

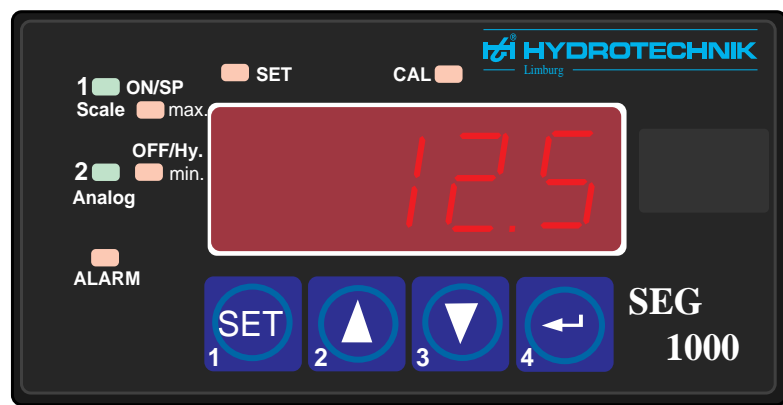
User Manual

for

Panel mounted instruments

Series SEG 1000

L3192-00-00.00E



Please read the instructions carefully, before putting the measuring instrument into operation.

Foreword

The following user manual describes all analogue and digital panel mounted instruments of series SEG 1000, manufactured by HYDROTECHNIK.

In today's metrology, sensors with standardised output signals are used for a trouble-free transfer of measuring signals. To follow this aspect, our panel mounted instruments were designed for the connection to sensor-input signals of 0 to 20 mA or 4 to 20 mA, which are evaluated with an analogue measuring instrument of series SEG 1000.

For sensors that supply a frequency signal, an input signal range for square wave signals from the TTL-level up to the max. sensor supply voltage of 15 VDC is provided. The frequency signals are evaluated with a digital measuring instrument of series SEG 1000.

The state-of-the-art instruments of series SEG 1000 are very accurate and easy to use.

Their compact design with the dimensions 96 x 48 mm allows the mounting into all customary housings and front elements. The instruments are used and programmed through the front, only, without having to remove the front frame.

Here you can see the technical features of the panel mounted instrument of series SEG 1000, at a glance:

- standardised fitting dimensions 96 x 48 mm according to DIN 43 718
- very good legibility of the LED-display, even from larger distances
- acquisition of analogue sensor-signals 0 to 20 mA and 4 to 20 mA
- acquisition of frequency signals (1 Hz to 10.000 Hz)
- storage of extreme values (min./max.)
- adjustment of limit values (min./max.) which serve for example for the external control of contactors through potential-free relay contacts
- adhesive foil to inscribe the different measuring units easily
- analogue outputs 0 to 20 mA/0 to 10 Volt or 4 to 20 mA/2 to 10 V
- voltage supply either 24 VDC or 230 VAC

You will surely have no problems in handling the SEG 1000-instrument, but you will only be able to use all possibilities of the instrument, if you know it well.

Should you have any difficulties in understanding nevertheless, please do not hesitate to contact us, we will do our best to help you.

We reserve the right to make modifications, necessary for the technical progress.

We wish you much success for the application of our panel mounted instruments of series:

SEG 1000

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Security advice

Please take the following into consideration, to exclude an endangering of the user:

- a) Switch the instrument off immediately, if you recognise damages or failures or if you detect a bad smell or smoke.
- b) Please avoid to open the instrument by yourself !
Before opening, separate the instrument from the power supply.
When mounting the instrument and the connections, please take care, that all parts are protected from direct contact (when opening the instrument the guarantee will become invalid).
- c) Please pay attention to the usual safety regulations for electric-, weak- and strong current plants, especially the security regulations in your country (e.g. VDE 0100).
- d) Connections to other instruments should be carried out very carefully.
It can happen that internal connections in instruments from other manufacturers (for example, connection GND with protective ground) cause voltage potentials, that are not allowed.

Warning: When operating electrical instruments, parts of the instrument have a dangerous voltage. Therefore the disregard of the security regulations may cause heavy physical injuries or damages of property.
Only qualified personnel should operate these instruments.
Conditions for the unobjectionable and safe operation of this instrument are the proper transport, storage, installation and mounting, as well as the careful operation and maintenance.

Please clean the front of the housing with a soft cloth, moistened with a mild detergent
(Please pay attention to the notes of the manufacturer).

Qualified personnel

are people who are familiar with the installation, mounting, putting into operation and the operation of the product and who have the corresponding qualifications.

For example:

- Education, training or authorisation to switch ON/OFF, clear, ground and mark circuits and instruments/systems according to the standards of safety engineering.
- Education or training for maintenance and use of appropriate safety equipment according to the standards of safety engineering.
- Training for First Aid.

1. Connection of the measuring instrument

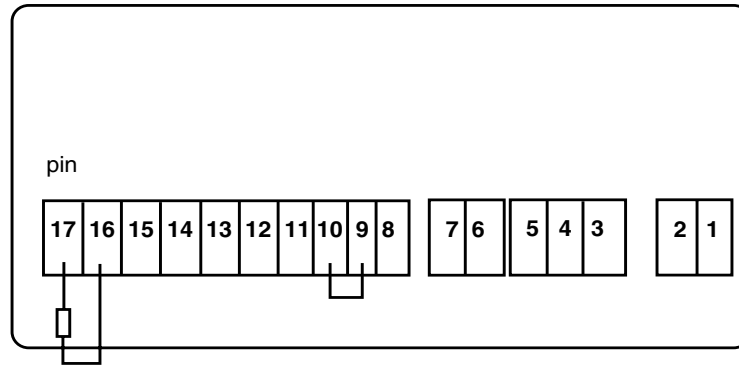
Electrical connection

The connections of the SEG 1000 are on the back of the instrument.

The connection is carried out through terminal screws or plug-in terminals, which always should be mounted loose and afterwards screwed- or plugged-in.

If the terminals are already screwed- or plugged-in, lands for soldering could be broken loose. Please use a suitable screw-driver and do not fix the screws by force.




Terminal connections on the back







Bridge and resistor:
state at delivery

designation/function

Pin 1: mains voltage L: 230VAC / 24 VDC L -
Pin 2: N: 230 VAC / 24 VDC L+

Pin 3:  switch output 2
Pin 4:  change over contact
Pin 5: 

Pin 6:  switch output 1
Pin 7:  make contact

Pin 8: Sensor supply voltage +Ub
Pin 9:  Sensor supply voltage -Ub
Pin 10:  GND/ common mass for sensor/sensor supply
(bridge 9 to 10, valid also for frequency input)

Pin 11: sensor signal + (0 to 20/4 to 20 mA)

Pin 12: free

Pin 13: sensor signal + (0 to 10 V)
also for frequency input, signal+ (square wave 5 to 15 V)

Pin 14: free

Pin 15: free

Pin 16: analogue output Signal + resistor 500 Ohm installed by manufacturer

Pin 17: Signal - output voltage 0 to 10 V,
without resistor max. 20 mA

The indicated numbers correspond to the pin connections.



When connecting, please pay attention to the right connection of the pins and their order. Please see from the label, which type of measuring instrument you have, which performance it has and with which voltage it may be operated. Only after having checked this, you should connect the corresponding voltage. Please, have your instrument connected by a well-trained expert.

1.1 Preparation for connection

1. Disconnect the power supply.
2. Connect the different leads of the power supply with the terminal screw and plug it into the corresponding connector (mains voltage 2-poles or low-voltage 2-poles).
3. Connect the different leads of the sensor cable with the terminal screw and plug it into the corresponding connector (10-poles). Please connect the other end of the measuring cable with the sensor.
When using a HYDROTECHNIK sensor, you can see the pin-connection and the colour of the cables in the table, shown below.
4. Option: Switch output
Please connect the different leads of the relay output 2 change over contact with the terminal plug and plug it into the corresponding connector (3-poles).
Connect the different leads of the relay output 1 make contact with the terminal plug and plug it into the corresponding connector (2-poles).
5. Option: Analogue output
Please connect the different leads of the analogue output with the terminal plug and plug it into the corresponding connector (10-poles).

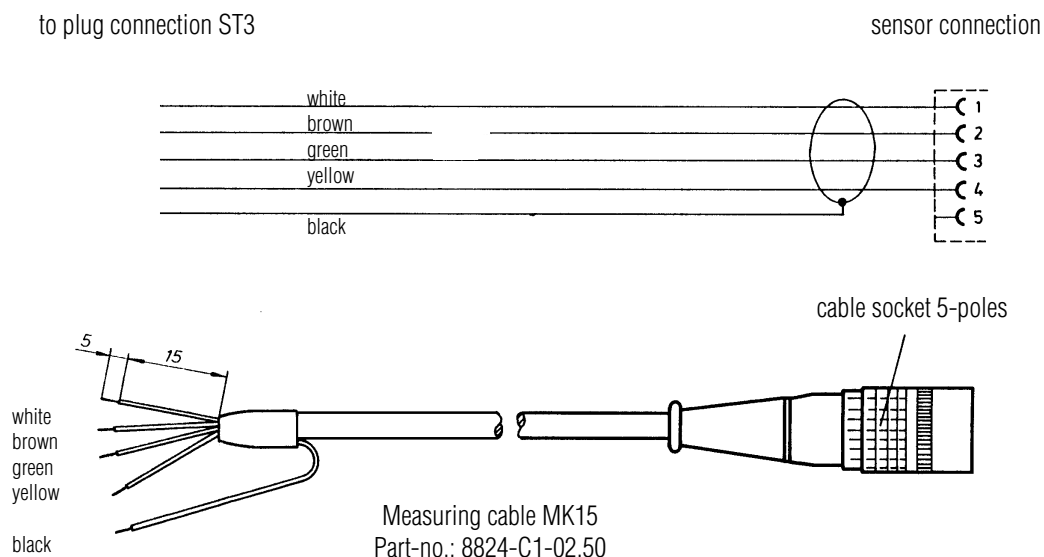
1.2 Measuring cable MK15

The user can order a ready-made connection cable MK15, which makes the connection of the HYDROTECHNIK-sensors easier. The free cable ends are directly connected to the 10-pole plug connection. Here, you should take into consideration, if your sensor is in 2-, 3- or 4-wire technique and which signal output it has (0 to 20 mA, 4 to 20 mA or 0 to 10 V).

According to the „terminal connections on the back“ on page 5, the fixed wiring of the connections must be carried out in this way.

When manufacturing the cable by yourself, you should pay attention to the fixed wiring of the connections in any case (see following drawing).

The free cable ends are directly connected to the 10-pole plug connection.

