECTFE), also known as HALAR®.

HALAR® Coating Characteristics:

- Very good resistance to chemicals and solvents (exception: amines, strong oxidizing acids)
- Temperature range up to approx. 150°C (in a dry atmosphere)
- Good mechanical properties
- Good diffusion barrier
- Very low dielectric constant of 2.5
- Very good weather resistance
- High dielectric strength up to approx. 3500 V DC and AC (in the medical sector)
- Good radiation resistance
- Hardness: Shore D 70
- Low water absorption approx. 0.1%
- Multilayer system
- Layer thicknesses between approx. 250µm and 1600µm, round material max. 600mm
- Suitable for food contact
- Colour: Olive-green

2.5.2 PFA Coated

SAFECOAT 778 is a very high quality PFA coating, with good anti adhesion effect and excellent corrosion protection properties.

PFA Coating Characteristics:

- Good diffusion barrier
- Excellent resistance to chemicals and solvents 0-14 pH
- Max. continuous use temperature: +260°C (dry atmosphere)
- Short-term maximum temperature: +290°C
- Very good diffusion barrier
- Anti-adhesion properties
- Multilayer system
- Layer thicknesses up to 1200µm (at least 300µm)
- Suitable for food contact (FDA / BGA approval)
- Colour: Black

3 SIGNAL EVALUATION UNIT DETAILS

3.1 TECHNICAL DATA

Operating principle:	Constant over temperature regulator with microcontroller, curve correction over 60point calibration table
Power supply:	24VDC (18 - 36VDC) OR 230VAC (100 - 265 VAC@50Hz)
Measuring range:	0.6 - 65m/s (with reference to normal conditions) (Higher upon request)
Full scale error:	< ± 0.5% of measured value
Warming up time t:	About 5 minutes after power on
Display:	LC dot matrix display 4 lines with 16 characters, illuminated
Showing values:	Mass flow and mass (counting), volume flow and volume (counting), temperature
Data protection:	nvSRAM (non-volatile storage)
Analogue output:	0/4-20 mADC (Isolated @500Ω) OR 0 -10VDC flowrate proportional
Relay, two-way contact:	1 NO / NC Relay contact @ 250VAC / 6A programmable for Temperature OR Flowrate
Communication interface:	RS232/ RS485 Modbus RTU for data and configuration
Ambient temperature:	-20°C to +60°C
Terminal connector:	Spring-cage connection (pluggable) for all inputs and outputs (max.1,0mm²)
Ingress Protection:	IP 65 (Other consult factory)
Enclosure Protection:	Flameproof Gas Group IIA, IIB, T4 (Optional) (Other consult factory)
Enclosure Details:	ABS Plastic,200mm (L)x150mm(W) x79mm(D); Aluminium Diecast 260mm (L) x 160mm(W) x 91mm (D) (Optional) (Other upon request)
Weight:	ABS Plastic Housing- 950g, Aluminium Housing - 2700g

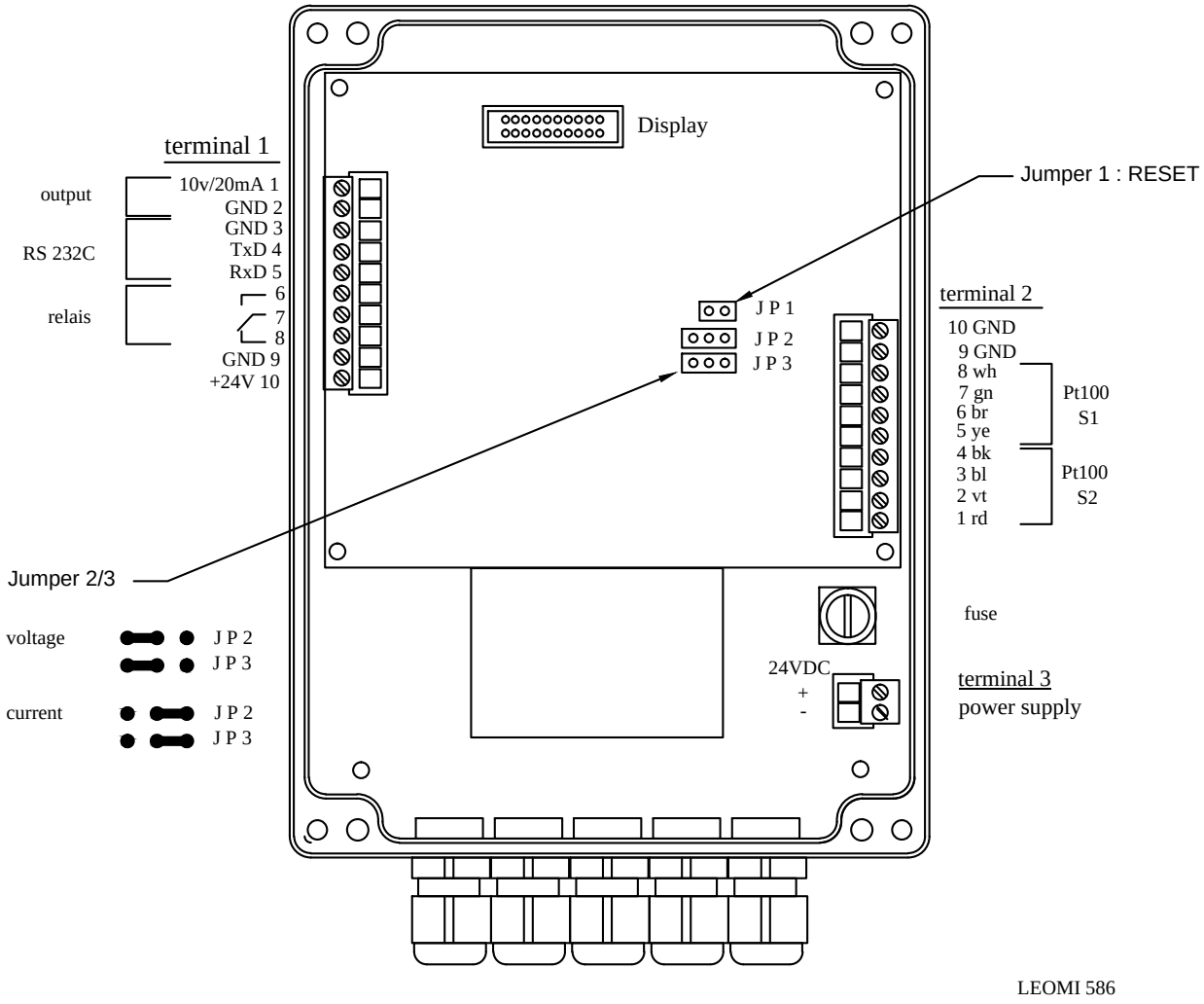
3.2 ELECTRICAL CONNECTION

3.2.1 Connection of Converter Electronics

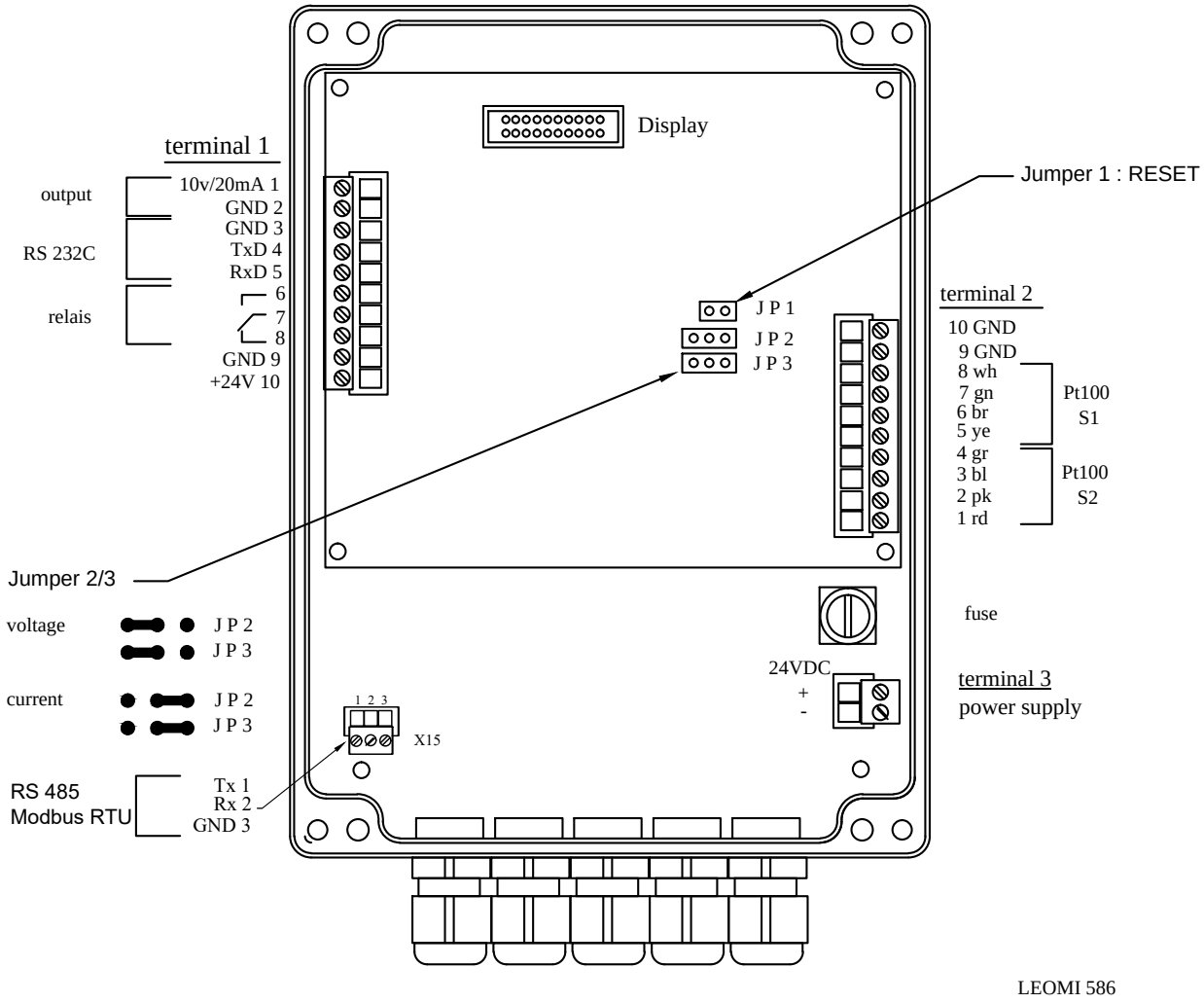
⚠ **Note:** While opening top cover of electronics, pay attention to display cable assembly attached with it.

