HYDROTECHNIK
Limburg
Messen mit System

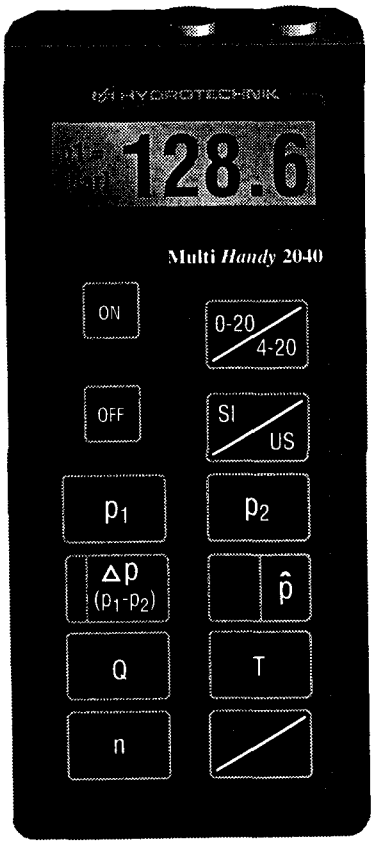
User Manual

for

Multi-Handy 2040

3160-00-25.00

Version 1.0



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

 L 3160-00-25.00, Edition 07/98

Preface

The user manual in hand is a description of the hand held measuring instrument Multi-Handy 2040 with the following measuring inputs:

2 measuring inputs for sensors with standardised, analogue output signals of 0 to 20 mA or 4 to 20 mA. The measuring channel p1 is prepared for the measurement of pressure only. In the second measuring channel p2 temperature, volume flow rate and RPM can be measured additionally, besides pressure.

You will surely have no problems in handling the Multi-Handy 2040, 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 a lot of success for the application of our hand held measuring instrument

Multi-Handy 2040

Programmversion 1.0

Index

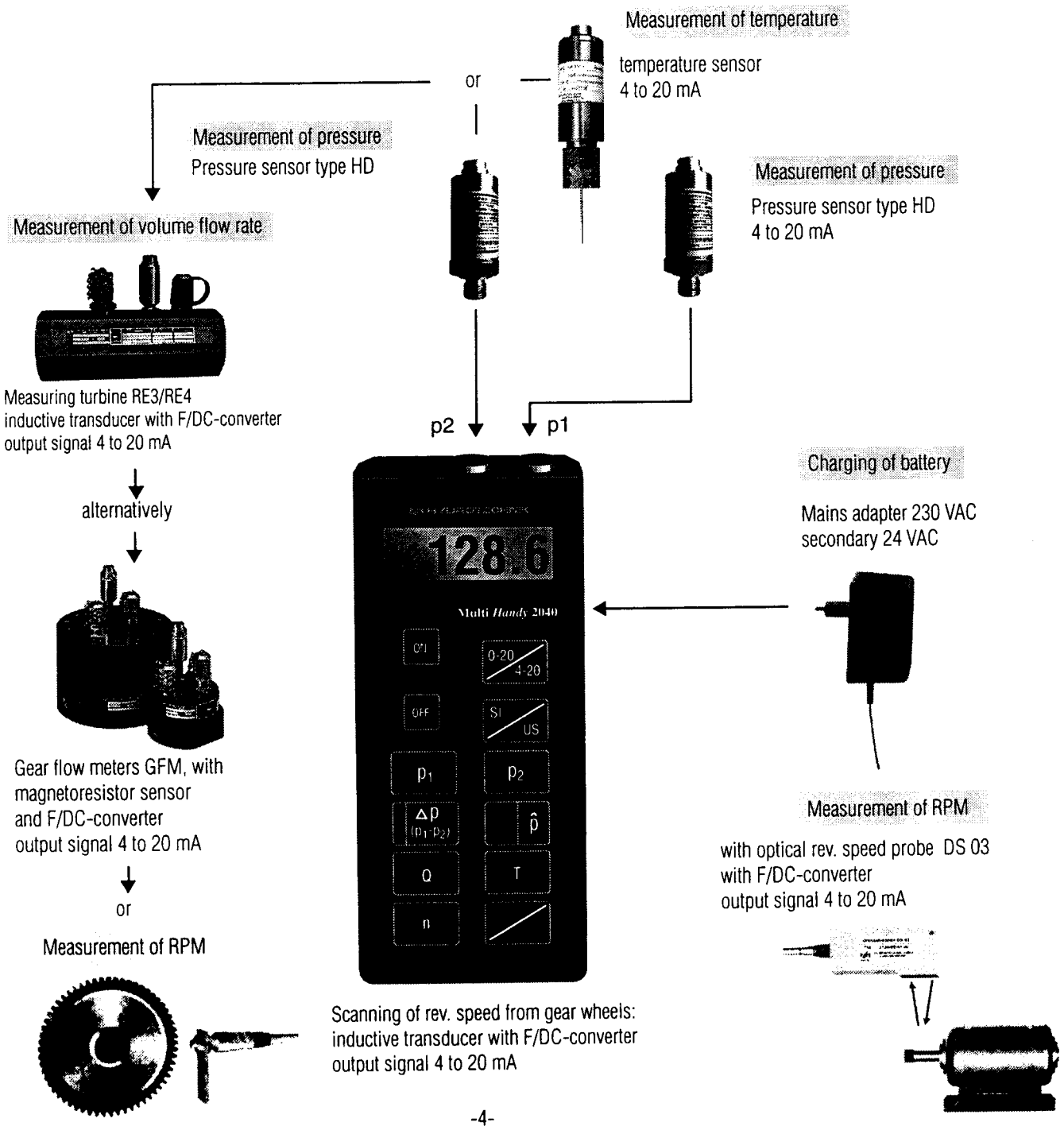
General

The measuring instrument Multi-Handy 2040 of company HYDROTECHNIK GmbH, Limburg is an efficient hand held measuring instrument for the measurement of pressure, pressure peaks, pressure differential, volume flow rate, rev. speed and temperature.
The Multi-Handy 2040 doesn't depend on a fixed power supply due to its rechargeable batteries. For the recharge of the batteries an external plug-in power supply unit is provided.

The instrument disposes of 2 measuring inputs for the connection of sensors with a standardised, analogue output signal of 0 to 20 mA or 4 to 20 mA.
A direct measurement of frequency can't be realised with this instrument.
However, with corresponding frequency/current converters (F/DC-converters), it is possible to convert the frequency signals into standardised 4 to 20 mA signals, which can be evaluated by the measuring instrument.
In doing so it is possible to measure RPM and volume flow rate.

It is also possible to connect sensors that were not produced by HYDROTECHNIK.
In doing so, you only have to pay attention to the above-mentioned output signals of the sensors and to a supply voltage among 14,4 and 30 VDC.

Connection possibilities for the Multi-Handy 2040 with HYDROTECHNIK-sensors



Instructions for the correct charging of the internal instrument batteries

Before using the measuring instrument you should ensure, that the internal NiCd-batteries have their full capacity.
By use of the HYDROTECHNIK plug-in power supply unit (primary 230 VAC, secondary 24 VDC) a continuous charging of the batteries is guaranteed.

When using the instrument the first time, you should take into consideration, that the batteries aren't charged completely by HYDROTECHNIK. Therefore we recommend you to connect the plug-in power supply unit for charging the batteries for at least 14 to 16 hours. This time should be kept in any case.