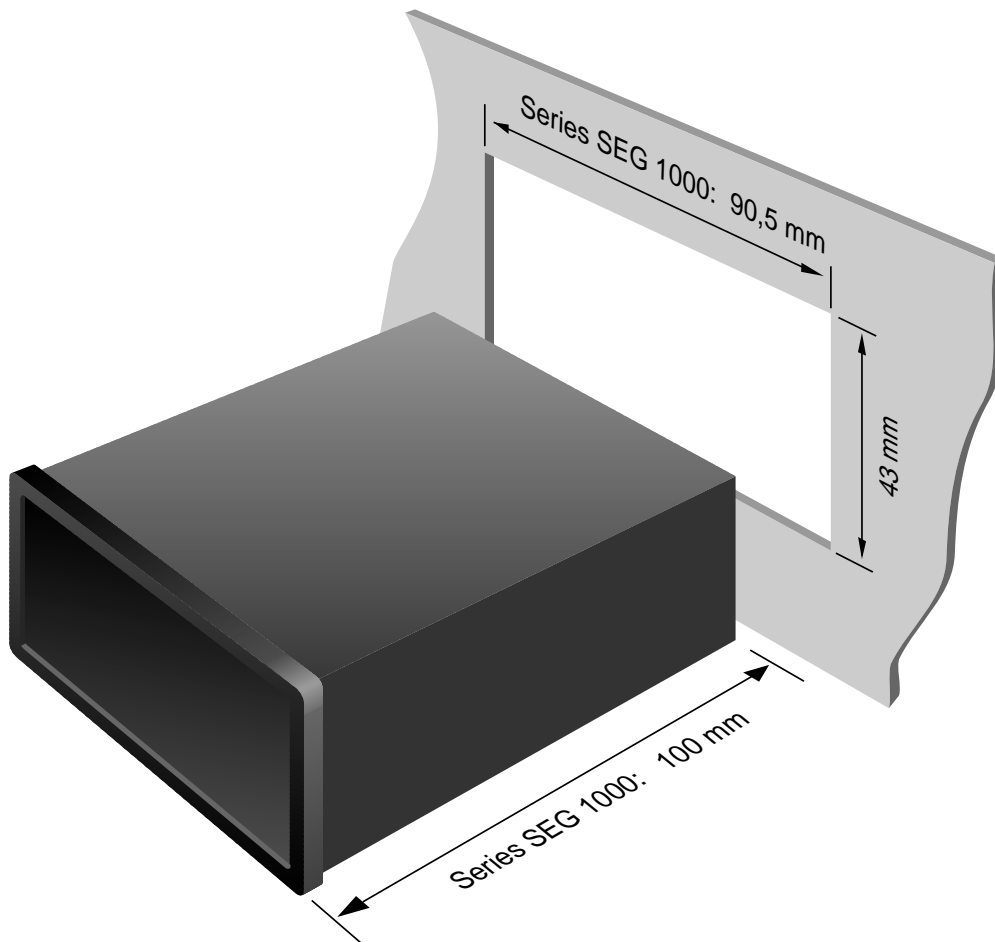


Connection of the free cable ends

colour	pin	to 10-poles plug connection of the measuring instrument
white	1	to pin 11 for current input; to pin 13 for voltage input
brown	2	to pin 9
green	3	to pin 8
yellow	free	free
black	4	to pin 9 or 10 (bridge)

1.3 Fitting situation

To fit the instrument into a front panel, please see the dimensions in the illustration, shown below, and prepare the panel correspondingly.

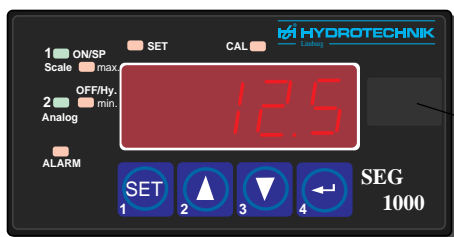


After having lead the connection cables through the opening of the panel and connected them with the measuring instrument, you have to press the instrument into the opening from the front side.



The two holding screws should only be fastened after the complete adjustment and calibration of the measuring instrument.

To help the user to distinguish, we have attached to each instrument a foil with adhesive labels, indicating all possible measuring units. You can stick a label with the corresponding measuring unit on the front of the instrument.

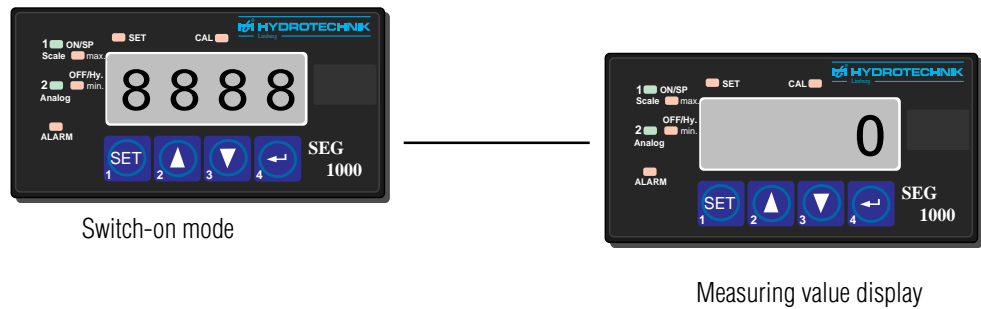


F	%	°	mm	m	kg
t	l	t/h	m ³ /h	m ³ /min	kg/h
l/h	l/s	l/min	mmWS	kPa	MPa
% rel F	bar abs	pH	psi	bar	mbar
°C	N	gal	cm ³ /U	rpm	cu. in
gr.-wt.	grain	inch	1/min	Nm	1/sec

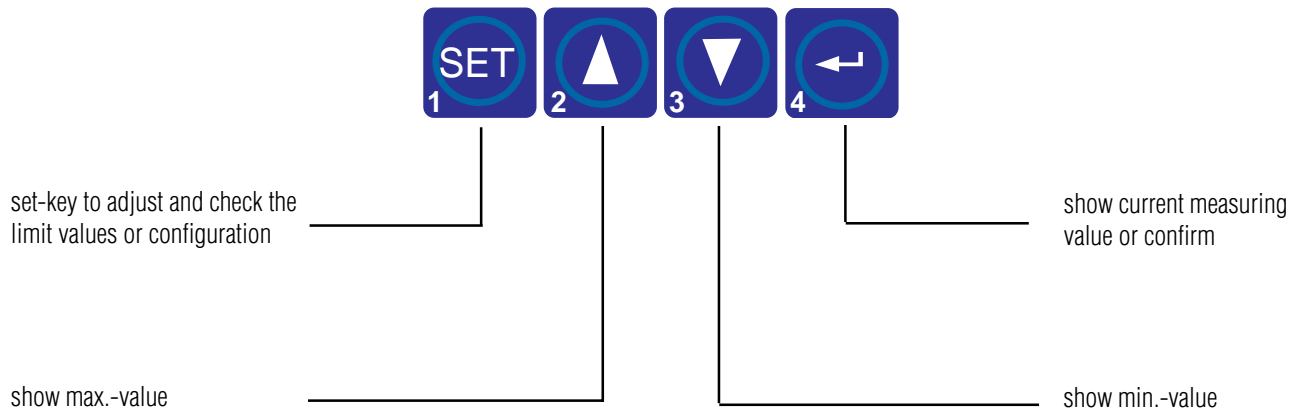
2. First putting into operation

When putting the measuring instrument into operation for the first time, it will display „8888“ for approx. 7 seconds and all LEDs will be illuminated.

After that, the measuring value display is shown automatically and the LEDs are switched off.


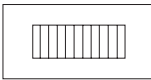



The instrument can easily be operated with the four keys, the functions of which are as follows:



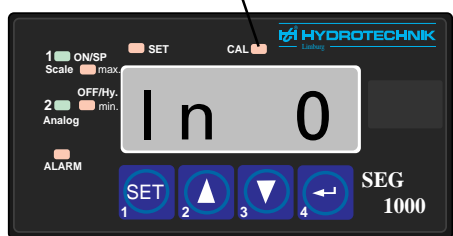
2.1 Configuration of the measuring instrument

During the first configuration of the measuring instrument, you have to distinguish if your instrument has an analogue or a frequency input. This can be seen by its label.

For configuration key  and the miniature key  should be pressed as long as „In“ is displayed together with a number. The miniature key is on the back of the instrument behind the 10-pole terminal.

After that, let go key  and the miniature key .

LED CAL is illuminated

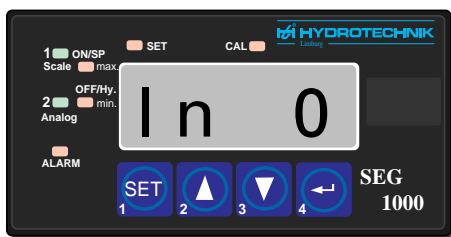


This display is shown and LED „CAL“ is illuminated.

3. Survey on the menu steps for both types of measuring instruments

In the following you will find a detailed description of the configuration steps for the measuring instrument with analogue input and for the instrument with frequency input.

Measuring instrument with analogue input



1. Step: Adjustment of the measuring signal input

selection of number 0 = 0 to 20 mA
 selection of number 1 = 4 to 20 mA
 or
 selection of number 3 = 0 to 10 V

2. Step: Selection of decimal point for the display

0000 = display ----
 000.0 = display ---.-
 00.00 = display --.-

3. Step: Scaling of the display

- Selection of the measuring end value


4. Step: Scaling of the display

- Selection of the beginning of the measuring range

5. Step:

Selection of the display speed with different filter characteristics

6. Step: without function, please skip "nr. 0" is shown in the display, this

message can be skipped with key 


7. Step: Scaling of the analogue output

- Selection of the measuring end value

8. Step: Scaling of the analogue output

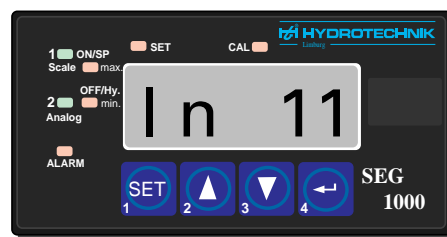
- Selection of the beginning of the measuring range

9. Step:

"out 1" is shown. If you press key 

now, you will leave the configuration.

Measuring instrument with frequency input



1. Step: Adjustment of the measuring sensitivity to TTL-level and frequency

selection of number 3 = 1000 Hz
 selection of number 7 = 100 Hz
 or
 selection of number 11 = rev. speed measurement

2. Step: Selection of decimal point for the display

0000 (rev. speed measurement)
 000.0 without decimal point
 00.00

3. Step: Scaling of the display

- Selection of the measuring end value


4. Step: is skipped with key

- Selection of the beginning of the measuring range (not necessary for measurement of frequency)

5. Step:

Selection of the display speed with different filter characteristics

6. Step: without function, please skip "nr. 0" is shown in the display, this

message can be skipped with key 


7. Step: Scaling of the analogue output

- Selection of the measuring end value

8. Step: Scaling of the analogue output

- Selection of the beginning of the measuring range

9. Step:

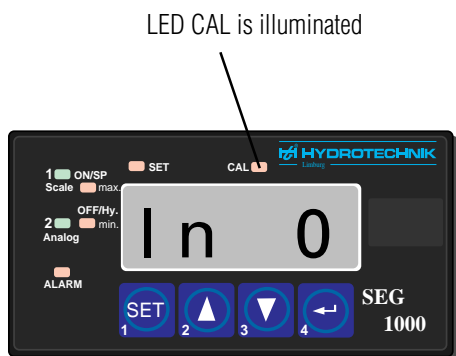
"out 1" is shown. If you press key 


now, you will leave the configuration.

The above mentioned operating steps are described in more detail on the following pages.

4. Adjustments of the measuring instrument with analogue input

First of all, all operating steps for the measuring instrument with analogue input are described.



For calibration you should press key  and the miniature key on the back of the instrument (behind the terminal plug) as long as „In“ is displayed together with a number.

After that you can let go key  and the miniature key.



The display looks as shown-above and the LED „CAL“ is illuminated.