- Take off cover of electronics housing after loosening the screws.
- Sensor cable, power supply cable and if needed interface cable and signal cable for analogue output and relay output have to be led through the Pg-cable gland and connected according to the wiring diagram (diameter 0.2-2.5mm²). Ensure cable glands are properly tight after cabling for required protection.
- After having done the necessary connections the unit is ready for use.
- Replace cover of electronics housing and tighten the screws.

3.2.2 Electrical Connection Diagram for Power Supply 24 VDC (standard)

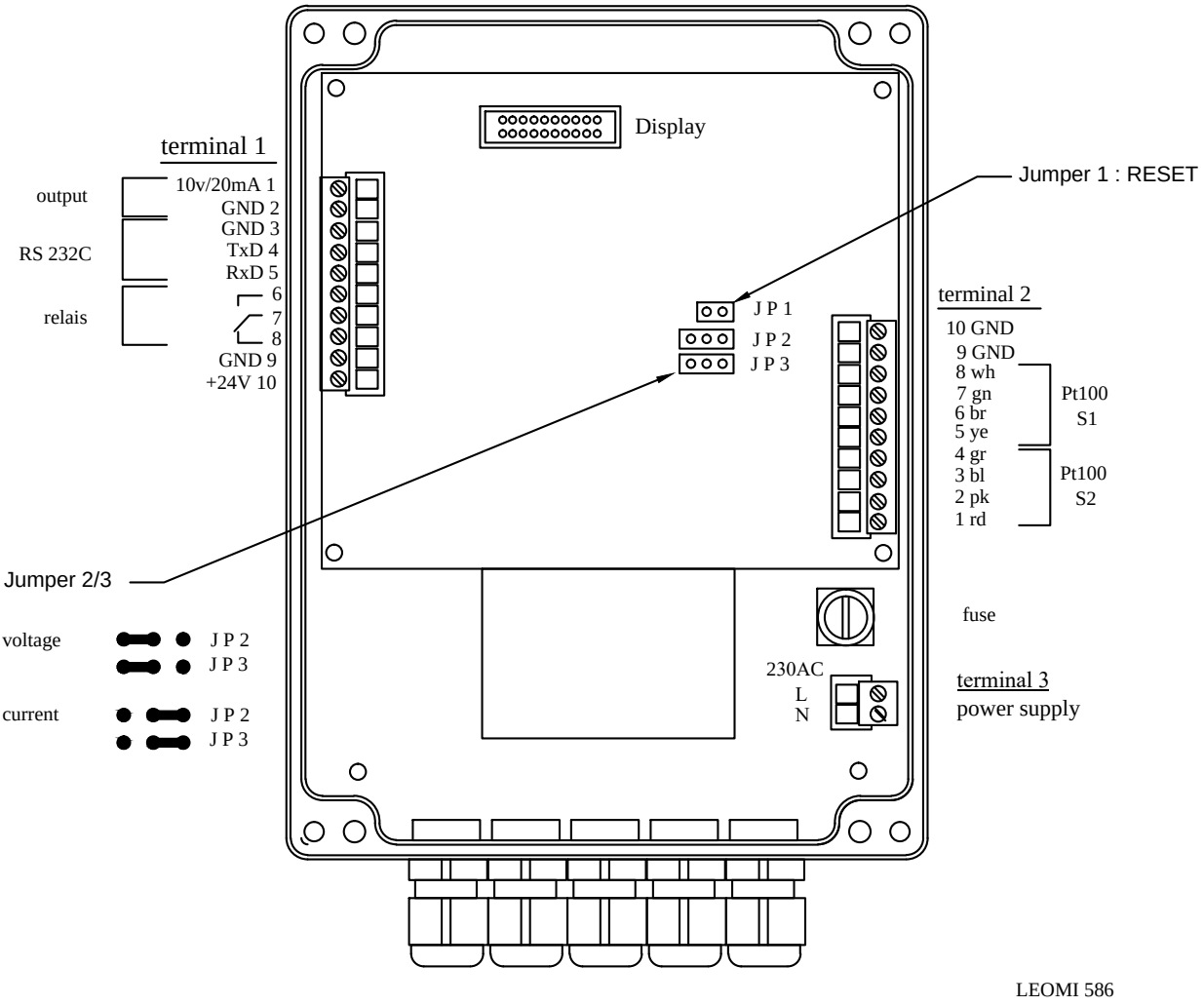


3.2.3 Electrical Connection Diagram for Power Supply 24 VDC with RS 485 Modbus RTU Communication (optional)

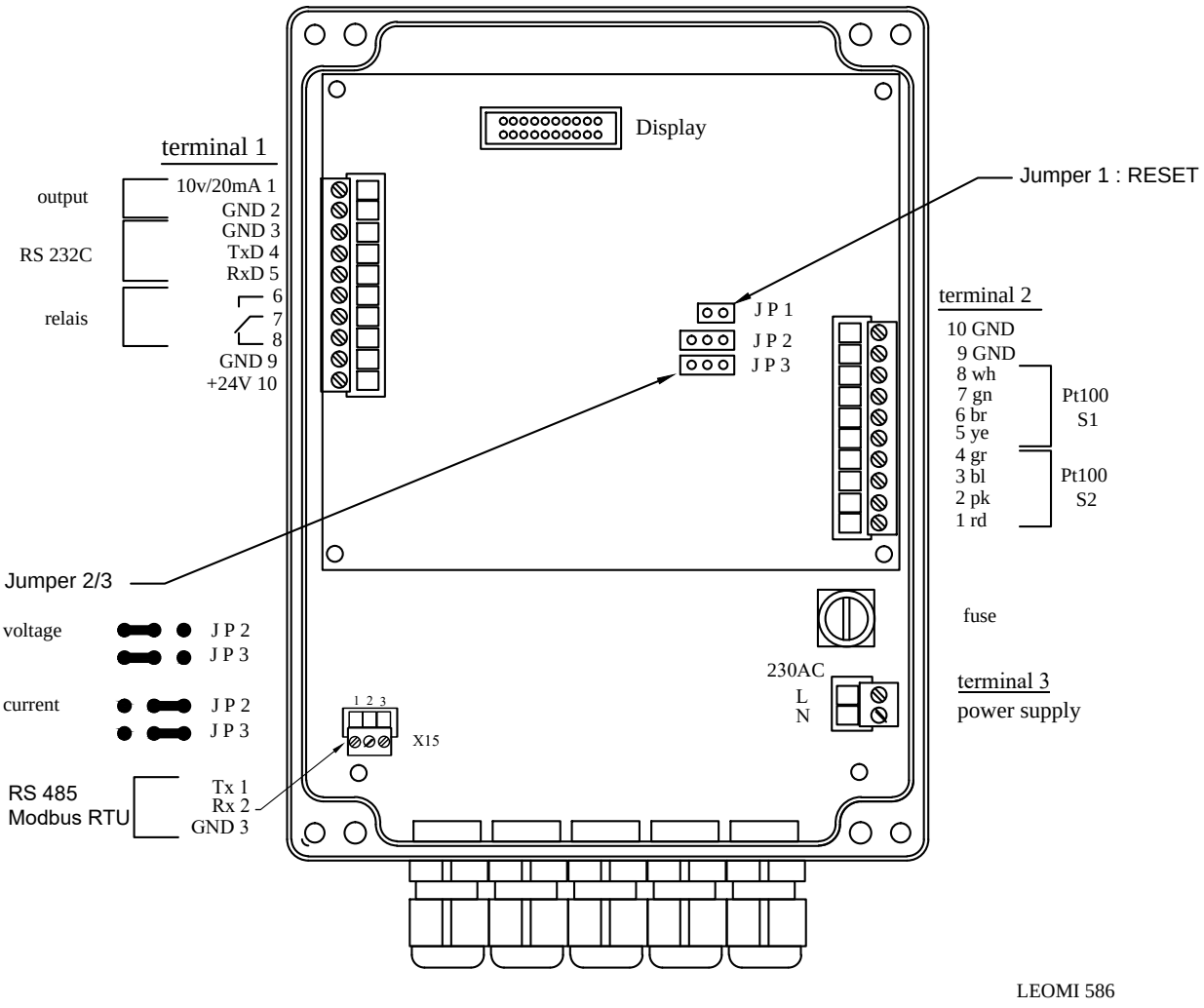


LEOMI 586

3.2.4 Electrical Connection Diagram for Power Supply 100-265 VAC (standard)



3.2.5 Electrical Connection Diagram for Power Supply 100-265 VAC with RS 485 Modbus RTU Communication (optional)



3.3 SIGNAL OUTPUT, SIGNAL INPUTS AND INDICATIONS

The used abbreviations of the terminal specification mean:
Figure before the point = number of terminal blocks
Figure after the point = number of connecting terminal