If a power supply unit from another manufacturer or a car battery of 12V is used, the instrument can be used for measuring, but the recharging of the batteries can't be guaranteed.
For a safe recharging of the batteries you always need a stabilised power source with a direct voltage from 24V to max. 30V.
Should the batteries be discharged, a charging time of 16 hours needs to be kept.
During this, the instrument should be switched-off !

The service life of NiCd-cells can be very long, but this always depends on the operating conditions. You should avoid a 100% discharging as well as a permanent charging or a charging after each operation.
If the batteries are recharged after a discharging below 50% only, the service life of the NiCd-cells will be influenced positively.
A recharging after a very short operation of the instrument will affect the batteries, as the well-known memory effect of the NiCd-cells will reduce their capacity.

That means, if you use the instrument only for a short period and if only a part of the batteries' capacity is used up, you shouldn't charge them directly afterwards.

If you do so for a longer time, the capacity of the cells will be reduced and the batteries may be damaged permanently.
However, they can be regenerated again by several charging- and discharging cycles, that means by using the measuring instrument for a longer period and a following recharging.

If the charging of the batteries isn't sufficient, a message „Charge battery !" will be displayed. In this case the batteries are discharged in a way, that you will have to recharge them for at least 16 hours !

Please take the following,

Important comments

concerning your security and the operational security of your instrument, into consideration:

- Don't submit the instrument to extreme heat or humidity.
- Never open the instrument by yourself.
- Please pull the mains adapter out of the wall socket under the following circumstances:

  1. during a thunderstorm
  2. if you detect a bad smell or smoke

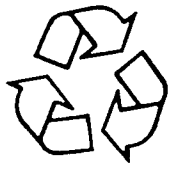
- Please protect your sensors from overloads:

  1. exceeding the allowed voltage supply range
  2. overloading the allowed pressure measuring range mechanically
  3. wrong pin configuration, especially at sensors from other manufacturers

For your special attention:

Should the housing be polluted, please clean it with a soft cloth, moistened with a mild detergent (Please pay attention to the notes of the manufacturer).
Strong chemical solvents may not be used, as they attack the housing.

Make a contribution to the environmental protection



Recycling for environment's sake !

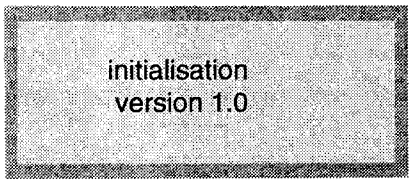
Used batteries do not belong into the household refuse.
Please throw your batteries into a special receptacle for disposal of refuse and sewage.

1. Operation Multi-Handy 2040

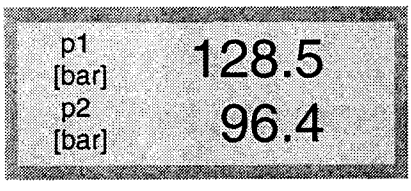
Two measurable variables can be shown at the same time on the 2-line LCD-display.
The first line is reserved for the pressure channel p1. In the second line either pressure p2, temperature T, volume flow rate Q or rev. speed n can be shown. On the keyboard you will find several keys, which can only be pressed in connection with another key.
These are the keys [Prog/ENT] and [→ | p̂] .
In doing so you have to take into consideration that the period between pressing the first and the second key must not be longer than three seconds. After three seconds the key pressed first will be ignored. All inputs need to be finished with „Prog/ENT".

1.1 Display examples

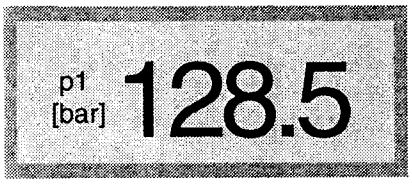
Depending on the number and the type of variables, the values are displayed in different sizes.
In the following you will find several examples about the display-possibilities of your instrument.



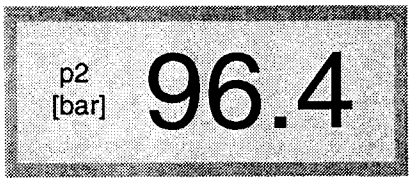
After having switched on the instrument, this menu will appear for approx. three seconds.



When the instrument is switched on again, the display for pressure p1 and p2 will always appear.

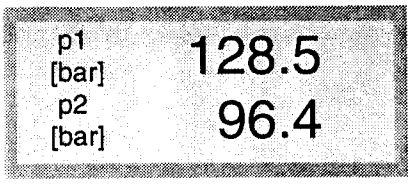


By pressing for example key [p1] the measuring value display can be switched to an enlarged display. However, only the pressure measuring value of p1 is shown, see left.

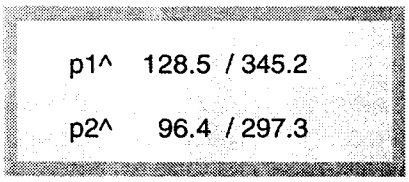


If the measuring value of p2 shall be shown in the same size, the user only has to press key [p2] .

The pressure measuring value of p2 is shown.

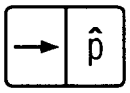


Another stroke of key [p2] returns to the usual display with two lines, indicating the measuring values of p1 and p2, see picture on the left.

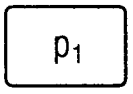


Display of extreme values (min/max.) of for example p1 min. and p1 max. in the first line and p2 min. and p2 max. in the second line.

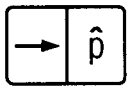
You can have the extreme values displayed by pressing the keys



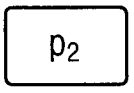
and



and in the second line by pressing the keys



and



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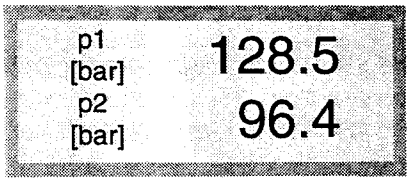
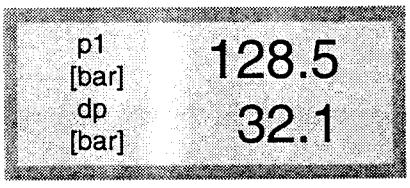
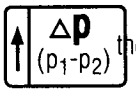


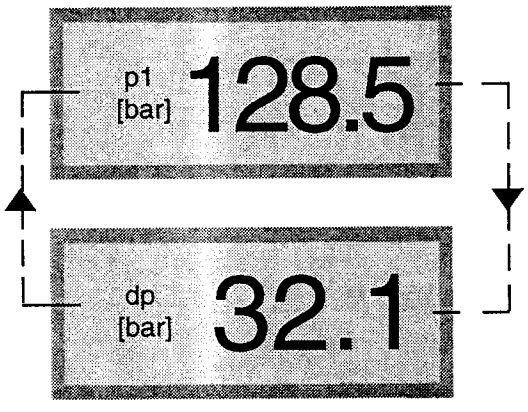
The normal pressure display is shown by pressing the keys P1 and P2. Display of the two pressure measuring values p1 and p2.



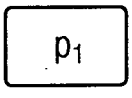
The next display shows a pressure differential out of these values.

After a stroke of key 

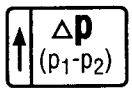
the measuring value from Dp = p1 - p2 is displayed in the second line.