4.1 Selection measuring signal input for the analogue measuring instrument

To be able to measure with the SEG 1000 with analogue input, you will have to adapt the signal input of the measuring instrument to the output signal of the analogue sensor, what is carried out with help of the software.

In the example you can see the preadjustments of the analogue measuring signal input.

In	x	analogue instrument
0		0 to 20 mA
1		4 to 20 mA
2		•
3		0 to 10 V
4		•
5		•
6		•
7		•
8		•
10		•
11		•

With one of the two cursor keys   the corresponding number in the display can either be increased or decreased. If, for example, you select the number „0“, the display will show „In 0“ and the measuring instrument will be adjusted to an analogue input measuring signal of 0 to 20 mA.

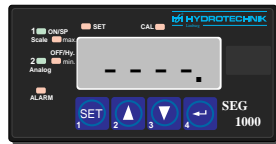
With key  the selected number „0“ is stored in the measuring instrument. The next operating step is displayed automatically.



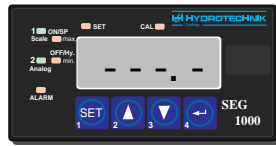
If an output signal of 0 to 10 V is requested for a sensor, the input connection on the 10-pole plug connector will need to be modified (white wire to pin 13) For this, please see the description of the connection on page 5.

4.2 Display with decimal point

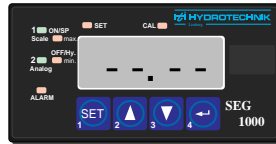
No decimal point selected



Decimal point 000,0 selected




Decimal point 00,00 selected

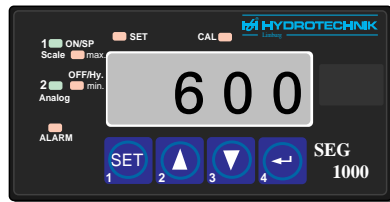


With the keys  and  the position of the decimal point can be moved to the left or the right side.

According to this adjustment, the result of the measurements will be displayed without decimal point, with a decimal point behind three figures or with a decimal point behind two figures.

With key  the selected position of the decimal point is stored.

4.3 Selection of the measuring range end value



The next operating step will be shown automatically.

For this example, a pressure sensor with a measuring range of 0 to 600 bar, is used.


When using analogue sensors, you will always have to enter a calibration value for the end and the beginning of a measuring range.

This is necessary, to assign the measuring signal of the sensor of e.g. 0 to 20 mA, to the display measuring range of the measuring instrument of 0 to 600 bar.

The corresponding measuring range can be seen on the label of the sensor.

In the example the number „600“ is entered (see left picture)

with the keys  and .

The input should always be finished with key .

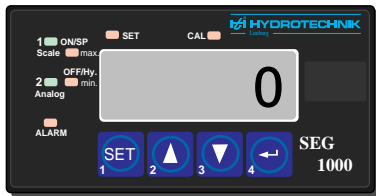
The instrument automatically changes to the next step.



The two cursor keys „2“ and „3“ have a rolling function. That means, when pressing one of these keys quickly (< 1s), the value to be adjusted will increase or decrease by one digit (1 number).

When pressing these keys for a longer time, the value begins to roll and from 150 digits on it accelerates up to ten times the speed. To make the adjustment easier, you should let go the key from time to time and begin again with a slower speed.

4.4 Selection of the beginning of the measuring range



In the example the measuring range of the pressure sensor is 0 to 600 bar.

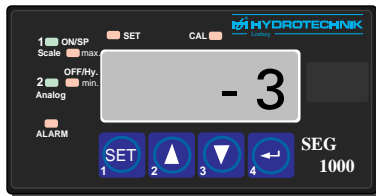
Therefore, a „0“ has to be entered with the keys



and



4.5 Manual zero point correction



It is also possible to use the beginning of the measuring range for the correction of a zero point. This can be very useful, if, for example, a pressure sensor has a zero point deviation.

In the measuring value display you can check, if a pressure sensor has a zero point deviation. A condition for that is, that the pressure sensor is depressurized.

You can correct this deviation, when selecting the beginning of the measuring range.



If for example, a pressure sensor has a zero point deviation of + 3,0 bar, you have to adjust this value as a negative value (-3 bar) with key



(see display).

This adjustment is stored with key



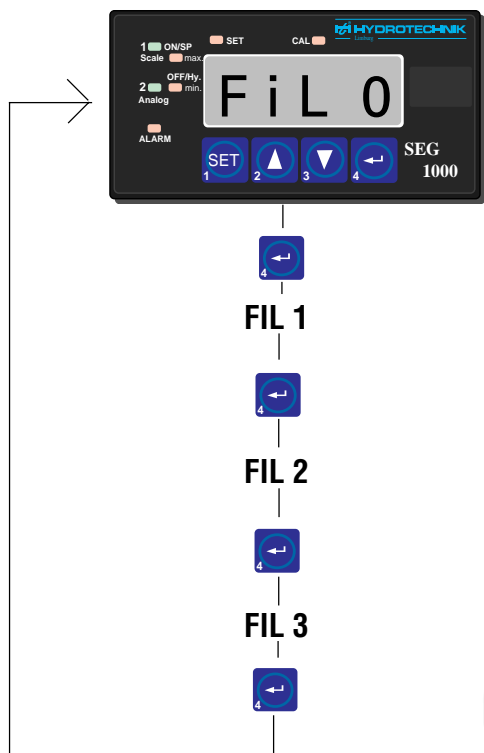
and the next step is invoked automatically.



The adjusted offset of the pressure sensor (zero point deviation) will be taken into account for all further pressure measurements and corrected by the programme.

The measuring value display shows the corrected pressure measuring value.

4.6 Selection of the display speed with filter possibilities



In the display the letters „**FIL**“ are shown in combination with a number (for example: **FIL 0**)

The following four possibilities can be selected:

FIL 0

means: The measuring value is displayed with nearly no delay, the filter is switched off.

FIL 1

means: The display time is delayed by 0,5 seconds, the filter is switched on and suppresses short interfering pulses that can occur when relays or contactors are switched.

FIL 2

means: The filter avoids, that the last digit in the display jumps and an additional delaying of the display for 1 sec. is active. This filter should be selected in any case, if the display is larger than 2000.

FIL 3

means: A combination of FIL1 and FIL2. The display delay of filter 1 and filter 2 is added and the display changes slowly and is insensible to interference from outside.



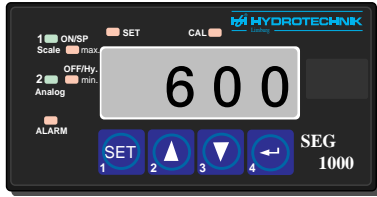
For digital measuring instruments (measurement of frequency) with a display value above 2000, „**FIL 2**“ should be selected.

After having chosen the display delay and the filter, you can store this adjustment with key  .

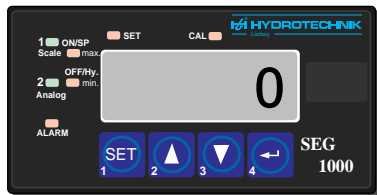
At the same time the display shows „**nr**“ with a following number.

This display has no function and needs to be skipped with key  .

4.7 Adjustment or scaling of the analogue output



Measuring range end value



Beginning of measuring range

In the next step, the user has to adjust the analogue output. The three LEDs CAL, Analog and max. are illuminated, that means, the end and the beginning of the measuring range (limit values) need to be entered for the analogue output.

Example:

The limit values for a pressure sensor with a measuring range of 0 to 600 bar shall be entered.

First of all the end of the measuring range 600 is entered with the keys

and (see display 600).

After that the input needs to be confirmed with key .

The instrument immediately asks for the input of the beginning of the measuring range.

The LEDs CAL, Analog and min. are illuminated.

In the example zero = (0) bar.

The value „0“ is adjusted with the keys and and the

selection should be confirmed with key .

4.8 Analogue output voltage

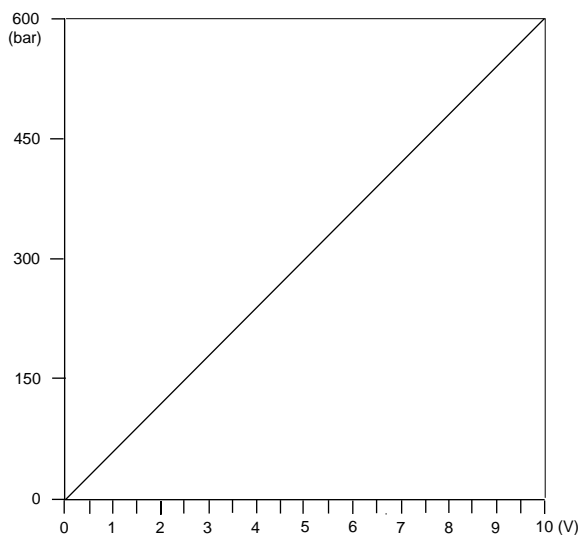


Diagram 1

When HYDROTECHNIK delivers the measuring instrument, it is equipped with a 500 Ohm resistor that is connected between pin 16 and pin 17.

If for example a pressure sensor with a measuring range of 0 to 600 bar and a signal output of 0 to 20 mA is connected to the measuring input, an output signal of 0 to 10 V is generated, relating to a measuring range of 0 to 600 bar.

For better understanding, please see diagram 1.

4.9 Analogue output current

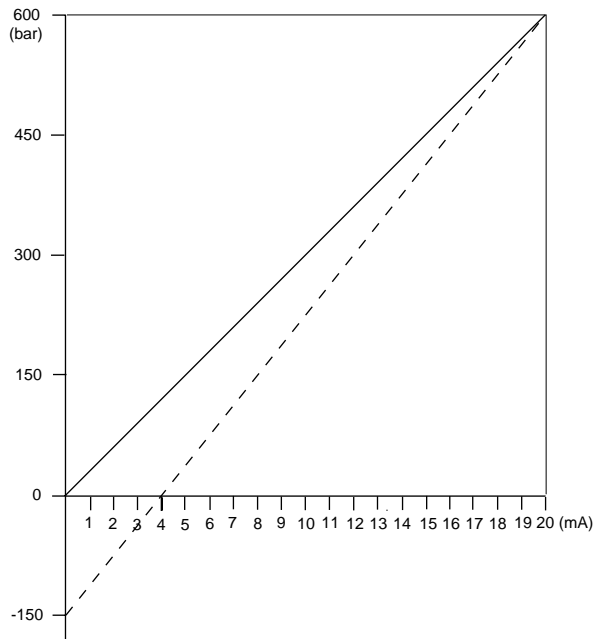


Diagram 2

If the 500 Ohm resistor is removed, very long wires can be bridged at the analogue output. The analogue output provides a load independent current, that means a controlled current not depending on the connected resistor (apparent ohmic resistance).

The advantage of that is, that the wire resistor and the instrument (e.g. a printer), connected with a longer wire, do not influence the current signal, as long as the sum of the resistors is smaller than the allowed apparent ohmic resistance of max. 1.500 Ohm.

If, for example, a pressure sensor with a measuring range of 0 to 600 bar and a signal output of 0 to 20 mA is connected to the measuring input, a proportional output current of 0 to 20 mA referring to a measuring range of 0 to 600 bar, is provided at the analogue output. Please see diagram 2 (full line).

If, however, a current of 4 to 20 mA shall provided at the analogue output, the beginning of the measuring range needs to be adjusted to -150, as shown on page 14.