3.3.1 Analogue Output

The unit has a formatted analogue output signal in the ranges 0-10V or 0/4-20mA which is proportional to the mass flow and selectable with jumper between 0-10V or 0-20mA. Within the range 0-20mA an offset of 4mA can be added via software to adjust an analogue output 4 to 20mA.The analogue output can be used in association with the software to achieve other parameters (**see software description**).

3.3.2 Relay Change Over Contact

The unit utilizes a relay change over contact which is adjustable over the whole measuring range. Either the flow or the consumption can be controlled. The relay change over contact can also be configured as pulse output (**see software description)**.

3.3.3 Serial Interface RS232C

The serial interface allows the communication with the PC to request the measured values. In addition, the PC supplies parameter for the configuration.

3.3.4 RS 485 Modbus RTU Protocol Converter

Serial RS485 Detail for Modbus Port:

- Baud Rate - 19200
- Data Bits - 8
- Parity - None
- Stop Bits - 1

Modbus listing is as below:

Modbus Address	Data Type	Variable
40001	Float (2 registers)	Volume (Nm3/hr)
40003	Float (2 registers)	Totalizer (Nm3)
40005	Float (2 registers)	Mass flow (kg/hr)
40007	Float (2 registers)	Total mass (Kg)
40009	Float (2 registers)	Velocity (Nm/s)
40011	Float (2 registers)	Reference Temperature (°C)

⚠ *Note: There are chances of error in case of failure of communication between RS 485 Converter and LEOMI 586 main board, where Modbus value will be shown as 65535.0*
Ensure and check the connection between the boards for proper output if this error occurs.

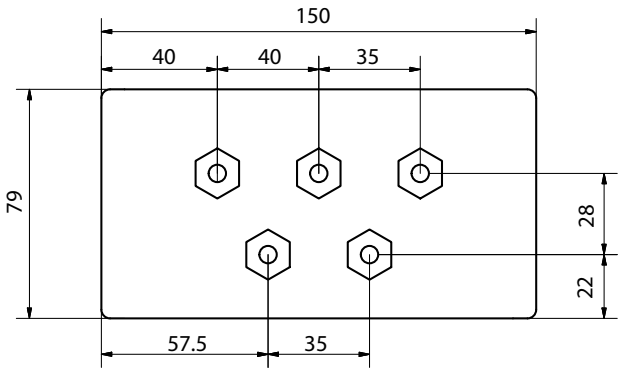
RS 485 is still the most widely used protocol for industrial communication applications. The wide common-mode range enables data transmission over longer cable lengths upto 1000 meters and in noisy environments such as the floor of a factory. Also, the high input impedance of the receivers allows multiple devices to be attached to the lines.

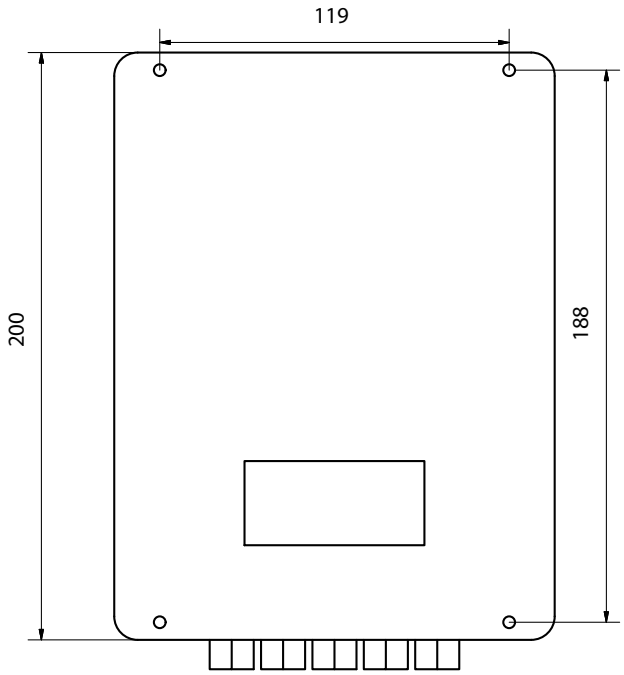
3.3.5 Indication

The unit consists of a 16 X 4 LCD-point matrix indication Backlit Green illuminated. It indicates by default the Normal Volume Flowrate and Totalizer. Furthermore, the display serves to indicate the software parameter and the alterations.

3.4 DRAWING OF ELECTRONIC HOUSING

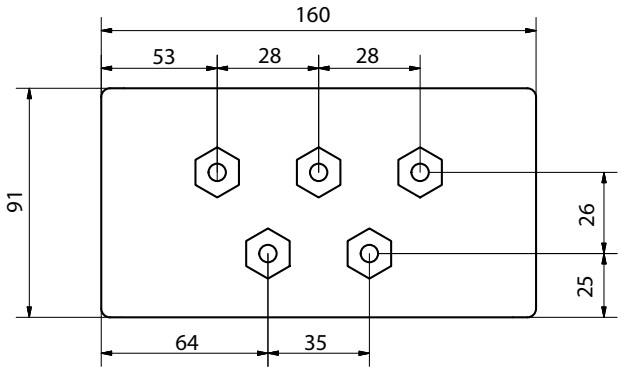
3.4.1 ABS Plastic Housing 200x150x79 mm

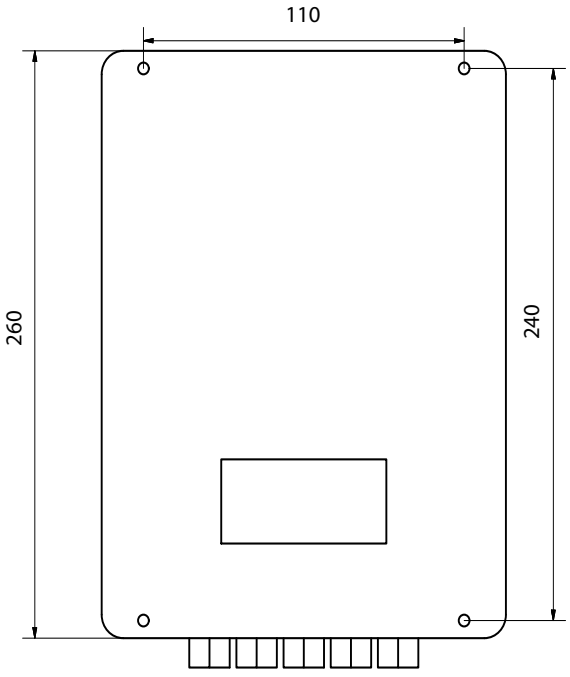




(All Dimensions in mm)

3.4.2 Aluminium Diecast Housing 260x160x91 mm





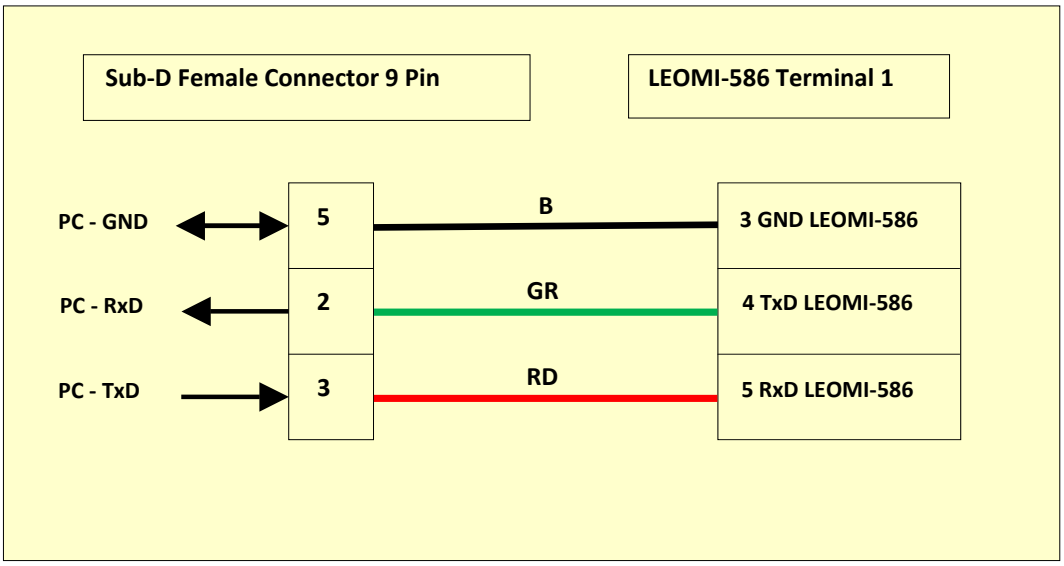
(All Dimensions in mm)

3.5 CONNECTING WITH A PC

For connecting with a PC you need a cable with 3 lines and a female 9 pin Sub-D connector. For short cable length you need no shield. When using a shield, please connect it with PIN 5 (GND) only on the PC side.