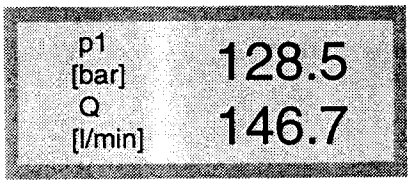
As already described on page 7, an enlargement of the display can be achieved by pressing key



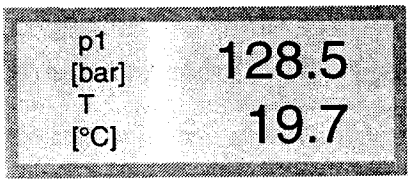
and key



The two pictures show the display (enlarged) of „p1" and „dp", as an example.



Measurement of volume flow rate Q instead of p2 in the second line of the display.



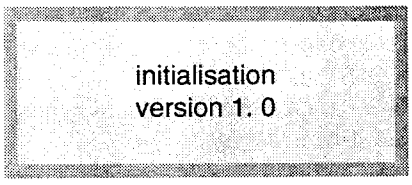
Temperature measurement T instead of p2 in the second line of the display.

These two displays can be enlarged, too.

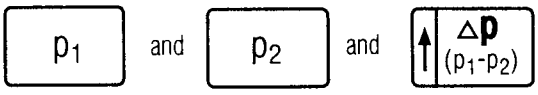
We have refused to give further examples to avoid confusion.

1.2 Initialisation

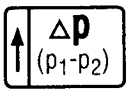
It can happen, that the information in digital storage systems is distorted, due to very heavy electromagnetic interference, which still can occur today in industrial plants.
This shows itself in an amount of data that must be considered unrealistic or the instrument doesn't react on a keystroke any more.
For this case the instrument has the possibility to set all data back to a given state by a so-called re-initialisation. However then, all data like calibration value, language, units of measurement, output signal of the pressure- and temperature sensors and all parameters, entered previously by the user, are deleted.



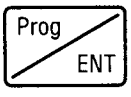
The re-initialisation is started by switching the measuring instrument on and by pressing the following keys within 3 seconds:



Afterwards the user can select one of the three fixed languages, German, English or French.

By pressing key 

, which is now acting as a cursor, one language can be chosen directly in the display.

The selection needs to be confirmed with key 

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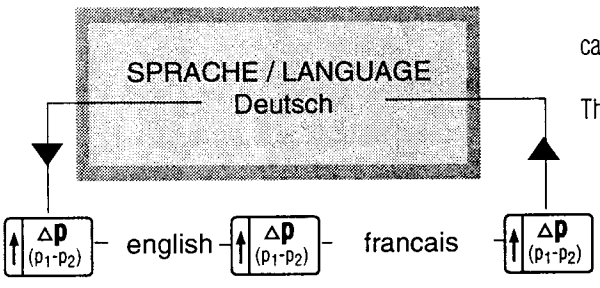
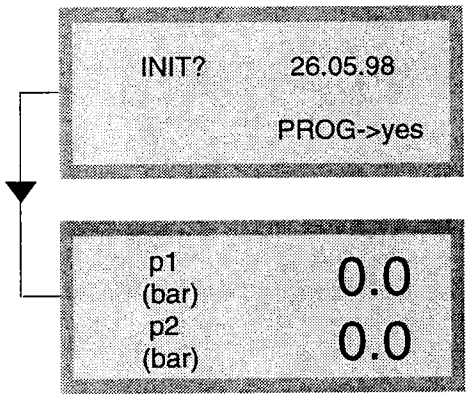
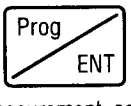


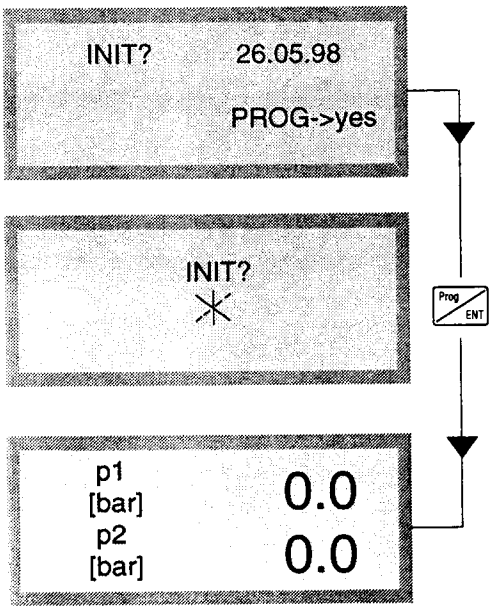


The instrument automatically asks for the initialisation. The user can decide whether he wants to initialise or not.

If no initialisation is requested any key except „Prog/Ent" may be pressed and the measuring value display is shown.

If an initialisation is requested and key 

is pressed, all data like calibration value, language, units of measurement, selection of the output signal of the pressure sensors, entered previously by the user, is deleted or reset to a work's adjustment.



The display „INIT" is shown for a short period with a rotating bar. This indicates, that the preadjustments are stored in the EEPROM.
Afterwards the instrument returns directly into the measuring value display.

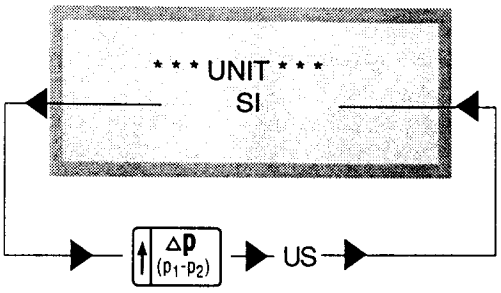
After an initialisation, the following basic adjustments are given automatically:

- Pressure measurement p1 and p2 in the display
- Pressure measuring range programmed to 0 to 200 bar
- Signal inputs of p1, p2 and T (temperature) adjusted to 0 to 20 mA
- All calibration values of Q (volume flow rate) set to zero
- Pulses per revolution of rev. speed measurement set to zero
- Language: German
- Measuring units in SI

2. Programming

2.1 Selection of unit of measurement

By pressing key [Prog/ENT] and key [SI/US] this menu is invoked.



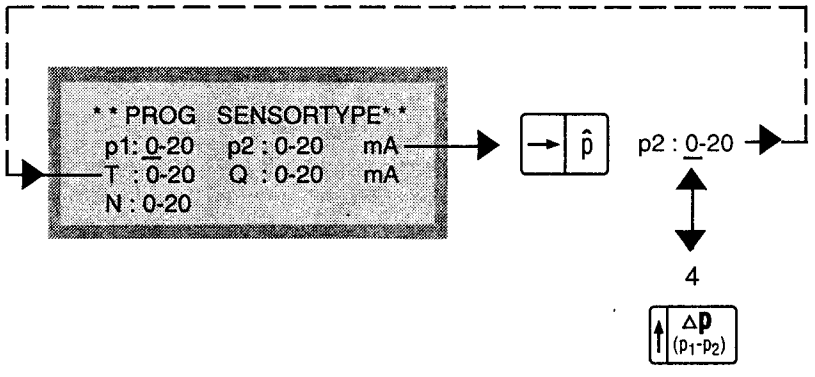
With a stroke of key [Δp (p1-p2)], which serves now as a cursor, you can switch over from SI- to US-units.

The SI-units are for example bar, °C, l/min., etc..
After the change-over to US-units, the usual units like psi, °F, gal/min. are used.
The calibration and the selection of the measuring range are always carried out in the corresponding SI-unit.