As you can see in diagram 2, the pointed line is shifted and meets the x-axis at the 4 mA point. The zero point shifts into the negative range of values (- 150 bar).

This corresponds to exactly a quarter of the measuring range from 0 to 600 bar = 150 bar.

That means the output signal at 0 bar is 4 mA and the measuring range end value from 600 bar is 20 mA.

4.10 Spreading of the measuring range

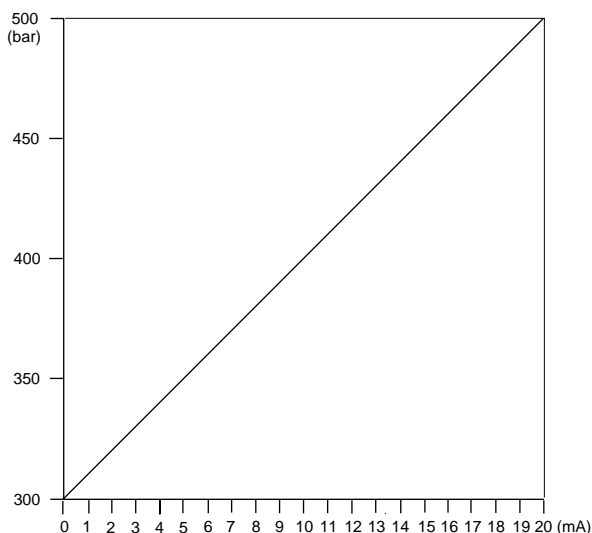


Diagram 3

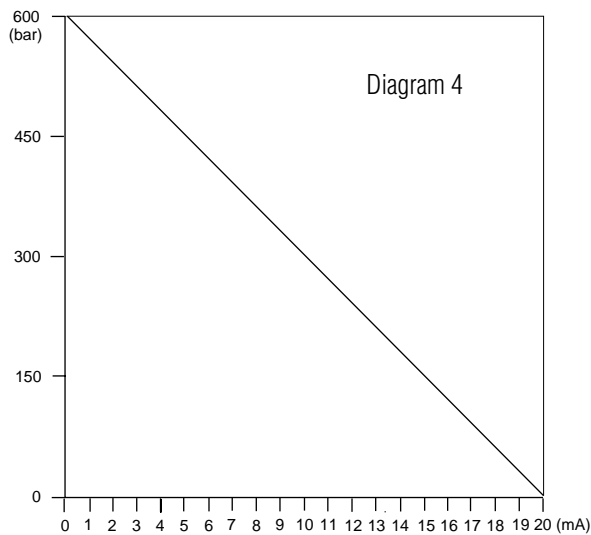
If you want to restrict the measuring range from 0 to 600 bar to, e.g. 300 to 500 bar, the resulting output signal range will be proportional to the new adjusted measuring range, that means:

300 to 500 bar = 0 to 20 mA

Therefore, measuring values below 300 bar or 500 bar will be restricted to 0 mA or 20 mA, see (diagram 3).

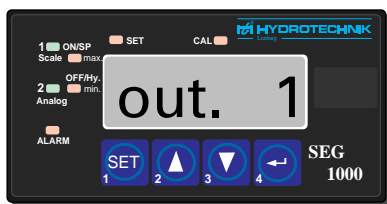
In doing so, you can have the measuring range printed out in a spread way.

If an extreme spreading is carried out, steps will be printed out due to the analogue-digital conversion.



The analogue output signal can be inverted, too. When entering the values, you only have to exchange the beginning- and the end value. Then, 600 bar corresponds to 0 mA and 0 bar corresponds to 20 mA, see diagram 4.

4.11 Finishing the configuration



If the adjustments of the analogue output are finished, the display on the left side will be shown automatically. You will always have to leave the configuration programme with this display „out.1“ and a stroke of key



, afterwards.

The current measuring value display is shown automatically.

You can repeat the programme steps for the configuration of the instrument, described above, as often as you like. However, you should always begin with the steps, described on page 14.



If during the configuration, no key is pressed for two minutes, it will be interrupted automatically. The LED „CAL“ won't be illuminated any more.

4.12 Examples for adjustment: analogue output

Analogue output scaled for 0 to 20 mA:

If a temperature, for example of $-50\text{ }^{\circ}\text{C}$ to $+150\text{ }^{\circ}\text{C}$, is measured at an analogue instrument and the analogue output shall provide an output current of 0 to 20 mA, proportional to the measuring range, the configuration of the analogue output needs to be adjusted to max. 150 and min -50.

The analogue output provides at $-50\text{ }^{\circ}\text{C} = 0\text{ mA}$, at $0\text{ }^{\circ}\text{C} = 5\text{ mA}$ and at $150\text{ }^{\circ}\text{C} = 20\text{ mA}$.

Analogue output scaled for 4 to 20 mA: (only valid for a sensor that provides 4 to 20 mA, too)

If, however, the analogue output shall provide an output current of 4 to 20 mA at $-50\text{ }^{\circ}\text{C}$ to $+150\text{ }^{\circ}\text{C}$, you only have to modify the beginning of the measuring range to -100 in the configuration (step 8, page 9).

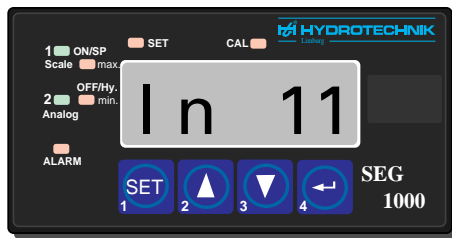
The analogue output provides at $-50\text{ }^{\circ}\text{C} = 4\text{ mA}$, at $0\text{ }^{\circ}\text{C} = 8\text{ mA}$ and at $150\text{ }^{\circ}\text{C} = 20\text{ mA}$.

If you want to carry out further adjustments for your measuring instrument with analogue measuring input, please skip the pages 17 to 23, as the measuring instrument with digital input (frequency input) is described on these pages.


From page 24 on, you will find further adjustments for the instrument with analogue input.

5. Adjustments of the measuring instrument with digital input (frequency measurement)

LED CAL is illuminated



All operating steps for the measuring instrument with digital measuring input are described.

For calibration you should press key  and the miniature key on the back of the instrument (behind the terminal plug) as long as „In“ is displayed together with a number. In the example „IN 11“ is displayed.

After that you can let go key  and the miniature key.

The display looks as shown-above and the LED „CAL“ is illuminated.

To be able to measure frequencies with the SEG 1000, you will have to adjust it to one of the following possibilities:

- TTL 1000 Hz = 3

This adjustment is suitable for the use of measuring turbines, gear flow meters and sensors with a frequency signal (square-wave signal from 5 V to 15 V).

- TTL-measurement of RPM = 11

This adjustment is suitable for the use of sensors with a frequency signal (square-wave signal from 5 V to 15 V)





- Adjustment TTL 100 Hz = 7


This adjustment is provided for special cases where low frequencies shall be displayed with a high resolution (two digits behind the decimal point). Sensors with a frequency signal (square-wave signal from 5 V to 15 V).



In x	digital instrument
0	•
1	•
2	•
3 TTL	1000 Hz
4	•
5	•
6	•
7 TTL	100 Hz
8	•
10	•
11 TTL	RPM

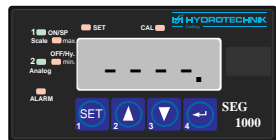
With one of the two cursor keys   the corresponding number in the display can either be increased or decreased.

If, for example, you select the number „11“, the display will show „In 11“ and the measuring instrument will be adjusted to a frequency signal for the acquisition of rev. speed (in doing so, the input signals per revolution are directly calculated with the factor 60 and displayed as revolution per minute).

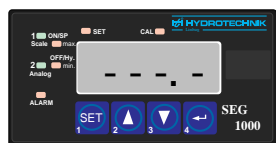
With key  the selected number is stored in the measuring instrument. The next operating step is displayed automatically.

5.1 Selection of the decimal point

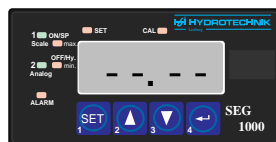
No decimal point selected



Decimal point 000,0 selected




Decimal point 00,00 selected



With the keys  and , the position of the decimal point can be moved to the left or the right side.

According to this adjustment, the result of the measurements will be displayed without decimal point, with a decimal point behind three figures or with a decimal behind two figures.

With key  the selected position of the decimal point is stored.

When measuring rev. speed, an input of the decimal point is not necessary, as the resolution in the display is always 1 revolution per minute.

If a decimal point is selected, it will be suppressed for the rev. speed measurement.

The selection of the decimal point is especially important, when using volume flow rate sensors, as it is quite possible to exceed the display range, in this case.

Volume flow rate sensors can have a resolution of up to two digits behind the decimal point. For the adjustment of the decimal point, you should take the calibration value from the calibration certificate, attached to each volume flow rate sensor. In the following example you can see, when an adjustment to one digit or to two digits behind the decimal point is recommended.

For measuring a volume flow rate, a measuring turbine type RE4-300 with a measuring range of 15 to 300 l/min., according to its calibration certificate, is used.

The calibration value is 87,68. This value corresponds to a volume flow rate of 87,68 l/min. with a frequency of 1000 Hz.

As the display of the measuring instrument can show four digits, only, the display range of 99,99 l/min. would be exceeded at a frequency of 1140,5 Hz (calculated value), already.

Besides that, an error „Fe 3“ would be displayed and the measurement of volume flow rate would not be possible any more.

Only if the value fell below 99,99 l/min., a measurement would be possible again.

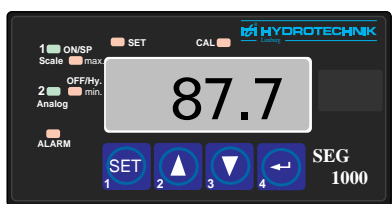
To prevent faulty measurements, it would be sensible to limit the calibration value to one digit behind the decimal point and, if necessary, to round up the calibration value to 87,7, for example. In doing so, you can measure a volume flow rate of up to 300 l/min. with the measuring instrument.

5.2 Input of the calibration value

For measuring instruments for volume flow rate, the input of a calibration value is imperative.


As an example for the input of a calibration value, the above-mentioned measuring turbine is used. According to its calibration certificate, the measuring range is 15 to 300 l/min. and the calibration value is 87,68. For entering the value with one digit behind the decimal point, you have to enter: 87,7.

In HYDROTECHNIK's sensors, for example, the calibration value can also be seen on the label.



The value 87,7 in the example can be adjusted with the cursor keys



The input needs to be finished with key  and the next step is invoked automatically.



The two cursor keys „2“ and „3“ have a rolling function.

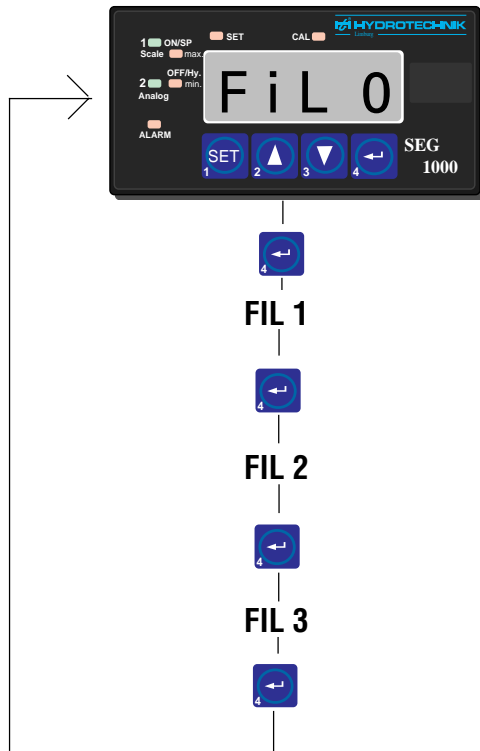
That means, when pressing one of these keys quickly (< 1s), the value to be adjusted will increase or decrease by one digit (1 number). When pressing these keys for a longer time, the value begins to roll and from 150 digits on it accelerates up to ten times the speed.