The connecting is shown in the following picture.

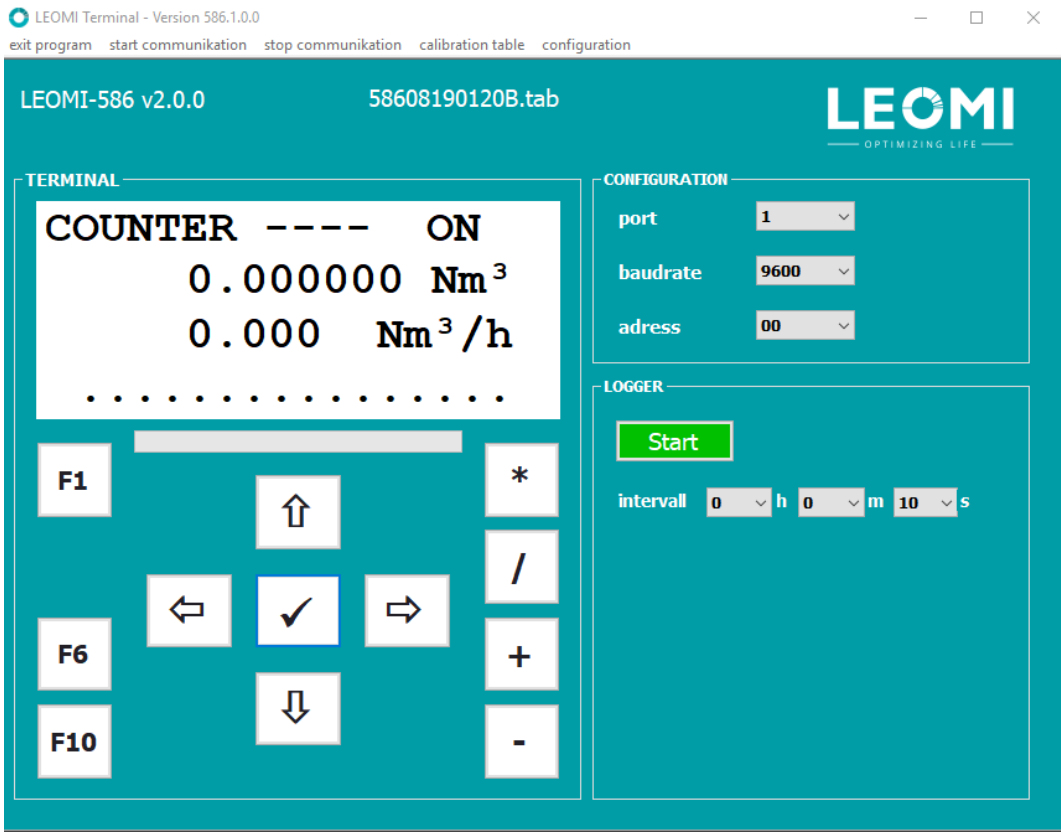
NOTE: Cable colour may vary from supplier, kindly go with cable ferrule Number



4. SOFTWARE DOCUMENTATION LEOMI 586 (TERMINAL VERSION: 586.1.0.0)

4.1 SOFTWARE DETAILS

4.1.1 Terminal Screen



4.1.2 Initialization

The operating software utilises the following functions:

- Detection of external parameter inputs
- Detection of sensor primary signals
- Linearization of primary signals
- Calculation of measured values
- Creation of corrected analogue signal
- Operating the switch contact
- Drive LC-display

The operating software of each computer is configured for each sensor and normally. There is no need for alterations.

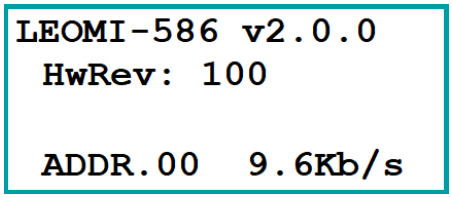
The user is able to change stored parameters via a PC with **LEOMI-586 Terminal Software Version 586.1.0.0**

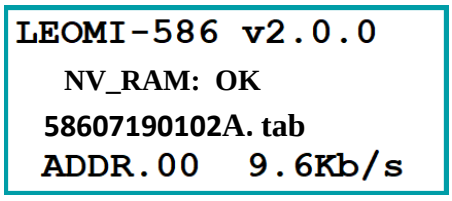
NOTE: Run setup as per instruction from CD supplied together with product.

Generally, the software operates to perform two functions, these are:
Indication and ***Input***

The actual process of detection and measurement of the flow, together with the Necessary calculations and the operation of the analogue output signal and the set point, continues independently in parallel to the above functions.

When starting the unit displays the LC-indication for about 5 seconds





Line 4. indicates the actual address and Baudrate of the unit. If the float loading of the RAM has been interrupted the following is indicated for about 5 seconds:

After the indication of address and Baudrate the calibration table is checked. The result is to be found in line 4.

The following indications are possible:

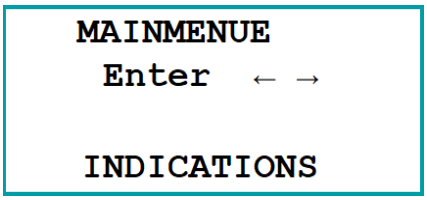
- CALIBRATION OK: Calibration table is OK
- C-TABn RESTORED: Calibration table No. n has been restored
- CALIB.TABLES 1-3 NOT EQUAL PLEASE RESTORE CALIBRATION: The calibration table has been destroyed and cannot be restored automatically. The unit waits for a new transfer of the calibration table via the serial interface. After successful transfer it starts again.

During operation a sensor control takes place. During this procedure the check of the max. media temperature and the over temperature of the measuring sensor is controlled. In case of an error the analogue output is set to 0 mA or. 0 V according to the type of the analogue output. If the 4-20

mA output is used a remote detection of the system disturbance is possible. Furthermore, the disturbance is indicated in the display.

NOTE: The contents of line 1, 3 and 4 may vary from the shown illustration depending upon the model.

4.2 THE WINDOW MAIN MENU



From window **MAIN MENU** the window **INDICATION** or **INPUT** can be selected.

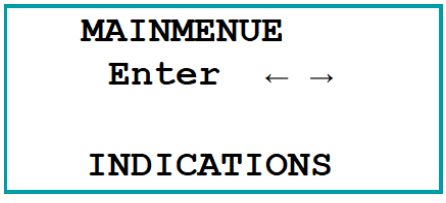
⇦ OR ⇨ switches between windows **INDICATION** and **INPUT**:

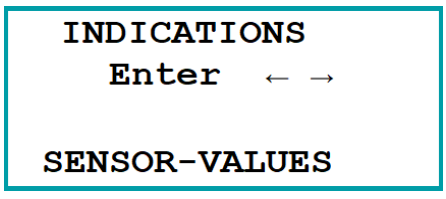
Enter activates the selected window.

4.3 THE WINDOW INDICATION

From window **INDICATION** one of the following windows can be selected:

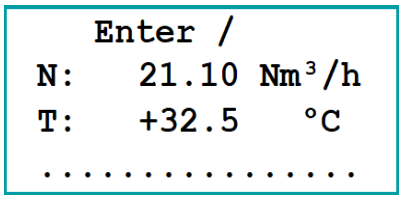
SENSOR-VALUES
STANDARD-VALUES
MASS-VALUES
BACK TO MAIN MENU





⇨ Next window appears.
⇦ Returns to window below.
Enter Activates selected window.

4.3.1 The Window SENSOR-VALUES

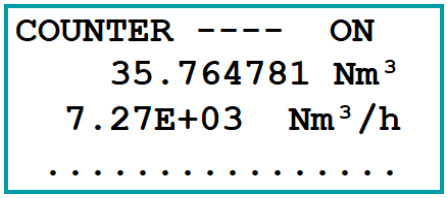


This window shows sensor´s values temperature, flow rate or velocity. Indication of flow rate may be related to following measuring values:

normal flow rate (0°C/1,01325 bar)
mass flow
velocity
/ activates next measuring value
Enter exit window **SENSOR-VALUES**

NOTE: LEOMI-586 shows velocity in Nm/s related to normal flow rate 0°C; 1013.25 mbar.

4.3.2 The Window STANDARD-VALUES

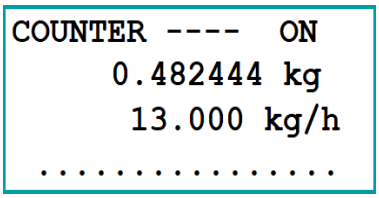


The window **STANDARD-VALUES** indicates the standard flow rate in **Nm³/h** and the totalized flow in **Nm³**.