2.2 Selection of pressure sensor for signal 0 to 20 mA or 4 to 20 mA

As it is possible to connect pressure sensors with an output signal of either 0 to 20 mA or 4 to 20 mA, it is imperative to inform your measuring instrument about the signal-type of your sensor.

By pressing key [Prog/ENT] and key [0-20/4-20], the following program is invoked.



The change-over to 4 to 20 mA is made by a stroke of key [Δp (p1-p2)], which is now acting as a cursor and which switches p1 to the requested current signal. Please take into consideration, that a flashing bar signalises the switching from 0 to 4 (mA) in the example.

A stroke of key [→ p̂], which is also used as a cursor in this case, switches directly to p2.

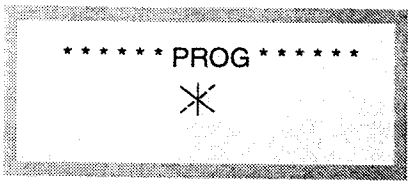
Here the current signal can be switched to 4 to 20 mA with key [Δp (p1-p2)], too, as already mentioned above.

The switching back to 0 to 20 mA is made in the same way.

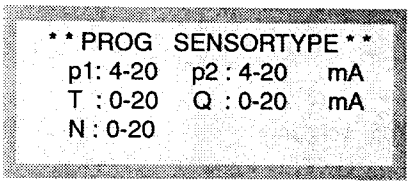
Please don't forget to press key „Prog/ENT" to confirm your selection. The above diagram shows the course of the operation in detail.

In the example both sensors were switched to 4 to 20 mA, of course the adjustments of every single channel can differ.
With the cursor key, showing to the right, the corresponding measuring channel will be selected. With the cursor key, showing upwards, the current range 0 to 20 mA or 4 to 20 mA can be selected.

The selection must be confirmed with key [Prog/ENT].



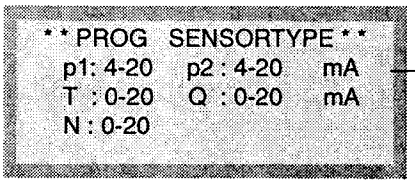
After key [Prog / ENT] was pressed a rotating bar will be shown for approx. 3 sec. and the selected signal will be stored in the instrument. After this, the measuring value display will be shown automatically.



Example of a display after having switched the pressure channel p1 and p2 to 4 to 20 mA.

2.3 Checking of current signal adjustment

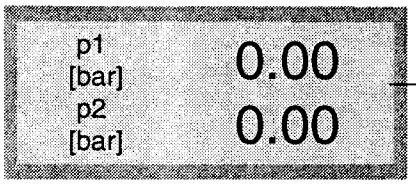
You have the possibility to check which current signals were chosen, when invoking this display with key [0-20 / 4-20] . In the example the same current signals were chosen for p1 and p2.



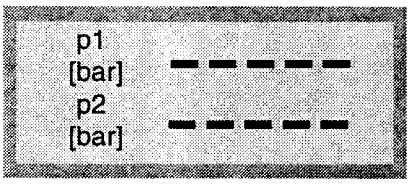
Measuring value display

3 s

After approx. 3 seconds, the display switches automatically into the measuring value display.



2.4 Error message at 4 to 20 mA sensors

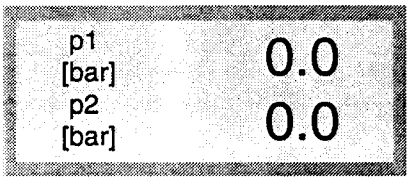


A display of this message can be caused by the fact, that no current signal is lead to the measuring input. This can, for example, be a missing connection to the pressure sensors (measuring cable between sensor and measuring input is missing), a parting of a cable or a defective sensor.
An optical status display (life-zero recognition) is used to inform the user directly about possible errors, as i.e. the above-mentioned one.

Please take into consideration, that different adjustments of the current signals can be made for pressure- and temperature sensors (p1, p2 and T).

For example: p2 = 4 to 20 mA
T = 0 to 20 mA

2.5 Measuring value display at 4 to 20 mA sensors

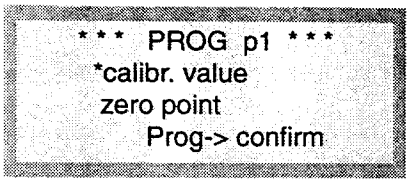


If the pressure sensor works correctly, the measuring value display will be shown in the usual way without horizontal lines (see picture on the left side).
These visual signals are only possible for current signals of 4 to 20 mA.

3. Measurement of pressure

3.1 Selection of pressure measuring ranges

To be able to measure pressure, you have to select the measuring range of the pressure sensor with the keys Prog/ENT and p_1.



The following display is shown.

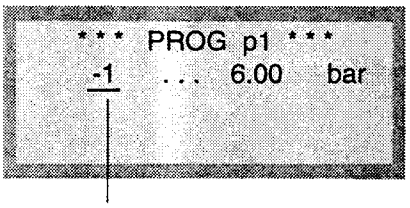
With key $\uparrow \Delta p\ (p_1\text{-}p_2)$, which acts as a cursor now, you can select among calibration value and zero point alignment. In the example the calibration value is selected. Please pay attention to the star symbol (*) which marks the selected possibility.

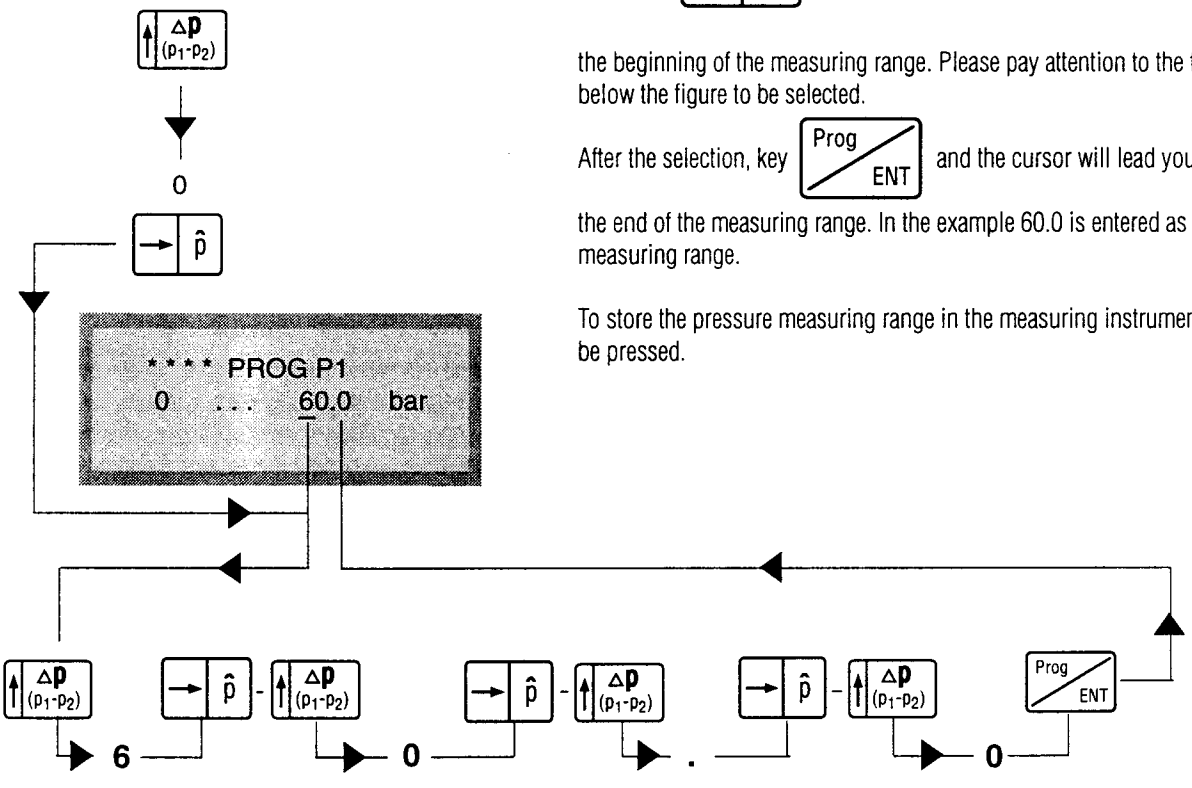
By pressing key $\uparrow \Delta p\ (p_1\text{-}p_2)$ the menu is selected and the following display is shown.