To make the adjustment easier, you should let go the key from time to time and begin again with a slower speed.



When measuring RPM, please pay attention to enter the number of markings, for example the reflective adhesive foil you have stuck on your object to be measured, instead of the measuring range end value. If you have stuck on only one marking, you will have to adjust the number 1 in the display. The rev. speed is acquired and displayed in RPM automatically.

5.3 Selection of the display speed with filter possibilities



In the display the letters „**FIL**“ are shown in combination with a number (for example: **FIL 0**)

The following four possibilities can be selected:

FIL 0

means: The measuring value is displayed with nearly no delay, the filter is switched off.

FIL 1

means: The display time is delayed by 0,5 seconds, the filter is switched on and suppresses short interfering pulses that can occur when relays or contactors are switched.

FIL 2

means: The filter avoids, that the last digit in the display jumps and an additional delaying of the display for 1 sec. is active. This filter should be selected in any case, if the display is larger than 2000.

FIL 3

means: A combination of FIL1 and FIL2. The display delay of filter 1 and filter 2 is added and the display changes slowly and is insensible to interference from outside.



For digital measuring instruments (measurement of frequency) with a display value above 2000, „**FIL 2**“ should be selected.

After having chosen the display delay and the filter, you can store this

adjustment with key

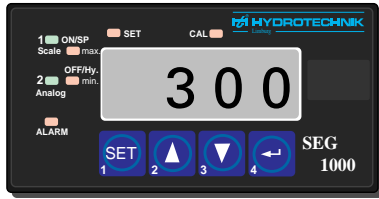


At the same time the display shows „**nr**“ with a following number.

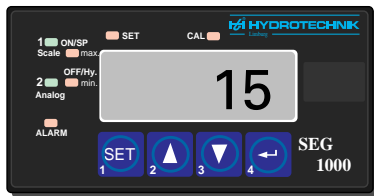
This display has no function and needs to be skipped with key



5.4 Adjustment or scaling of the analogue output



Measuring range end value



Beginning of measuring range


In the next step, the user has to adjust the analogue output. The three LEDs CAL, Analog and max. are illuminated, that means, the end and the beginning of the measuring range (limit values) need to be entered for the analogue output.

Example:

The limit values for a measuring turbine with a measuring range of 15 to 300 l/min. shall be entered.

First of all the end of the measuring range 300 l/min. = 300 is entered



with the keys  and  (see display 300).

After that the input needs to be confirmed with key .

The instrument immediately asks for the input of the beginning of the measuring range.

The LEDs CAL, Analog and min. are illuminated.

In the example 15 l/min. = 15 needs to be entered.

The value „15“ is adjusted with the keys  and .

and the selection should be confirmed with key .

5.5 Analogue output voltage

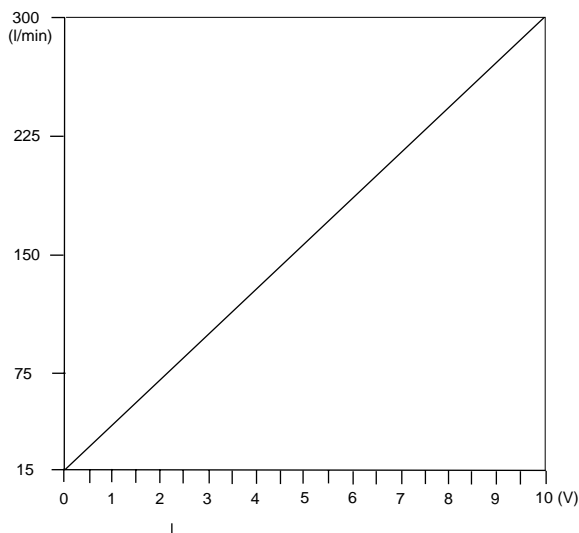


Diagram 5

When HYDROTECHNIK delivers the measuring instrument, it is equipped with a 500 Ohm resistor that is connected between pin 16 and pin 17.

If for example a turbine with a measuring range of 15 to 300 l/min. is connected to the measuring input, an output signal of 0 to 10 V is generated, relating to a measuring range of 15 to 300 bar.

For better understanding, please see diagram 5.

5.6 Analogue output current

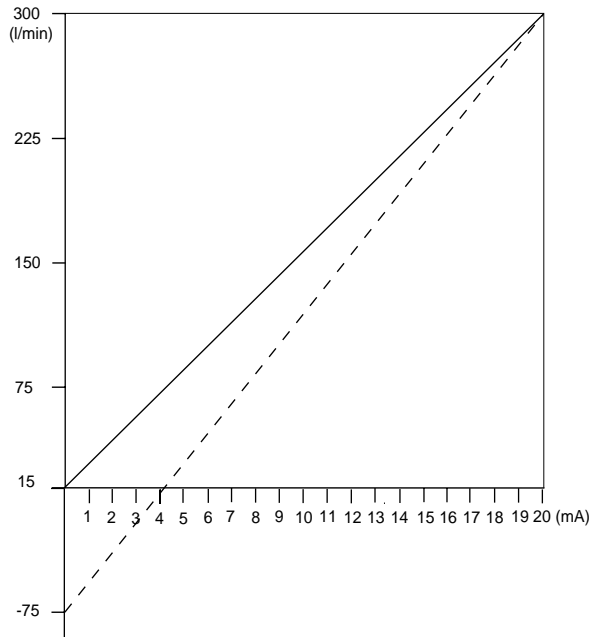


Diagram 6

If the 500 Ohm resistor is removed, very long wires can be bridged at the analogue output. The analogue output provides a load independent current, that means a controlled current not depending on the connected resistor (apparent ohmic resistance).

The advantage of that is, that the wire resistor and the instrument (e.g. a printer), connected with a longer wire, do not influence the current signal, as long as the sum of the resistors is smaller than the allowed apparent ohmic resistance of max. 500 Ohm.

If, for example, a measuring turbine with a measuring range of 15 to 300 l/min. is connected to the measuring input, a proportional output current of 0 to 20 mA referring to a measuring range of 15 to 300 l/min., is provided. Please see diagram 6 (full line).

If, however, a current of 4 to 20 mA shall provided at the analogue output, the beginning of the measuring range needs to be adjusted to -75,0 in the display, as shown on page 14.

As you can see in diagram 6, the pointed line is shifted and meets the x-axis at the 4 mA point. The zero point shifts into the negative range of values (- 75 l/min.).

This corresponds to exactly a quarter of the measuring range from 15 to 300 l/min. = 75 l/min. That means the output signal at 15 l/min. is 4 mA and the measuring rang end value from 300 l/min. is 20 mA.

5.7 Spreading of the measuring range

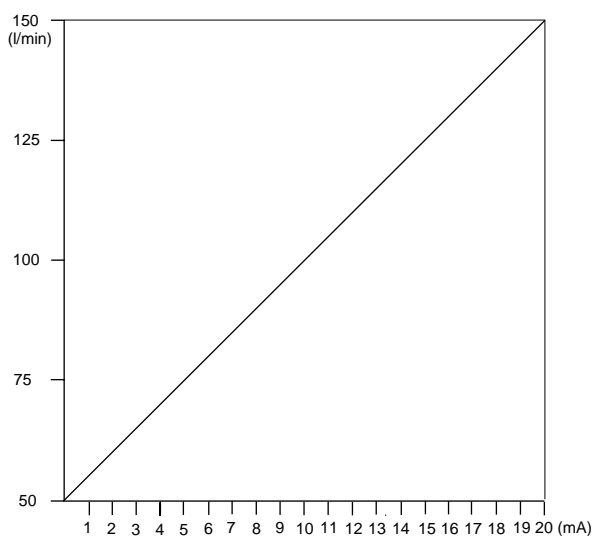


Diagram 7

If you want to restrict the measuring range from 15 to 300 l/min. to, e.g. 50 to 150 l/min., the resulting output signal range will be proportional to the new adjusted measuring range, that means:

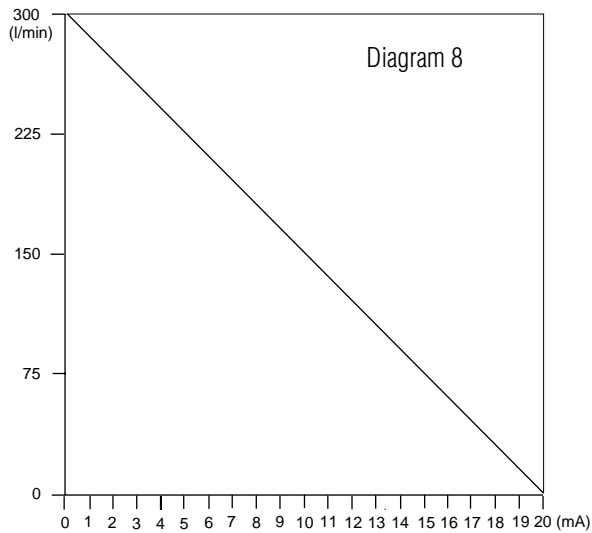
50 to 150 l/min. = 0 to 20 mA

Therefore, measuring values below 50 l/min. or 150 l/min. will be restricted to 0 mA or 20 mA, see (diagram 3).

In doing so, you can have the measuring range printed out in a spread way.

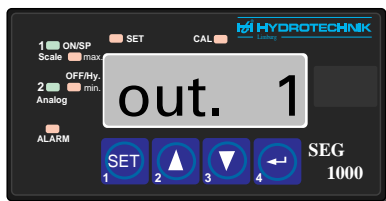
If an extreme spreading is carried out, steps will be printed out due to the analogue-digital conversion.

In diagram 7 you can see a spreading of the measuring range from 50 to 150 l/min. to 0 to 20 mA.



The analogue output signal can be inverted, too. When entering the values for the scaling of the analogue output, you only have to exchange the beginning- and the end value. Then, 300 l/min. corresponds to 0 mA and 15 l/min. corresponds to 20 mA, see diagram 8.

5.8 Finishing the configuration



If the adjustments of the analogue output are finished, the display on the left side will be shown automatically. You will always have to leave the configuration programme with this display „out.1“ and a stroke of key



, afterwards.