***** Standard volume totalizer **ON/OFF**
F1 Erase contents of normal volume totalizer
Enter Exit window **STANDARD-VALUES**

If the normal volume totalizer reaches its range limit this is indicated by means of a *****. The limit is **99999999.999 * Nm³**.
Standard values flow rates in excess of the upper measuring range limits are also indicated with a *****.
Indication: **xxxx.yyy * Nm³/h**.

4.3.3 The Window MASS-VALUES



The window **MASS-VALUES** indicates the mass flow in **kg/h** and the totalized flow in **kg**.

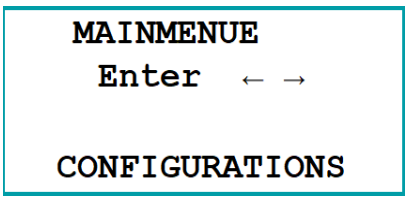
***** Mass totalizer **ON/OFF**
F1 Erase contents of mass totalizer
Enter exit window **MASS-VALUES**

If the mass totalizer reaches its range limit this is indicated by means of a ***** The limit is **99999999.999 * kg**.

Mass flow rates in excess of the upper measuring range limit are also indicated with a *****. Indication: **xxxxx.yyy * kg/h**.

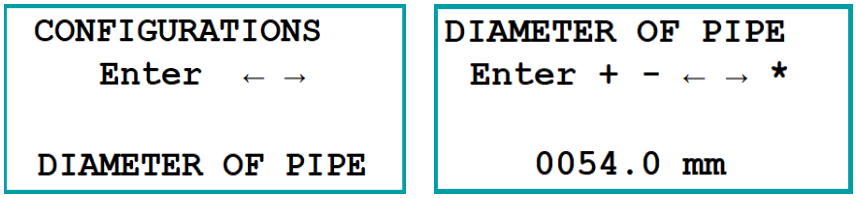
4.4 THE WINDOW CONFIGURATION

Window **CONFIGURATION** allows to activate the following windows:



DIAMETER OF PIPE
SENSOR AREA
MEDIUM
ANALOG RANGE
RELAY
MEANVALUE
MIN. QTY. SUPPR.
OFFSET
SET ADDRESS
SET BAUDRATE
SELECT LANGUAGE
BACK TO MAIN MENU

4.4.1 The Window DIAMETER OF PIPE

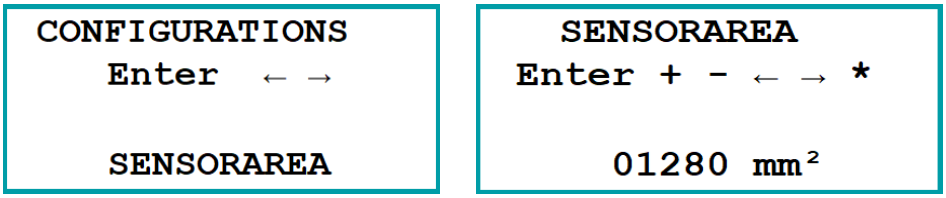


⇦ Moves cursor one step to the left
⇨ Moves cursor one step to the right
+ Marked position one up
- Marked position one down
***** Uses the pre-set value (e.g. 082.5 mm)
Enter Exit window **DIAMETER OF PIPE**

The measuring process is still active when entering the pipe diameter. Each input becomes effective immediately.
The input of the pipe diameter is limited to max.10,000 mm.

NOTE: If you choose this window you have to actualise the **ANALOGRANGE** and the **SET POINT,** because the computer sets it automatically to the maximum possible value.

4.4.2 The Window SENSOR AREA

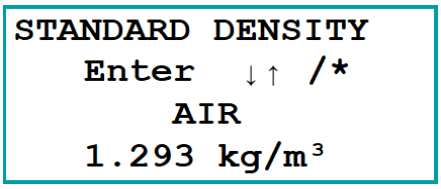


⇦ Moves cursor one step to the left
⇨ Moves cursor one step to the right
+ Marked position one up
- Marked position one down
***** Uses the pre-set value
Enter Exit window **SENSORAREA**

The measuring process is still active when entering the **SENSORAREA**. Each input becomes effective immediately.

NOTE: If you choose this window you have to actualise the **ANALOGRANGE** and the **SET POINT,** because the computer sets it automatically to the max. possible value.

4.4.3 The Window MEDIUM



⇦	Moves cursor on step to the left
⇨	Moves cursor on step to the right
+	Marked position on up
-	Marked position on down
⇩	Chooses the next following medium from the table
⇧	Chooses the previous medium from the table
*	Re-set specific gravity and C-factor to the factory set values
/	Changes between name and formula characters of the medium

Enter Exit window **MEDIUM**

The measuring process is still active when entering the medium menu. Each input becomes effective immediately.

NOTE: If you choose this window you have to actualise the **ANALOGRANGE** and the **SET POINT,** because the computer sets it automatically to the max. possible value.
Version 586a allows to change specific gravity and C-factor for medium ***USER DEFINED*** in the table Mediums only.

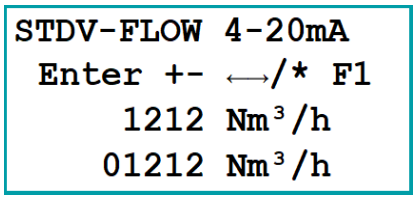
4.4.4 The window ANALOGRANGE

The analogue range (0/4-20 mA or 0-10V) can be associated with the following measuring ranges

LC-INDICATION

STDV-FLOW	Standard Volume flow
MASSFLOW	Mass flow
TEMP.	Temperature
SPEED	Flow velocity

The configuration of a current or voltage output is done via the jumper within the unit (see part converter electronics of the operating instructions).



⇦	Moves cursor one step to the left
⇨	Moves cursor one step to the right
+	Marked position one up
-	Marked position one down
/	Associates the analogue range output to the next measuring size
*	Uses the recommended value as upper analogue range limit
F1	Switches between 0 and 4-20 mA or 0 -10 V

Enter Exit window **ANALOGRANGE**

The recommended value of the third line of the input window is a maximum, which can be taken as upper analogue range limit.

The entered chosen digital value is always associated to the maximum analogue signal value (10 V or 20 mA).

The measuring process is still active when entering the pipe diameter. Each input becomes effective immediately.

NOTE: If you make changes in window **MEDIUM** you have to actualise the **ANALOGRANGE,** because the computer sets it automatically to the max. possible value.

4.4.5 The window RELAY

This module can be configured as counter or set point.

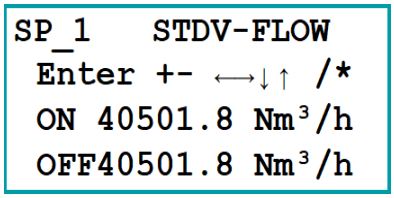
⇧	Switches between counter and set point

Configuration as set point

The module set points can be associated with the Following measuring sizes:

LC-INDICATION

Locked	Module for set point adjustment is locked
STD.V-FLOW	Standard volume flow
MASSFLOW	Mass flow
TEMPERATURE	Temperature
SPEED	Flow velocity



⇦	Moves cursor one step to the left
⇨	Moves cursor one step to the right
⇩	Switches cursor between set point „ON“ and set point „OFF“
⇧	Switches cursor between set point „OFF“ and set point „ON“ or changes to configuration counter, if set point is ***locked***
+	Marked position on up
-	Marked position one down
/	Associates the set point to the next measuring size
*	Uses the max. measured value as set point

Enter Exit window **RELAY**

The set point can be operated as window or as set point with hysteresis.
Modus window: Set point OFF is above ON. Measured values between both set points set the switch contact. Measured values above OFF or below ON re-set the contact.
Modus Hysteresis: Set point OFF is below set point ON or set point OFF equals ON. Measured values above the value ON fix the switch contact. The contact is re-set if the measured value is below the value OFF.

State of Relay	Set point: Off > On Modus Window	Set point: Off ≤ On Modus Hysteresis
Off	ON ≥ Measured values > OFF	Measured values < EIN
On	ON < Measured values ≤ OFF	Measured values ≥ EIN
RESET (Off)	ON ≥ Measured values > OFF	Measured values < AUS

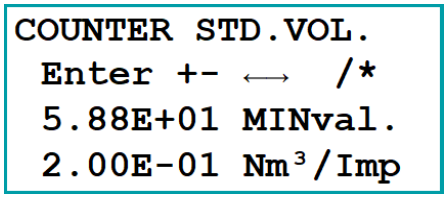
The recommended value of the input window is a maximum, which can be taken as set point. The measuring process is still active when adjusting the set points. Each input becomes effective immediately.