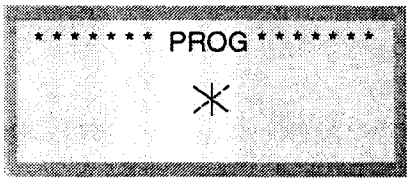
With key $\rightarrow \hat{p}$ which is acting as a cursor, -1 or 0 can be entered as the beginning of the measuring range. Please pay attention to the flashing cursor below the figure to be selected.

After the selection, key Prog/ENT and the cursor will lead you to the input of the end of the measuring range. In the example 60.0 is entered as the end of the measuring range.

To store the pressure measuring range in the measuring instrument key o must be pressed.



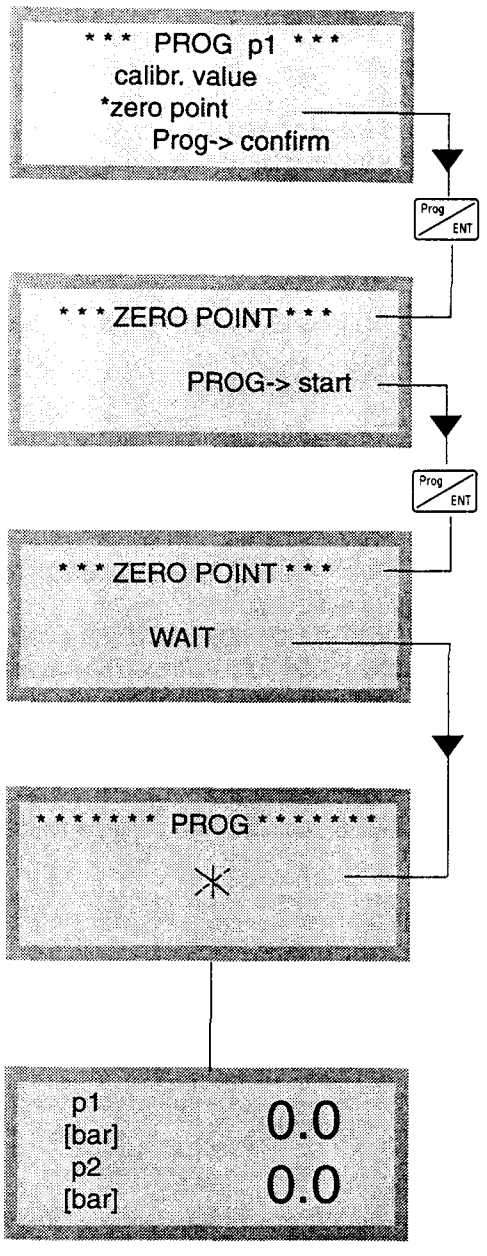




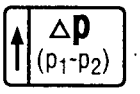
During the storage a rotating bar is display for approx. 2 sec. and afterwards the measuring value display is shown again.

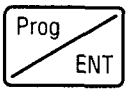
The pressure measuring range for p2 is adjusted in the same way !

3.2 Zero point alignment



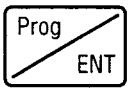
When measuring negative pressures and precise pressure differentials and if the connected pressure sensor has a small zero point deviation, it is advantageous to submit it to a zero point alignment.

Starting from menu „PROG P1" you select the programme „Zero point alignment" by pressing key 

. Please pay attention to the start symbol *and that your selection needs to be confirmed with key 

.

For the alignment the pressure p1 must be removed from the plant what means, that the zero point alignment must always be carried out on a depressurized sensor.

If the sensor has no pressurisation its zero point can be aligned with a stroke of key 

. The display shows „WAIT".

The zero point deviation of the pressure sensor is determined and stored as a correction value while a rotating bar is displayed.

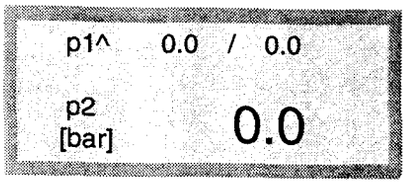
After the zero point correction the measuring value display is shown automatically.
If pressure measurements are carried out now, an existing zero point deviation is taken into consideration by the internal software as a correction value for all measurements.

If you want to carry out a zero point correction for another pressure sensor, e.g. p2, you should act as described above. You only have to press keys „Prog" and „p2" instead of „Prog" and „p1".

3.3 Measurement of pressure peaks

3.4 Invocation of min/max. values in the display

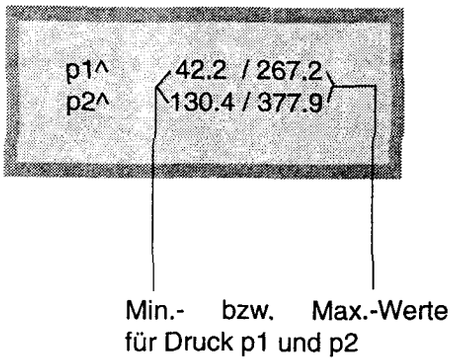
The extreme values (min/max. values) of pressure p1 and p2 are continuously stored in a memory in the background and can be shown in the display, if the user requests it.



This can be achieved by a stroke of the keys [p_1] and [→ | $\hat{p}$]. The display shown on the left side appears.

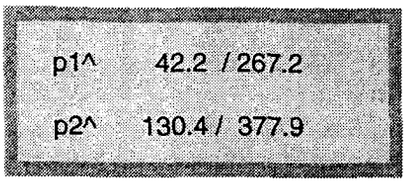
To switch the lower line to pressure peaks, too, the keys [→ | $\hat{p}$] and [p_2] must be pressed.

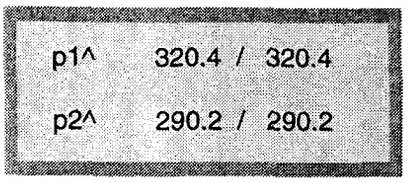
In both lines the min. and max. values are displayed.



The extreme values (min/max.) can only be shown for the pressure of p1 and p2.
Please take into consideration, that a measurement of pressure peaks is only possible up to the pressure measuring range end value of the pressure sensor, chosen by you, with an additional tolerance of max. 10%. The pressure measuring range end value 600 bar for example, plus additionally 10%, results in a maximum pressure peak value acquisition of 660 bar.
Higher pressure peaks will be limited to 660 bar.