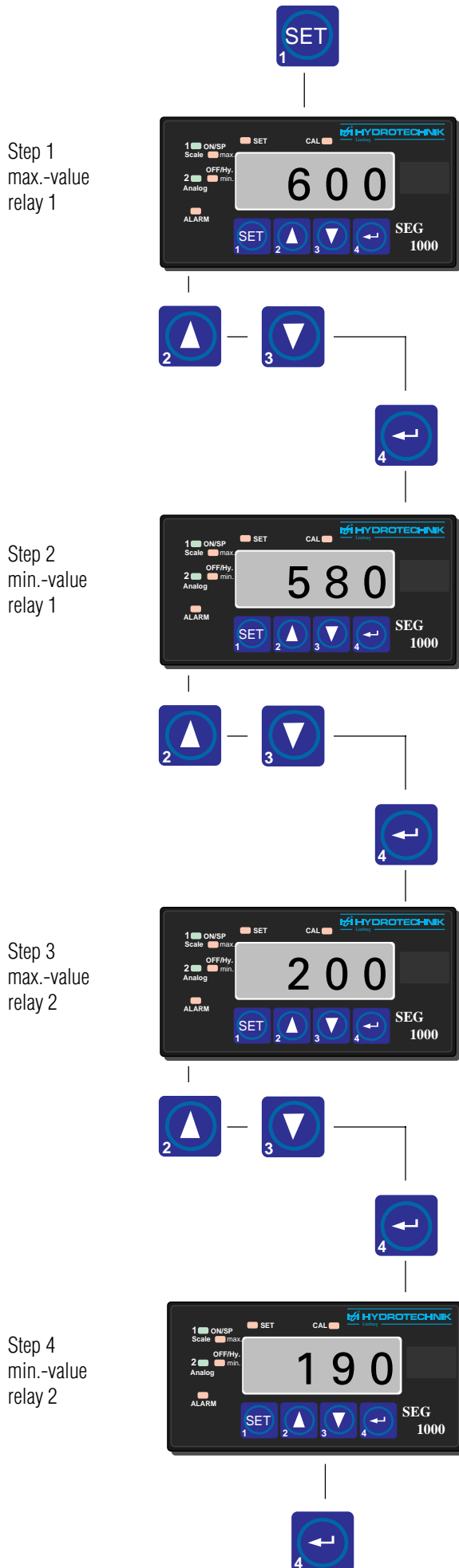
The current measuring value display is shown automatically.



You can repeat the programme steps for the configuration of the instrument, described above, as often as you like. However, you should always begin with the steps, described on page 14.

If during the configuration, no key is pressed for two minutes, it will be interrupted automatically. The LED „CAL“ won't be illuminated any more.

6. Programming of the min. and max. values for relay 1 and relay 2




The measuring instrument can be equipped with max. two all-or-nothing relays.

The relay REL 1 is equipped with a potential-free switching contact as a make contact.

For REL 2 a change-over contact is provided. The corresponding state of the relays is shown in the measuring menu by the LEDs 1 (scale) or 2 (analogue) on the left side near the display.

If one of the LED's is illuminated, the corresponding contact is closed or switched over (at the change-over contact it can be closed or opened).




To set limit values, press key  quickly. By pressing it several times, the following programme steps can be selected and adjusted one after the other:


- step 1 input max.-value for relay 1
- step 2 input min.-value for relay 1
- step 3 input max.-value for relay 2
- step 4 input min.-value for relay 2

As an example the programming for relay 1 and relay 2 is carried out.


In all four steps the corresponding example values are adjusted, one after the other:

- | | | | |
|--------|-----|-------------------|--------------|
| step 1 | 600 | illuminated LEDs: | 1, max., Set |
| step 2 | 580 | illuminated LEDs: | 1, min, Set |
| step 3 | 200 | illuminated LEDs: | 2, max., Set |
| step 4 | 190 | illuminated LEDs: | 2, min, Set |

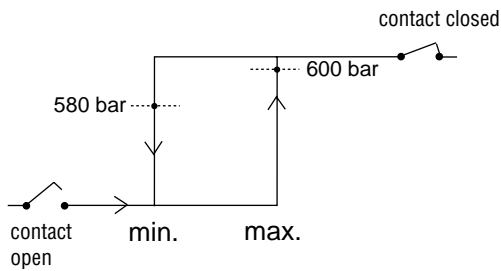
The adjustment is carried out with the keys  and , and is confirmed with key .

The limit values can always be checked by a stroke of key .

With several strokes of this key, all adjustments are displayed one after the other.

To leave the menu, press key  and the current measuring value display will be shown automatically.

Functioning at a later measuring application:



Up to a pressure of 600 bar the contact is open, when it is exceeded it will be closed and if the value falls below 580 bar, it will be opened again.



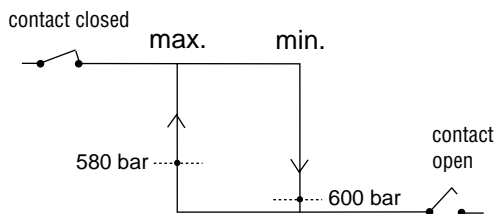
Please take into consideration that the min./max. values can only be adjusted within the limits of the measuring range.

In the above-mentioned example, the pressure limit values can also be exchanged:

600 bar = min. and 580 bar = max.

In doing so, you can invert the function of relay 1.

If the max. value of 600 bar is exceeded, the switching contact opens and closes again until the value falls below 580 bar, only.



Up to a pressure of 600 bar the contact is closed, when it is exceeded it will be opened and if the value falls below 580 bar, it will be closed again.



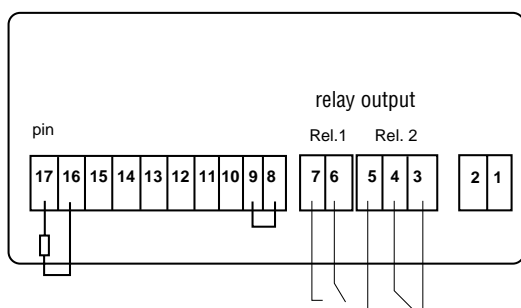
Please pay attention, that the value of the hysteresis is not too close to the max. value.

When monitoring pressure in hydraulic systems, there are always pressure variations.

Therefore it would make no sense to have the min.-value very close to the max.-value (e.g. min. = 599 bar, max. = 600 bar), as the pressure variations would cause the max.-value to respond or an alarm or the switching-off of an external machine.

At a power failure, the switching contacts are opened automatically (forced opening).

Basic position of the switching contacts



Please take into consideration that the contact paths have the following basic positions after a power failure or when the relays have not been activated, yet:

Relay 1: switching contact opened between pin 6 and 7

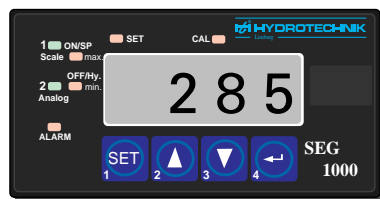
Relay 2: switching contact closed between pin 3 and 4

Please check your connection or switching function thoroughly before using the switching contacts for external control.

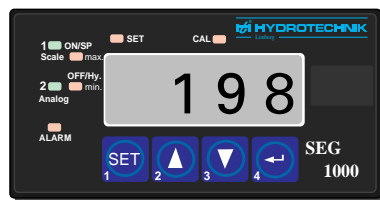
With wrong connections, errors can occur when controlling external machines and HYDROTECHNIK will not accept any claims resulting from that.

7. Display of min./max. values

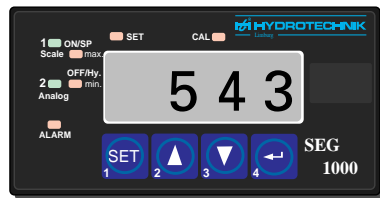
Example: current measuring value display



select min.-value



select max.-value



back to the current measuring value display



If it is possible that pressure peaks occur during, e.g. the monitoring of pressure, the display of pressure peaks in a running measurement can be of help for the user.

According to the maximum indicator principle, the max. amplitude of a pressure peak or the minimum pressure are acquired.

You can have the min./max. values displayed (see diagrams on the left) with one of the following keys:



for max. pressure peak

The LEDs „max.“ and „analogue“ are illuminated at the same time



for min. pressure peak

The LEDs „min“ and „analogue“ are illuminated at the same time.

Delete min./max. values

If you press key



for longer than 4 seconds, the max. value

in the display will be deleted automatically and the current pressure in the plant will be shown.

The same is done for the min. value in the display.

If you press key



for longer than 4 seconds, the min. value in

the display will be deleted automatically and the current pressure in the plant will be shown.

You can return to the measuring mode with a stroke of key



LED „analogue“ is illuminated.

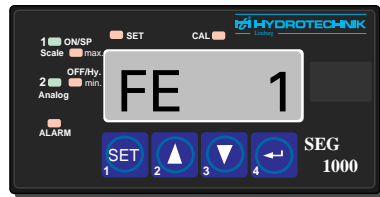


For your information:

Even if the instrument is in the normal measuring mode, all min. and max. values are measured continuously. These values will not be stored, if the instrument is switched off. When the instrument is switched on again, the current measuring values will be displayed.

8. Error messages

If one of the following error messages is displayed, certain conditions and adjustments have not been fulfilled.



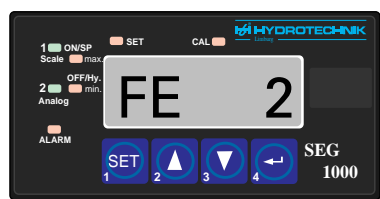
This display indicates, that the measuring range of the A/D-converter was exceeded.

Possible reason at digital measuring instruments:

The input frequency was too high.

Possible reason at analogue measuring instruments:

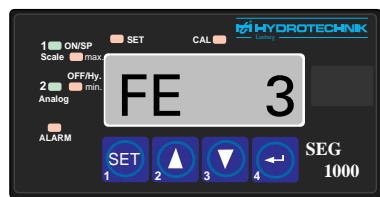
The sensor is defective or the connection cable was interrupted.



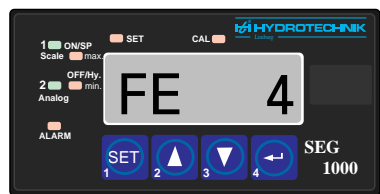
This display indicates, that the measuring range of the A/D-converter was not reached.

Possible reason at analogue measuring instruments:

The sensor is defective, the connection cable was interrupted or a short-circuit occurred.



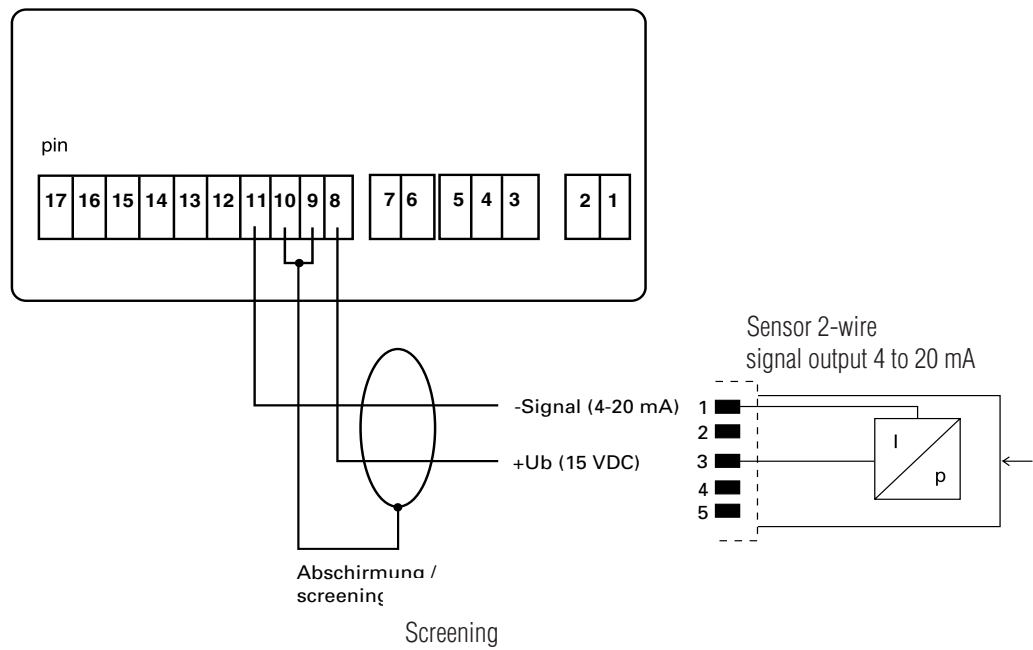
This display indicates, that the max. display range of 9999 was exceeded.