Configuration as Counter

The counter can be associated with the following measuring sizes:

LC-INDICATION

Locked	Module for counter is locked
COUNTER STD.VOL.	Standard volume
COUNTER MASS	Mass

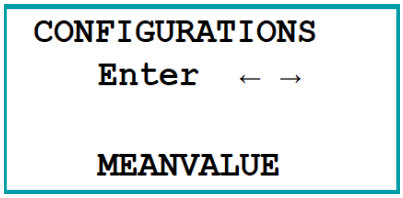


⇦ Moves cursor one step to the left
⇨ Moves cursor one step to the right
⇧ Changes to the configuration set point, if the counter is ***locked***.
+ Marked position one up
- Marked position one down
/ Associates the counter to the next measuring size
Enter Exit window **RELAY**

NOTE: When starting for the first time the pulse is set to the lowest countable standard volume value for the max. flow and max. 120 pulses/minute. This value is influenced by the menu inputs density and zero point. An alteration of these adjusted values calculates a new lowest counted pulse value. If the adjusted value is below the new min. value, the counted pulse value is set to the min. value. It is recommended to check the above values after each alteration.
The counting pulses are only generated if the counter in the indication is activated, this ensures a synchronisation between the number of counted pules and the display indication.

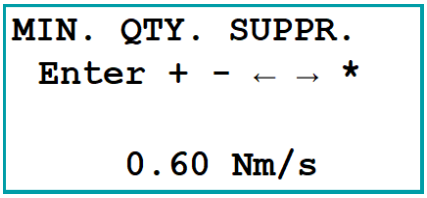
The following procedure is recommended:
Switch off counter in the indicated menu and re-set to zero
Adjust density and zero point
Set up switch contact as pulse counter
Adjust counter in the indicating menu for measuring size chosen in the pulse counter.

4.4.6 The window MEANVALUE



+ Number of measured values one up
- Number of measured values on down
***** Chooses pre-selection
Enter Exit window **MEANVALUE**
Max. 99 measured values are possible for the mean value creation.

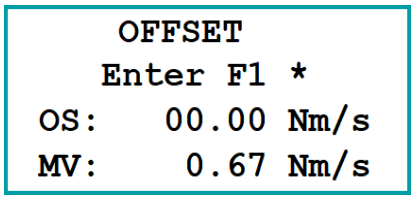
4.4.7 The window MIN. QTY. SUPPR.



⇦ Moves cursor one step to the left
⇨ Moves cursor one step to the right
+ Marked position one up
- Marked position one down
***** Uses the pre-set value
Enter Exit window **MIN. QTY. SUPPR.**

Values below zero switch off are indicated with zero. This allows the user with the relevant adjustments, e. g. to suppress air movements with closed valves.

4.4.8 The window OFFSET

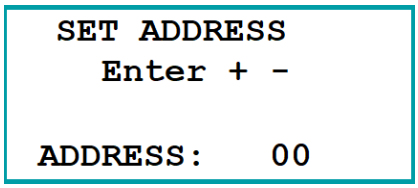


F1 Accepts the actual measured value (MV) as offset (OS)
***** Uses the pre-set value
Enter Exit window **OFFSET**

This menu allows to adjust the zero point. This procedure is similar to the tare of a balance. With F1-key the value indicated in line 4 is taken as zero-point and subtracted from the internal measured values. For control purposes this value is indicated in line 3.

NOTE: Attention should be drawn to the fact that in opposition to the zero switch off the measured values are influenced over the whole measuring range.

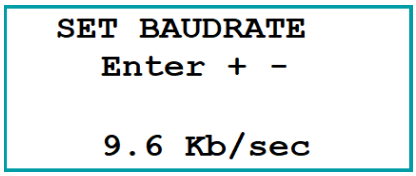
4.4.9 The window SET ADDRESS



+ Address of interface RS232C one figure up
- Address of interface RS232C one figure down
Enter Exit window **SET ADDRESS**

The RS232C interface can be associated with an address between 0 and 99.

4.4.10 The window SET BAUDRATE

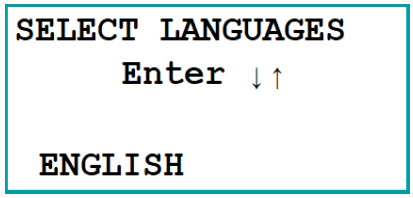


+ Initialises the RS232C interface with the next higher Baudrate
- Initialises the RS232C interface with the next lower Baudrate
Enter Exit window **SET BAUDRATE**

The RS232C interface can be initialized with the following Baudrates:

1.2 Kb/sec
2.4 Kb/sec
4.8 Kb/sec
9.6 Kb/sec
19.2 Kb/sec

4.4.11 The window SELECT LANGUAGES

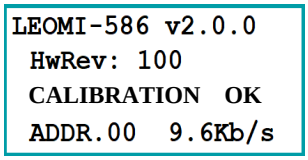


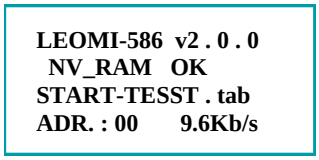
⇩ Chooses next language
⇧ Choose previous language
Enter exit window **SELECT LANGUAGES**

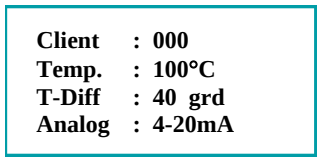
Languages to be chosen:

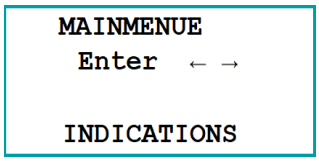
English
Deutsch
France
Espanol

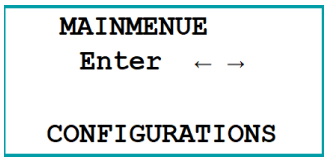
5. USER MENU SHORTCUT SCREENS

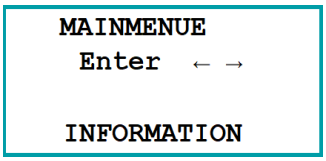


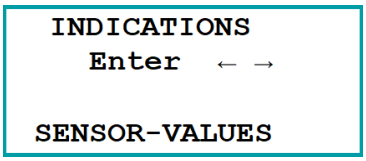


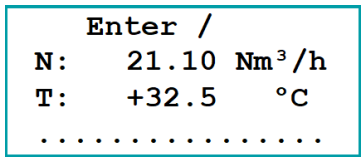


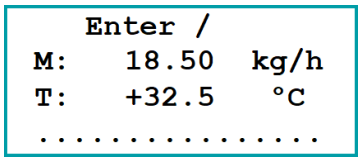


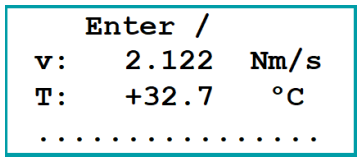


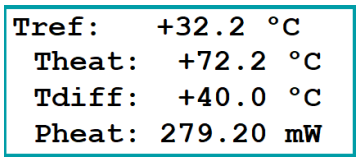


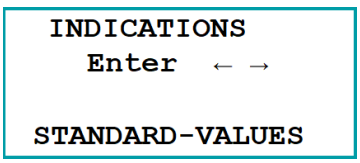


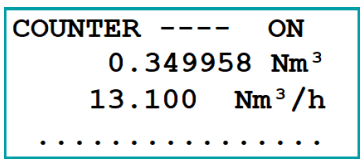


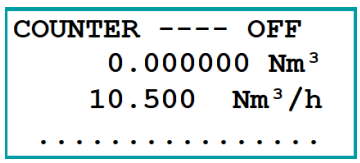


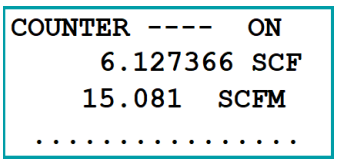


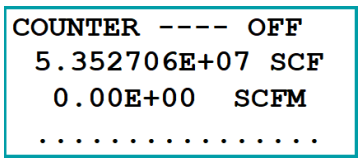


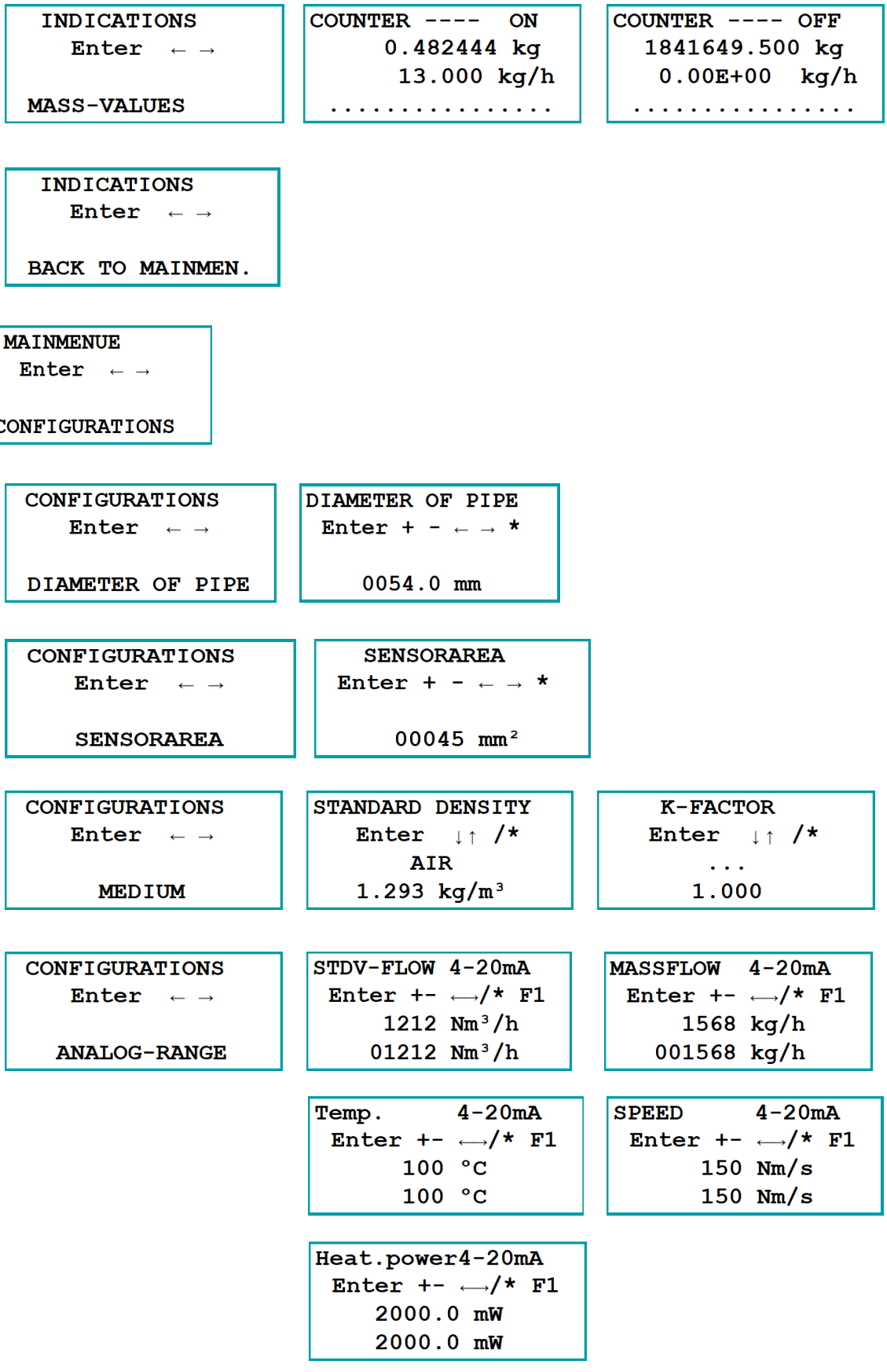


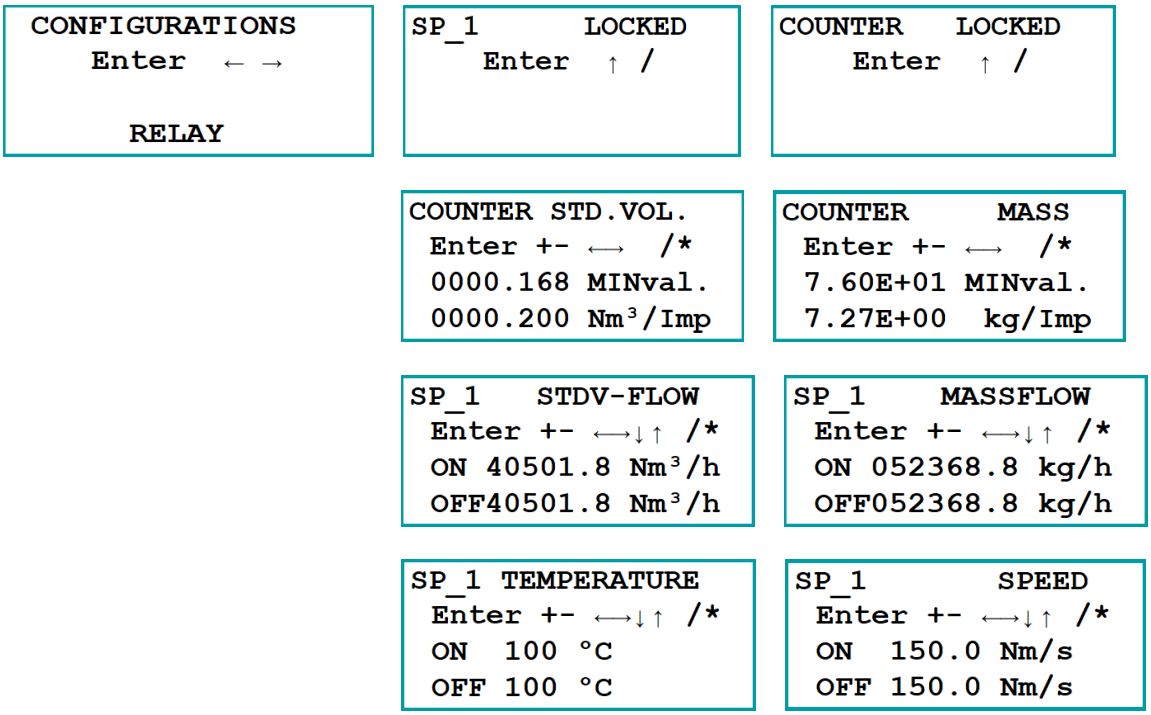


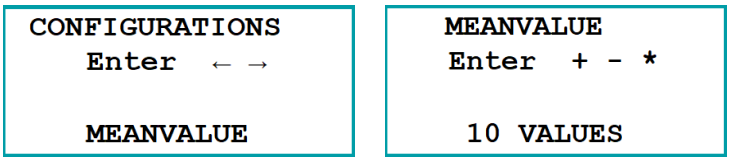


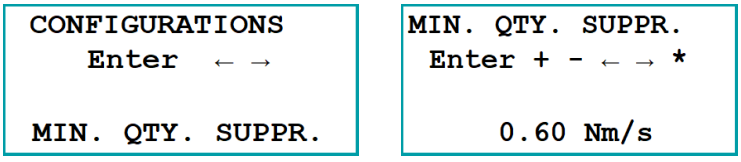


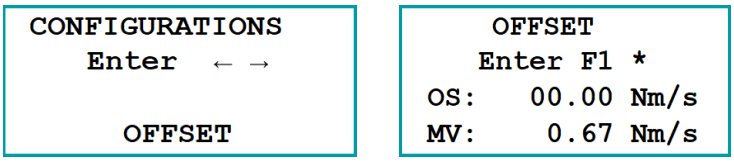



INDICATIONS
Enter ← →
MASS-VALUES
COUNTER ---- ON
0.482444 kg
13.000 kg/h
.....
COUNTER ---- OFF
1841649.500 kg
0.00E+00 kg/h
.....
INDICATIONS
Enter ← →
BACK TO MAINMEN.
MAINMENUE
Enter ← →
CONFIGURATIONS
CONFIGURATIONS
Enter ← →
DIAMETER OF PIPE
DIAMETER OF PIPE
Enter + - ← → *
0054.0 mm
CONFIGURATIONS
Enter ← →
SENSORAREA
SENSORAREA
Enter + - ← → *
00045 mm²
CONFIGURATIONS
Enter ← →
MEDIUM
STANDARD DENSITY
Enter ↓↑ /*
AIR
1.293 kg/m³
K-FACTOR
Enter ↓↑ /*
...
1.000
CONFIGURATIONS
Enter ← →
ANALOG-RANGE
STDV-FLOW 4-20mA
Enter +- ⟷/* F1
1212 Nm³/h
01212 Nm³/h
MASSFLOW 4-20mA
Enter +- ⟷/* F1
1568 kg/h
001568 kg/h
Temp. 4-20mA
Enter +- ⟷/* F1
100 °C
100 °C
SPEED 4-20mA
Enter +- ⟷/* F1
150 Nm/s
150 Nm/s
Heat.power4-20mA
Enter +- ⟷/* F1
2000.0 mW
2000.0 mW

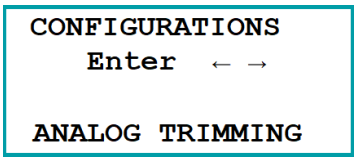

CONFIGURATIONS
Enter ← →
RELAY
SP_1 LOCKED
Enter ↑ /
COUNTER LOCKED
Enter ↑ /
COUNTER STD.VOL.
Enter +- ⟷ /*
0000.168 MINval.
0000.200 Nm³/Imp
COUNTER MASS
Enter +- ⟷ /*
7.60E+01 MINval.
7.27E+00 kg/Imp
SP_1 STDV-FLOW
Enter +- ⟷↓↑ /*
ON 40501.8 Nm³/h
OFF40501.8 Nm³/h
SP_1 MASSFLOW
Enter +- ⟷↓↑ /*
ON 052368.8 kg/h
OFF052368.8 kg/h
SP_1 TEMPERATURE
Enter +- ⟷↓↑ /*
ON 100 °C
OFF 100 °C
SP_1 SPEED
Enter +- ⟷↓↑ /*
ON 150.0 Nm/s
OFF 150.0 Nm/s

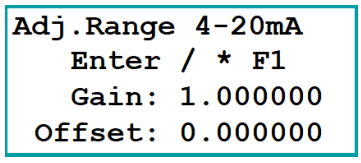

CONFIGURATIONS
Enter ← →
MEANVALUE
MEANVALUE
Enter + - *
10 VALUES

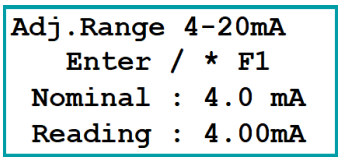

CONFIGURATIONS
Enter ← →
MIN. QTY. SUPPR.
MIN. QTY. SUPPR.
Enter + - ← → *
0.60 Nm/s