3.5 Deletion of pressure peak





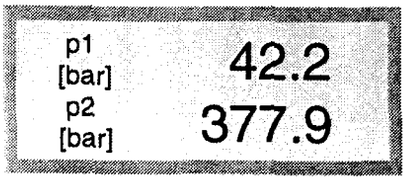
By pressing the keys [Prog / ENT] and [→ | $\hat{p}$], you can

delete both extreme value memories of p1 and p2. The note, that both min/max. memories are deleted, is shown briefly in the display.

If the pressure sensors have certain operational pressures, the extreme value memories will be set back to these pressure levels.

As an example the next picture shows a deletion and a setting back to the current operational pressures, which can occur in a hydraulic plant.

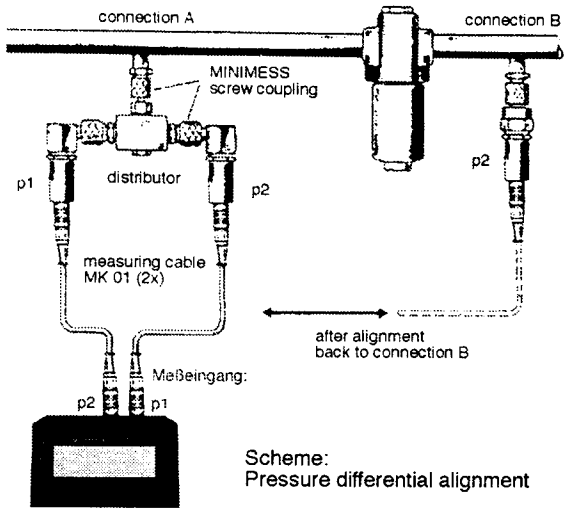
3.6 Change-over from measurement of pressure peaks to normal pressure measurement



With a stroke of key [p_1] and key [p_2], you can

switch the instrument back to normal pressure measurement. The example shows the switching over to pressure p1 and p2 (both keys have to be pressed one after the other), carried out.

3.7 Measurement of pressure differential

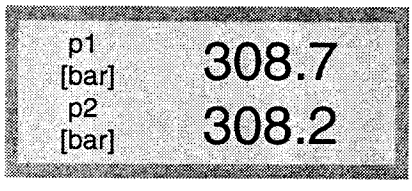


Scheme:
Pressure differential alignment

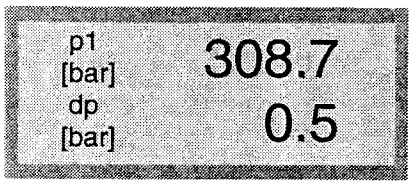
Precise pressure differential measurements are only possible, if an alignment of both pressure sensors was executed first at the same operational pressure level, at which the measurement shall be carried out later.

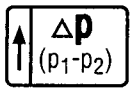
To carry out a pressure differential alignment, you have to mechanically connect both pressure sensors p1 and p2 to the same pressure level via a distributor (see scheme „Pressure differential alignment").

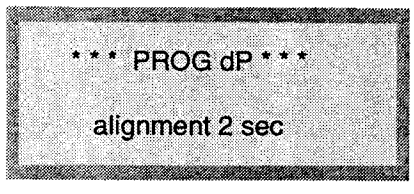
You can also use pressure sensors with different pressure measuring ranges, but in this case you should always pay attention to their pressure load on the sensor to avoid a damage of the sensor.

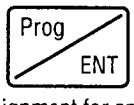
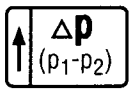


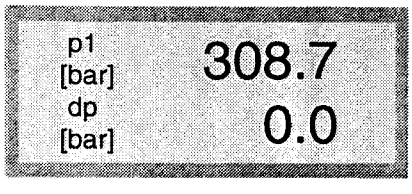
In the example an operational pressure of 308 bar is shown in the display.



The change-over with key  shows a pressure differential of 0,5 bar.



With a stroke of the keys  and  you can carry out an automatic alignment for approx. 2 seconds, what is shown in the display.



The deviations of both pressure sensors are set to zero at the corresponding operational pressure level, see display (pressure differential of both pressure sensors = zero).

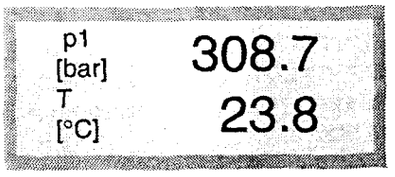
After the alignment you have to mechanically connect the pressure sensor p2 to the connection B (see scheme „Pressure differential alignment").

Now you can carry out precise measurements of pressure differential without being influenced by sensor deviations, temperature drifts and offsets.

Please take into account, that a pressure differential is always displayed with the correct sign, corresponding to the mathematical formula.

(Dp = p1 - p2)

4. Measurement of temperature



Example of a single display by a stroke on key "T"

Instead of pressure p2 a Pt 100 temperature sensor with a current output signal of 0 to 20 or 4 to 20 mA can be connected to this measuring input.
You only have to press key [T] and a temperature of

-50°C to +200 °C can be measured.
The temperature measurement is shown in the lower line of the display.

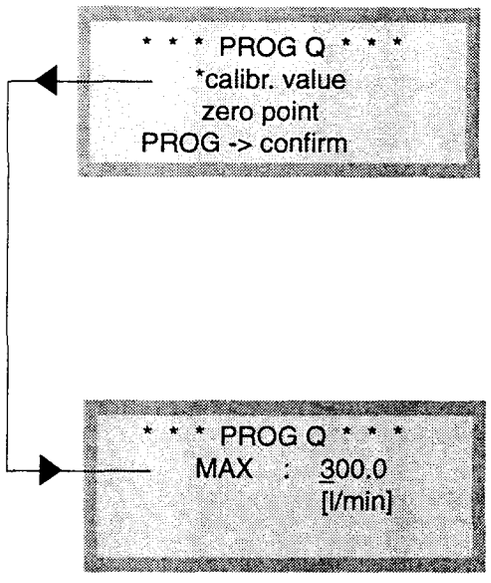
The way to switch over the current signal from 0 to 20 mA to 4 to 20 mA and vice versa, is already described on page 10, chapter 2.2.

Please take into account, that the temperature measuring range is fixed (calibration: -50 °C to +200 °C).

5. Measurement of volume flow rate

5.1 Input of calibration value

A condition for the measurement of volume flow rate with the Multi-Handy 2040 is the connection of a measuring turbine or a gear flow meter with integrated F/DC-converter.
That means, the frequency signals measured by the volume flow rate sensor must be converted into current signals from 4 to 20 mA.



When connecting a volume flow rate sensor (turbine or gear flow meter) to the instrument, the max. volume flow rate needs to be entered as a calibration value.

The programme for entering this calibration value is invoked with the keys Prog/ENT and Q.

Key Δp (p_1-p_2) serves for the switching between the input of the calibration value and the zero point alignment.

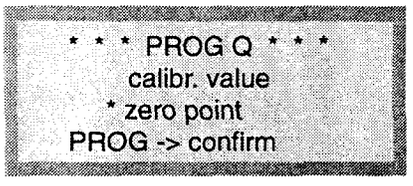
Please take into consideration, that the star * marks the selected line, in this example the line „calibration value".

With key Prog/ENT the selection needs to be confirmed and the max. volume flow rate (measuring range end value) must be entered immediately.