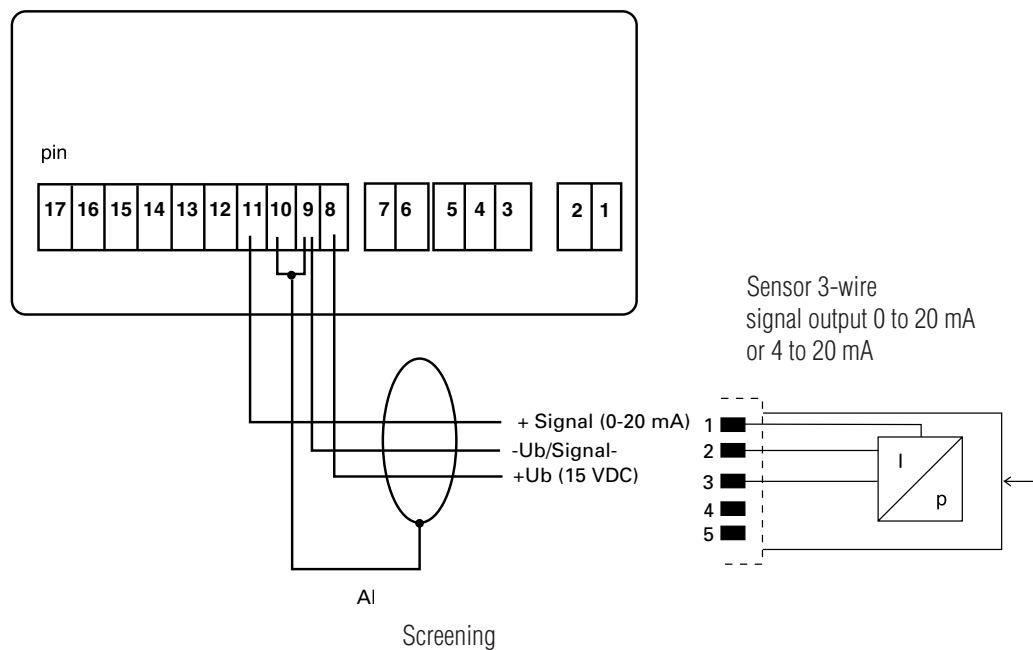
This display indicates, that the min. display range of -1999 was not reached.

9. Connection of the different sensors in 2-, 3- and 4-wire technique

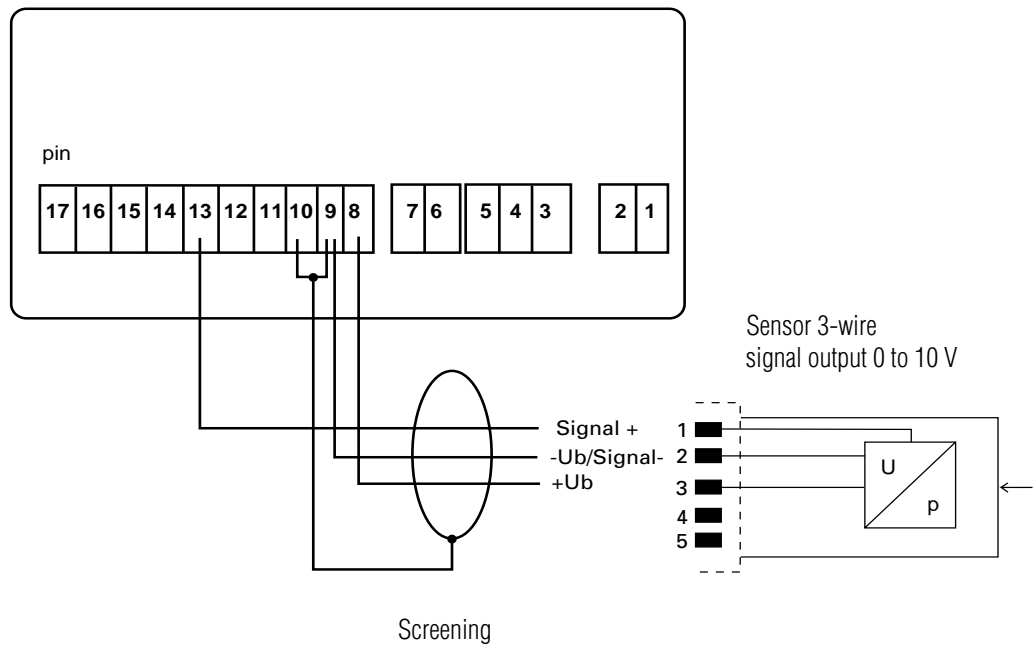
Connection of a sensor in 2-wire technique to the pin connection on the back of the SEG 1000



Connection of a sensor in 3-wire technique to the pin connection on the back of the SEG 1000

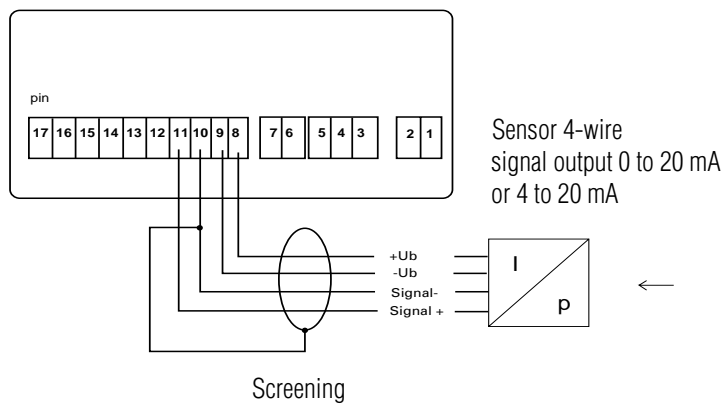


Connection of a sensor in 3-wire technique to the pin connection on the back of the SEG 1000

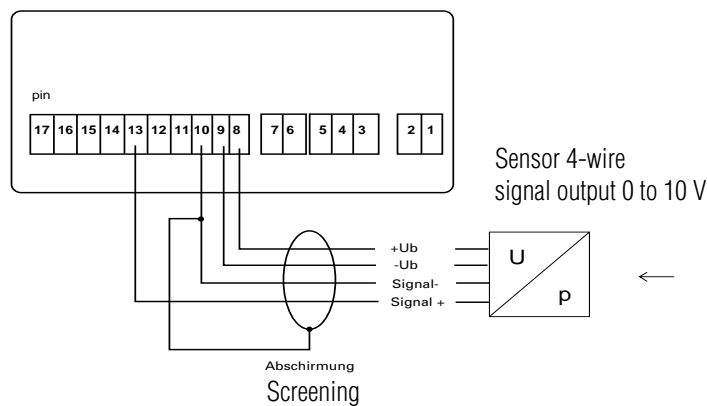


Two further types of connections that are used in certain cases, only:

Connection of a sensor in 4-wire technique to the pin connection on the back of the SEG 1000



Connection of a sensor in 4-wire technique to the pin connection on the back of the SEG 1000



10. HYDROTECHNIK-sensors with connection schemes

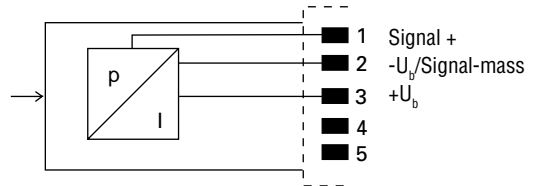
Sensors for pressure measurement

Pressure sensor PR15



Connection scheme

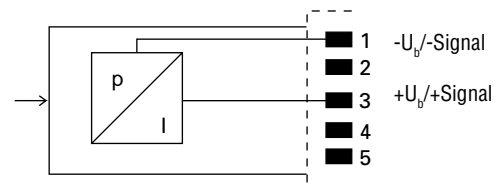
3-wire technique 0 to 20 mA



Pressure sensor type HD

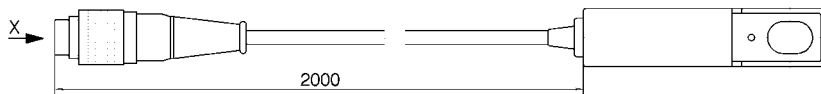


2-wire technique 4 to 20 mA



Sensor for measurement of RPM

Rev. speed probe DS03



Output: square wave signal



Sensor for temperature measurement

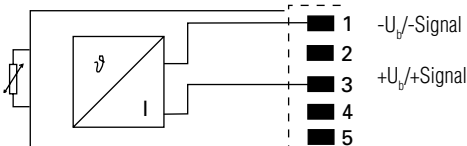
Temperature sensor
(screw-in sensor)



3-wire technique 0 to 20 mA



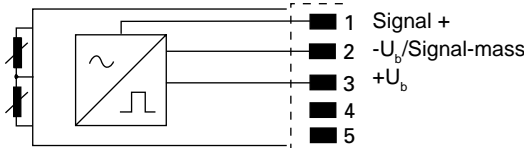
2-wire technique 4 to 20 mA



Sensor for volume flow rate measurement

Gear flow meters type GFM

Magnetoresistor sensor with amplifier
Output: square wave signal



Sensors for volume flow rate measurement

Turbine RE3



Inductive transducer with amplifier
Output: square wave signal



Turbine RE4



11. Technical data

Operating voltage: 230 V \pm 10% / 50 Hz or 24 V \pm 6 V direct voltage



Note: After an interrupt of the voltage, all programmed values remain in the memory.

Note: You can only measure volume flow rate with a measuring turbine, the inductive transducer of which has an integrated amplifier, that means, the signals are square wave signals with a signal amplitude of 5 to 10 V.

The instrument is equipped with max. 2 limit values for one relay with a make contact and a change-over contact, each.
Switching load: max. 48 V / 8 A, at a power failure the switching contacts are opened automatically.

Input signal:	analogue: 0 to 20 / 4 to 20 mA or 0 to 10 V 40 ms scanning rate digital: 1 Hz to 10 kHz 5 to 15 V, square wave signal
Display:	14 mm LED 7-segment, colour red
Sensor supply:	15 VDC, max. 50 mA
Power consumption:	max. 8 W at 230 VAC and 4,8 W at 24 VDC
Input frequency:	0 to 10 kHz / at input signal square wave: 5 to 15 V
Analogue output signal:	0 to 20 mA or 0 to 10 V (max. apparent ohmic resistance: 500 Ohm)
Error limit:	at analogue instruments (display) \pm 0,5% of full scale at digital instruments (display) \pm 1 digit
Front:	splash- and wiping water proof according to IP 65



Our measuring systems are manufactured according to the European production standards and fulfill the EC-directives concerning the electromagnetic compatibility (EMC) according to EN 50081 and EN 50082

12. Information on guarantee

Within the framework of our guarantee conditions we guarantee the unobjectionable manufacture of our technical instruments.
The guarantee is valid for 6 months.