CONFIGURATIONS
Enter ← →
OFFSET
OFFSET
Enter F1 *
OS: 00.00 Nm/s
MV: 0.67 Nm/s


CONFIGURATIONS
Enter ← →
K-FACTOR
K-FACTOR
Enter + - ← → *
001.000


CONFIGURATIONS
Enter ← →
ANALOG TRIMMING


Adj.Range 4-20mA
Enter / * F1
Gain: 1.000000
Offset: 0.000000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Enter / * F1
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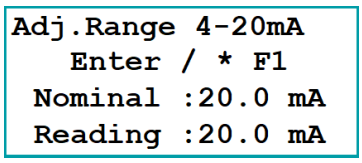
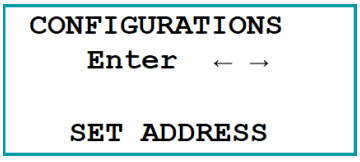
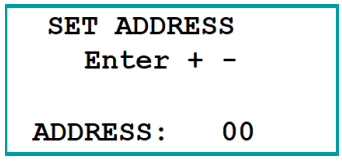
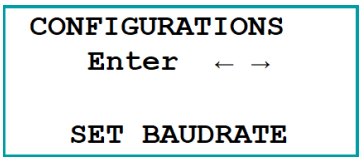
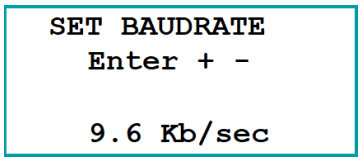
Reading : 4.00mA

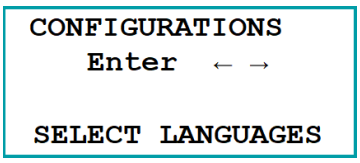

Adj.Range 4-20mA
Enter / * F1
Nominal :20.0 mA
Reading :20.0 mA


CONFIGURATIONS
Enter ← →
SET ADDRESS


SET ADDRESS
Enter + -
ADDRESS: 00


CONFIGURATIONS
Enter ← →
SET BAUDRATE


SET BAUDRATE
Enter + -
9.6 Kb/sec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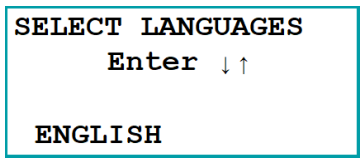
SELECT LANGUAGES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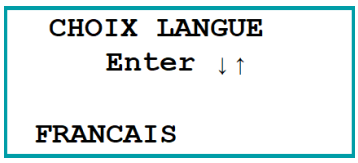
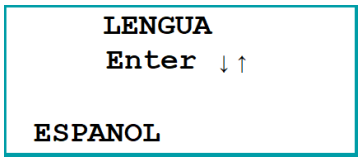

CHOIX LANGUE
Enter ↓↑
FRANCAIS


LENGUA
Enter ↓↑
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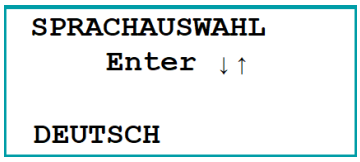
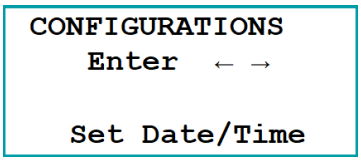
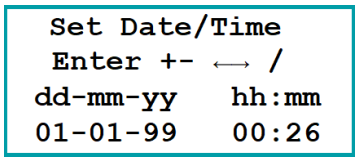
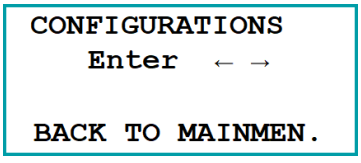

SPRACHAUSWAHL
Enter ↓↑
DEUTSCH


CONFIGURATIONS
Enter ← →
Set Date/Time

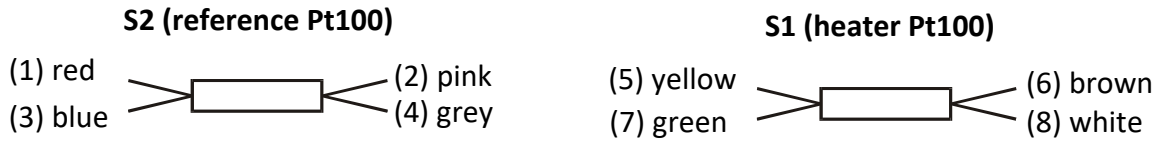

Set Date/Time
Enter +- ⟷ /
dd-mm-yy hh:mm
01-01-99 00:26


CONFIGURATIONS
Enter ← →
BACK TO MAINMEN.

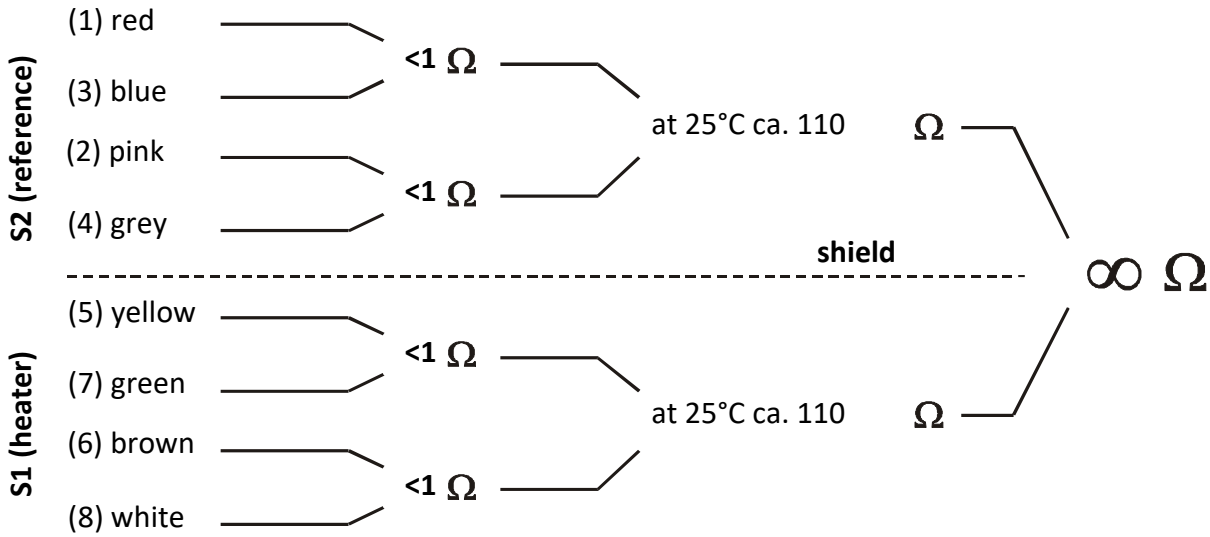
6. TROUBLE SHOOTING

6.1 INSTRUCTIONS HOW TO CHECK THE SENSOR

Cable Connection



Cable Test



Sensor check

-switch off power supply
-disconnect sensor
-check cables following above diagram using a -meter

Important

-no contact from shield to any line

6.2 OTHER TROUBLE SHOOTING ACTIONS

Sr. No	Complaint	Possible Cause	Action to be Taken
1	**No power Supply**	Loose wiring connection	Check input supply connection to terminal 3
		Mains power supply issue	Check mains supply 230 VAC OR 24 VDC at terminal 3
		Power supply board fuse may be blown	Check fuse on power supply board & replace if found faulty
		LCD display not working	If led glowing on power supply board, than check display board connection pins, if found faulty replace display board ribbon connector or display module
2	**Probe Error**	Loose sensor probe connection at terminal 2	Fix terminal 2 connections of sensor probe properly
		Sensor probe heater or reference physically damaged	If any one sensor part of heater or reference found damaged, then sensor probe need to be replaced
		Sensor probe resistance not as per cable test section 6.1 Instructions how to check the sensor (Page no. 45)	Check sensor resistance values of S2 (reference) & S1(heater) must be as indicated <1Ω & ~110Ω@25°C on Digital multi meter as per cable test section 6.1 Instructions how to check the sensor (Page no. 48) If resistance is value greatly differ sensor probe need to be replaced
3	**T-Diff Error**	Electronic drift possible	Need to check at factory for further diagnosis
		Sensor probe connection error	Need to fix probe connection at terminal 2
4	**NO 4-20 mA output**	Improper terminal 1 connection	Jumper position on main board to be checked JP2 & JP3 must be connected, if not need to be fix
5	**Communication error with PC**	Wrong computer com port assignment	Assign port as per PC > Manage > Device manager screen; If assigned properly than set address 00 and baud rate 9600
		Wrong cable connection at RS232C at terminal 1 signal from Sub-DB 9 pin	Remove and reconnect cable in sequence given as per manual section 3.5 Connecting with a PC (Page No. 28) properly
		Serial to USB convertor issue	Check & install suitable USB driver or communication software with PC

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