The max. volume flow rate can be seen on the label of the volume flow rate sensor, in the example the max. volume flow rate is 300.0 l/min.

The input is made as already described on page 12, paragraph 3.1, however for volume flow rate sensors you have to programme the end of the measuring range, only.

5.2 Zero point alignment



Starting from menu „Prog Q" the key Δp (p_1-p_2) serves for the switching between the input of the calibration value and the zero point alignment.

In the example the zero point alignment is selected (* !) and confirmed with key Prog/ENT.

Please carry out the zero point alignment as described on page 13, paragraph 3.2.

6. Measurement of rev. speed

6.1 Input of calibration value

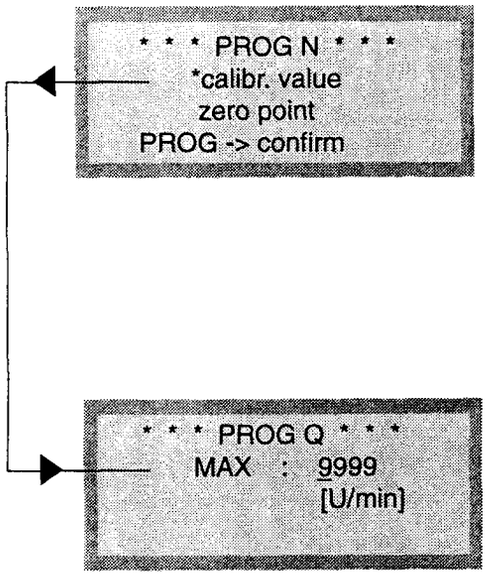
A condition for the measurement of RPM with the Multi-Handy 2040 is the connection of a rev. speed sensor with integrated F/DC-converter.
That means, the frequency signals measured by the rev. speed sensor must be converted into current signals from 4 to 20 mA.

When connecting an optical rev. speed sensor with F/DC-converter to the instrument, the calibration value needs to be entered as follows:

- when using one reflective foil, the calibration value 9999 needs to be entered
- when using more than one reflective foil, the calibration value can be calculated as follows:
10.000 : Number of reflective foils = calibration value

When connecting an inductive rev. speed sensor with F/DC-converter, e.g. acquisition of the RPM at a gear ring, the calibration value is calculated as follows:

10.000 : Number of pulses per rotation (number of teeth) = calibration value



The programme for the input of the calibration for the rev. speed sensor is invoked with the keys [n] and [Prog / ENT].

The following display is shown.

Key [Δp (p1-p2)] serves for the switching between calibration value and zero point alignment.

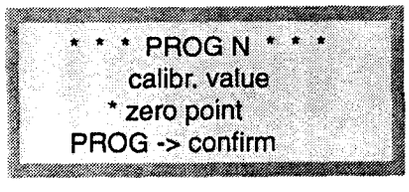
Please take into consideration, that the star * marks the selected line, in this example the line „calibration value".

With key [Prog / ENT] the selection needs to be confirmed and the max. rev. speed (measuring range end value) must be entered immediately.

The max. rev. speed can be seen on the label of the rev. speed sensor, in the example the max. rev. speed is: 9999 U/min. (referring to one reflective foil).

The input is made as already described on page 12, paragraph 3.1, however for rev. speed sensors you have to programme the end of the measuring range, only.

6.2 Zero point alignment



Starting from menu „Prog N" the key [Δp (p1-p2)] serves for the switching between the input of the calibration value and the zero point alignment.

In the example the zero point alignment is selected (* !) and confirmed with key [Prog / ENT].

Please carry out the zero point alignment as described on page 13, paragraph 3.2.

6.3 Further technical advice for the measurement of rev. speed

The rev. speed probe DS 03 with F/DC-converter, used by HYDROTECHNIK, is working as a reflective light barrier, that means, the light-sender as well as the receiver is in one housing.
To measure rev. speed the user only has to stick-on a reflective foil on the turning object to be measured.
Pollution, borings or keyways are suppressed effectively by the measuring principle (polarisation filter), only the light reflection of the foil is evaluated as a turning pulse.

At very large diameters of shafts or fans it can happen, that instable or interrupted rev. speeds are displayed. If this is the case, the number of reflective foils should be increased, that means several foils need to be stuck on the object to be measured, one besides the other.
This will improve the optical scanning and a correct measurement of rev. speed is achieved.

If you request rev. speed measurements below 60 min^{-1}, you can realise this by sticking-on several reflective foils. In any case you should modify the input of the pulses per rotation (see above) and take the instructions for the input of calibration values on page 18, paragraph 6.1, into consideration.
Rev. speed measuring range relating to one reflective marking: 60 min^{-1} to 30.000 min^{-1}.

If you request measurements of rev. speed on gear wheels, an inductive transducer with integrated amplifier and F/DC-converter needs to be used.
Here, the number of teeth of the gear wheel needs to be entered into the measuring instrument as pulses per revolution, too (see paragraph 6.1 on page 18).
The ideal distance for sticking on the reflective markings depends on the form of the teeth. Usually the distance between the inductive transducer and the tooth is 1 to 2 mm.

For these very small measuring distances the sensor needs to be fixed **very safe and stable**.

7. Technical data of Multi-Handy 2040

(Reference of the specified data 20 °C ±3 K)

Measuring inputs:	2 x 5-pole input jacks (Amphenol-Tuchel) Measuring input p1: for pressure only Measuring input p2: for pressure, can be switched to measurement of temperature or volume flow rate and rev. speed via F/DC-converter.Both measuring inputs support standardised current signals of 0 to 20mA and can be switched over to 4 to 20 mA by internal software.
Measuring ranges:	Pressure: can be freely adjusted to the corresponding pressure measuring range end value Temperature: - 50°C to +200 °C Volume flow rate: measuring range end value of the volume flow rate corresponds to an output current signal of 0 to 20 mA or 4 to 20 mA on the F/DC-converter Rev. speed: 9999 min^{-1}
Error limit:	Analogue inputs: ±0,5% of full scale ±1 digit Frequency input: ±1 digit
Temperature coefficient:	±0,2% / 10 K
Measuring rate:	Analogue inputs: pressure 1 ms Digital inputs (pulses): between 1 Hz and 60 Hz a single measurement of the period duration is carried out. From 60 Hz on the measuring time is constant = 16 ms.
Resolution A/D-converter:	10 Bit
Extreme value memory:	Extreme value storage (min/max.) of p1 and p2 in the background, display by a keystroke
Display:	Graphic display, display of the measuring ranges: max. 5 digits (depending on measuring range and channel)
Power supply:	Internal 14,4 V NiCd-battery, 0,7 Ah for approx. 6 to 8 hours continuous operation with integrated NiCd-battery charger and battery warning device. External voltage supply via power supply unit 230 VAC or 115 VAC, secondary 24 VDC or via external voltage supply unit (stabilised 24 V - 30 VDC) recommended power supply: 200 mA.
Sensor supply voltage:	supply from the instrument, for battery operation 14,4 V, for plug-in power supply 24 V
Ambience conditions:	Working temperature: 0 °C to + 50°C Relative humidity: <80%, no condensation
Generally:	Material of housing: Aluminium/ABS-plastic Dimensions: 152 x 80 x 40 mm (L x W x H) Weight: 0,695 kg
	Modifications, necessary for the technical progress, are subject to change without notice.