In principle, the general terms of business are valid.

The right to claim under guarantee will become invalid, if repairs or interventions are carried out by persons, who were not authorised by us.

Within the six months of the guarantee, we will provide gratis removals of damages or defects, which can be proved to be based on a works' mistake, as far as the customer informs us immediately after having detected it, but within six months at the latest.

The fulfilling of the guarantee is done in a way, that defective parts are repaired or replaced by unobjectionable parts at our choice, free of charge.

Instruments, for which you want to claim under guarantee, have to be sent carriage paid together with the corresponding copy of the invoice or the delivery note to:

HYDROTECHNIK-SERVICE

13. Maintenance

Your measuring instrument is a precision instrument, which will work without trouble for many years, if it is treated correspondingly.

However, in the case that interference occurs nevertheless, please do not try to repair the instrument yourself!

Leave the maintenance or the repair up to our HYDROTECHNIK-SERVICE.

Address: HYDROTECHNIK GmbH
Holzheimer Straße 94 - 96
D-65549 Limburg
Tel.: 0 64 31 - 40 04 · 0
Fax 0 64 31 - 4 53 08

Should your Multi-System 5000 require repair, we depend on your support. Please describe your complaint as precisely as possible. That enable us to locate the error more easily and you will profit from shorter repair times.

If we have any additional queries, please state the person to contact:

Company:	
Department:	
Name:	
Telephone:	
Fax:	

Please tick the appropriate answer:

Part to repaired: Measuring instr. Sensor Cable Supply unit	Your PC 386 486 Pentium P 2	operating system DOS Windows 3.1x or Windows 95 NT	software HYDROcomsys/DOS: version HYDROcomsys/Windows: version
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How to describe an error:

Please leave all parameters etc. unchanged after an error occurs. Briefly describe your measuring task, connection of sensor, parameter adjustments (for example memory parameters, trigger, how many measuring values are acquired, type of printer, etc.

Your description:

Order data for panel mounted instrument series SEG 1000		Part-number
SEG 1000 - analogue, for signal 0 to 20 mA / 4 to 20 mA		
- SEG 1000, 230 VAC only display		3192-01-01.00
- SEG 1000, 230 VAC with option analogue output		3192-01-03.00
- SEG 1000, 230 VAC with option limit value		3192-01-05.00
- SEG 1000, 230 VAC with option analogue output and limit value relay		3192-01-07.00
- SEG 1000, 24 VDC only display		3192-01-02.00
- SEG 1000, 24 VDC with option analogue output		3192-01-04.00
- SEG 1000, 24 VDC with option limit value		3192-01-06.00
- SEG 1000, 24 VDC with option analogue output and limit value relay		3192-01-08.00
SEG 1000 - digital, for frequency signals		
- SEG 1000, 230 VAC only display		3192-02-01.00
- SEG 1000, 230 VAC with option analogue output		3192-02-03.00
- SEG 1000, 230 VAC with option limit value		3192-02-05.00
- SEG 1000, 230 VAC with option analogue output and limit value relay		3192-02-07.00
- SEG 1000, 24 VDC only display		3192-02-02.00
- SEG 1000, 24 VDC with option analogue output		3192-02-04.00
- SEG 1000, 24 VDC with option limit value		3192-02-06.00
- SEG 1000, 24 VDC with option analogue output and limit value relay		3192-02-08.00

Design in 115 VAC on request

Sensors (series SEG 1000 and Compare)		Part-number
- Pressure (output signal 4 to 20 mA) Pressure sensor type HD	Measuring range in bar 0 to 60 (... 870)	3403-21-A4.37
	(in psi) 0 to 200 (... 2900)	3403-10-A4.37
	0 to 400 (... 5800)	3403-15-A4.37
	0 to 600 (... 8700)	3403-18-A4.37
	Pressure sensor type PR 15 -1 to +6 (-14,5... 87)	3403-32-71.37
	0 to 1000 (... 14500)	3403-29-71.37
- Pressure (when selecting the pressure sensors with an output signal of 0 to 20 mA , you only have to replace the last two numbers .37 with the numbers .33) for example:		3403-21-A4 .33
- Volume flow rate Measuring turbine RE 3 (inductive transducer with amplifier) Output signal (square wave) With MINIMESS and p/T-test points (series 1620 - M 16 x 2) (Please see our brochure RE 3/RE 4 for further details)	Measuring range in l/min 7,5 to 75 (2... 20)	31V7-21-35.00
	(in gal/min) 15 to 300 (4... 79)	31V7-30-35.00
	25 to 600 (6,6... 158,5)	31V7-40-35.00
- Volume flow rate Measuring turbine RE 4, (inductive transducer with amplifier) Output signal (square wave) With MINIMESS and p/T-test points (series 1620 - M 16 x 2) (Please see our brochure RE 3/RE 4 for further details)	Measuring range in l/min 1,0 to 10 (0,26... 2,6)	31V7-01-35.00
	(in gal/min) 7,5 to 75 (2... 20)	31V7-70-35.00
	15 to 300 (4... 79)	31V7-71-35.00
	25 to 600 (6,6... 158,5)	31V7-72-35.00
- Volume flow rate Gear flow meter type GFM Output signal (square wave) With MINIMESS and p/T-test points (series 1620 - M 16 x 2) (Please see our brochure GFM 4 for further details)	Measuring range in l/min 0,005 to 1 (0,0013... 0,25)	3143-01-35.00
	(in gal/min) 0,05 to 5 (0,013... 1,3)	3143-02-35.00
	0,2 to 30 (0,05... 8)	3143-03-35.00
	0,7 to 70 (0,18... 18,5)	3143-04-35.00
	3,0 to 300 (0,79... 79,25)	3143-05-35.00
- Rev. speed sensor, infra-red sensor type DS 03 with 25 pieces of reflective foil	Measuring range in min ⁻¹ (rpm) 1 to 9999 (1... 9999)	3130-02-01.00
- Reflective foil (spare part, 50 pieces)		8840-02-01.01
- Inductive transducer with amplifier Output signal: square wave 5 - 10 V (rev. speed measurement on gear wheels)		3107-00-09.00
- Temperature Temperature-screw-in sensor Pt 100, 3-wire technique 0 to 20 mA for p/T-test point 1620 / 04 Temperature-screw-in sensor Pt 100, 2-wire technique 4 to 20 mA for p/T-test point 1620 / 04 (Further technical details can be seen in our brochure „Sensors for pressure, temperature and RPM“)	Measuring range in °C (°F) -50 to +200 (-58... +392)	3973-04-01.00
		3969-04-01.00

Further additional sensors for special measuring tasks on request.

Accessories (series SEG 1000 and Compare)	Part-number
- Measuring cable MK 15 (direct connection between Compare /SEG and sensors, length: 2,5 m)	8824-C1-02.50
- Label set (self-adhesive foil with different units of measurement)	8081-32-04.00
- Cable, four-wire with screening:	8824-02-02.01
- Cable plug, five-pole with strain relief: for self-mounting	8808-04-00.01
- Cable socket, five-pole with strain relief:	8808-05-00.01
- Direct connection for pressure sensor type HD - straight (series 1620 - M 16x2)	2103-07-08.62
- Direct connection for pressure sensor type HD - 90° (series 1620 - M 16x2)	2146-13-05.00
- Direct connection for pressure sensor type PR 15 - straight (series 1620 - M 16x2)	2146-05-30.00
- Direct connection for pressure sensor type PR 15 - 90° (series 1620 - M 16x2)	2146-54-19.40
- p/T-test point 1620 (M 16 x 2) screw-in thread M 10 x 1	2149-04-19.13
- p/T-test point 1620 (M 16 x 2) screw-in thread DIN ISO 228-G 1/4	2149-04-15.13
- Additional sealing for SEG 1000 (sealing between frame of housing and mounting panel, IP 65)	8804-00-00.31
- Additional sealing for Compare (sealing between frame of housing and mounting panel)	8804-00-00.32

Order data for panel mounted instruments: series Compare	Part-number
Compare - analogue, for signals 0 to 20 mA / 4 to 20 mA - one-channel	
- Compare, 24 VDC with interface RS 232	3C3A-00-20.00
- Compare, 24 VDC with interface RS 485	3C3A-00-10.00
- Compare, 24 VDC with interface RS 232, analogue output and limit value relay	3C3A-00-21.20
- Compare, 24 VDC with interface RS 485, analogue output and limit value relay	3C3A-00-11.20
- Compare, 230 VAC with interface RS 232	3C2A-00-20.00
- Compare, 230 VAC with interface RS 485	3C2A-00-10.00
- Compare, 230 VAC with interface RS 232, analogue output and limit value relay	3C2A-00-21.20
- Compare, 230 VAC with interface RS 485, analogue output and limit value relay	3C2A-00-11.20
Compare - digital, for frequency signals - one-channel	
- Compare, 24 VDC with interface RS 232	3C3D-00-20.00
- Compare, 24 VDC with interface RS 485	3C3D-00-10.00
- Compare, 24 VDC with interface RS 232, analogue output and limit value relay	3C3D-00-21.20
- Compare, 24 VDC with interface RS 485, analogue output and limit value relay	3C3D-00-11.20
- Compare, 230 VAC with interface RS 232	3C2D-00-20.00
- Compare, 230 VAC with interface RS 485	3C2D-00-10.00
- Compare, 230 VAC with interface RS 232, analogue output and limit value relay	3C2D-00-21.20
- Compare, 230 VAC with interface RS 485, analogue output and limit value relay	3C2D-00-11.20
Compare - analogue, for signals 0 to 20 mA / 4 to 20 mA - two-channel	
- Compare, 24 VDC with interface RS 232	3C3B-00-20.00
- Compare, 24 VDC with interface RS 485	3C3B-00-10.00
Compare - digital, for frequency signals - two-channel	
- Compare, 24 VDC with interface RS 232	3C3E-00-20.00
- Compare, 24 VDC with interface RS 485	3C3E-00-10.00

Software only for panel mounted instruments series Compare	Part-number
- Data transmission cable (single connection of a Compare instrument to PC-interface RS 232, 9-pole D-Sub-socket, one free cable end, length: 2,0 m)	8824-C4-02.00
- RS 232-adaptor (9-pole D-Sub-plug to 25-pole D-Sub-socket)	8808-38-01.01
- Cable for RS 485 (2-pole connection cable with screening, two free cable ends)	8824-C6-02.00
- Interface converter SSK 100 - RS 485 to RS 232 (for connection of max. 31 instruments of series Compare to the serial PC-interface RS 232 via 25-pole D-Sub-socket)	3160-01-22.02
- Software support for series Compare for display and evaluation of measuring values on PC-XT/AT/PS/2	
- HYDR0comsys/DOS-software package from DOS 4.0 on included in the delivery range	Diskette 3 1/2" German Diskette 3 1/2" English
	8874-01-01.02 8874-01-01.05
- HYDR0comsysWin (Windows-version) included in the delivery range	Diskette 3 1/2" German Diskette 3 1/2" English
	8874-01-01.21 8874-01-01.23
- Software Compare for pressure and volume flow rate for linearisation of pressure- and volume flow rate sensors	Diskette 3 1/2" German
	8874-06-01.02