CE

Our measuring systems are manufactured according to the European Production Standards and fulfil the EC-directives concerning the electromagnetic compatibility (EMC) according to EN 50081 and EN 50082.

8. Pin connections of Multi-Handy 2040

Measuring inputs

electrical connection scheme

coupler socket 5-poles
Amphenol-Tuchel T33 63 009

socket for external voltage supply:
24 V to 30 VDC

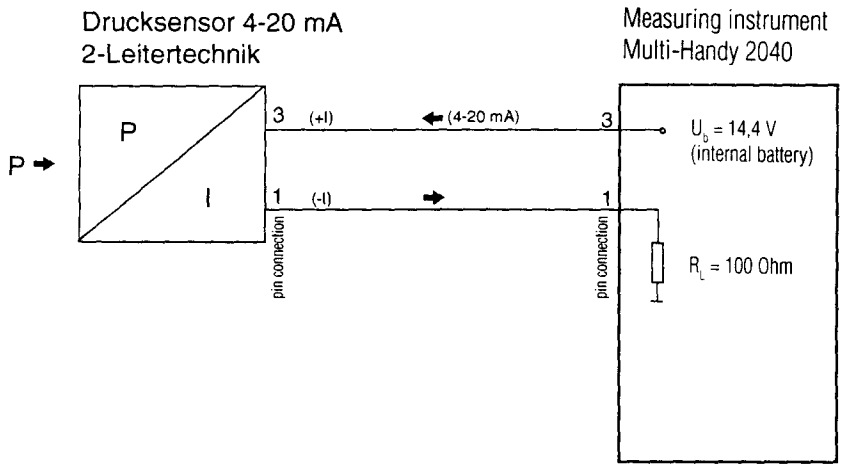
small voltage socket 2-poles
according to DIN 45323

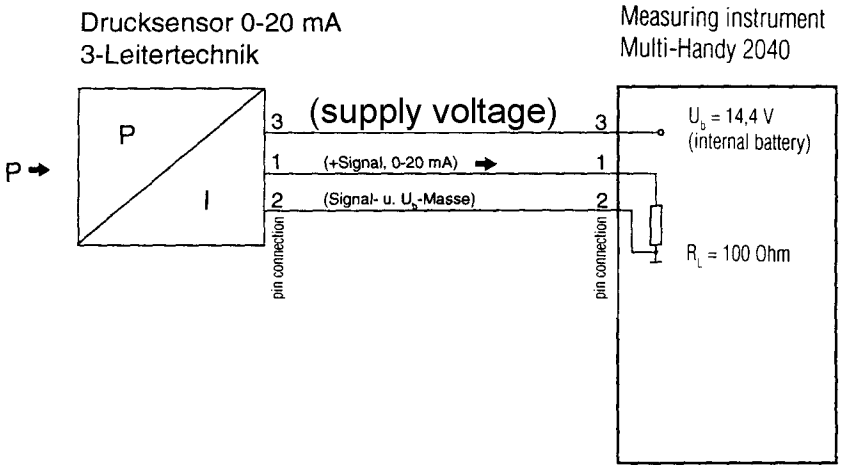
Measuring input

pin connection		p1		p2	
		Analogue signal input		Analogue signal input	
		0 - 20 mA 3-wire	4 - 20 mA 2-wire	0 - 20 mA 3-wire	4 - 20 mA 2-wire
1		Signal + (R_L 100 Ohm)	Signal - (I-) (R_L 100 Ohm)	Signal + (R_L 100 Ohm)	Signal - (I-) (R_L 100 Ohm)
2		Mass f. signal- and U_{b-}		masse f. -signal and U_{b-}	
3		int. battery voltage *14,4 VDC I_{out} max. 50 mA	Signal + (I+) *14,4 VDC I_{out} max. 50 mA	int. battery voltage *14,4 VDC I_{out} max. 50 mA	Signal + (I+) *14,4 VDC I_{out} max. 50 mA
4		no connection N/C	no connection N/C	no connection N/C	no connection N/C
5		cable screen	cable screen	cable screen	cable screen

***) Attention when connecting sensors from other manufacturers !!!**
When connecting an external voltage supply, e.g. via net adapter of HYDROTECHNIK, the supply voltage for the sensors is the same as the net adapter voltage of 24 VDC (- approx. 1,5V). Should you choose a free, external supply voltage for the instrument, the voltage supply for the sensors can be between 24 V and 30 VDC (- approx. 1,5V).

ıd information for connection of pressure sensors,
20 mA-type





when using sensors from other manufacturers !

into account, that, when you connect an external power supply to the Multi-Handy 2040, the supply
the pressure sensors may vary among 14,4 and 30 V.
ıre, that the sensors to be connected are designed for this supply voltage, otherwise they could be

9. Error detection

The Multi-Handy 2040 has been tested and adjusted at the manufacturer according to the most stringent quality standard.
Should you have any problems nevertheless, please check the instrument, according to the following list, first.

Disturbance / wrong operation	Checks / remedy
After the switching-on of the instru-ment the display shows nothing.	• The battery is empty, please recharge the internal batteries of the instrument with net adapter 230 VAC/secondary 24 VDC for approx. 14 to 16 hours.
The measuring value display shows only horizontal lines.	• At 4 to 20 mA sensors it can happen, that the sensor itself, or the measuring cable is not connected or defective. Please check if the sensor or the cable is the reason for the error. Exchange both parts one after the other.
Wrong measurement of pressure or temperature (unlikely measuring values).	• The current signal of the sensor isn't adjusted correctly to 0 to 20 mA or to 4 to 20 mA. Readjust it if necessary. • With key [0-20 / 4-20] you can see in the display, which current signal has been chosen.
Temperature display shows -50 °C (room temperature, current signal is adjusted to 0 to 20 mA).	• The measuring cable is not connected with the sensor and the measuring instrument.
Wrong measurement of pressure differential (Dp measuring value is improbable).	• The pressure differential alignment is wrong, please execute the alignment according to the description on page 13, chapter 3.6.
Wrong pressure peak values.	• Old min/max. values are still stored in the memory. Before measuring pressure peaks, you always have to delete the content of the memory, see page 13, chapter 3.4.
The display shows "Over".	• The input measuring range has been exceeded. There is either a short circuit in the sensor or the cable or the pressure measuring cell was mechanically overloaded (overpressurized).
The display shows „Charge battery".	• The batteries of the measuring instrument can be recharged with a HYDROTECHNIK net adapter (230 VAC, secondary 24 VDC) or with an external voltage among 24 V and max. 30 V (stabilised) via the external voltage socket. We recommend a charging time of 14 to 16 hours.

10. 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 becomes invalid, when reparations or interventions are executed by persons, who were not authorised by us.

Within the six months of the guarantee, we will remove free of charge damages or defects, which can be proved to be based on a work's 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 defect 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 and with a corresponding copy of the invoice or the delivery note to:

HYDROTECHNIK - Kundendienststelle

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11. 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 by yourself!

Leave the maintenance or the repair up to our

HYDROTECHNIK - Kundendienststelle

Address: HYDROTECHNIK GmbH
Holzheimer Straße 94 - 96
D-65549 Limburg
Tel.: 0 64 31 - 40 04 · 0
Fax 0 64 31 - 4 53 08
Internet: http://www.hydrotechnik.com
eMail: hydrotechnik@t-online.de
