FILTRATION TECHNOLOGY

Stauff Hydraulic Tester

PPC-06/08/12

Operating instructions

Version 2.1

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Directory

1 Unpacking

Please inform the shipping department at Walter Stauffenberg GmbH & Co. KG if the delivery package is damaged. When removing the PPC-06/08/12 out of the package make sure that it is in good condition.

1.1 Protection of PPC-06/08/12

Do not place any objects on the PPC-06/08/12. Protect it against direct sunlight, high humidity, heavy vibrations, extreme temperatures and chemically aggressive environments.

2 General remarks

The **STAUFF PPC series of „Hydraulic Testers“** are service and diagnostic instruments to measure pressure, flow, temperature, rotational speed (frequency), current and voltage. Depending on the instrument type the user is able to operate with up to 6 channels (inputs), allowing accurate hydraulic diagnostics. Measured values can be transferred to a PC or printer via an integrated RS 232 interface. The instrument has an internal memory which can hold up to 240 independent measurement values. Each individual data set holds all single measured values of each of the connected sensors / inputs. It is possible to store the entire data set as well as a single measurement (curve) under the identical name. This makes a later measurement analysis easier. For further measurement evaluation and processing on a PC, the software packet PPC-Soft (for Windows 95® / 98® / XP® and Windows NT®) is also available.

The graphic LCD-display shows up to six channels in an easy-to-read form. Every measurement can be displayed as an actual, minimum and maximum value. In the optional line mathematical operations are displayed (hydraulic power + volume). It is also possible to present the measured values graphically as a curve.

Attention:

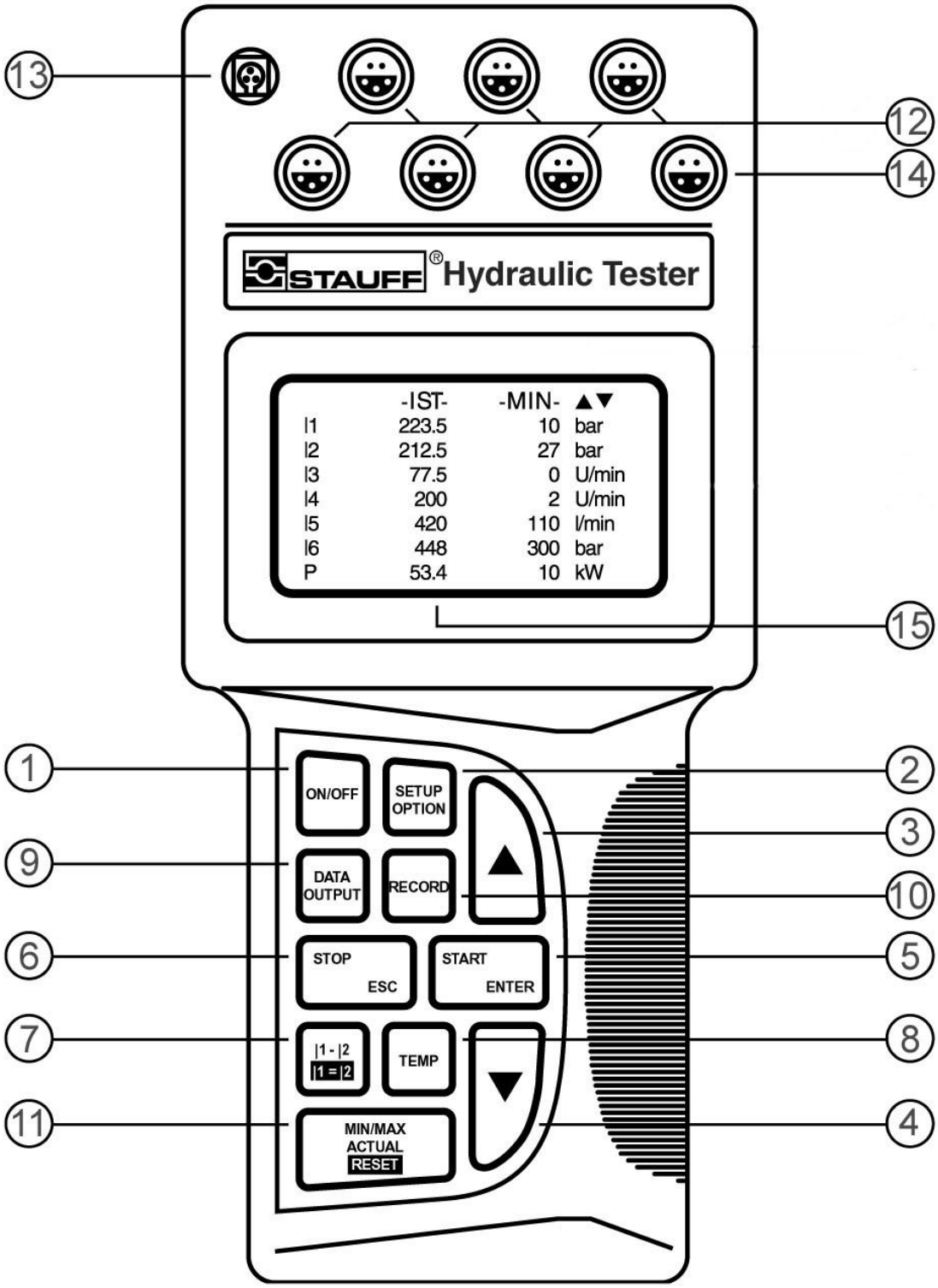
Before first operation of the Hydraulic Testers PPC-06/08/12 charge the internal battery for min. 16 hours!!

2.1 Instrument types

Depending on the application requirement, STAUFF PPC „Hydraulic Testers“ are available in three different types:

TYPE / Model	Channels	MIN / Max memory values
PPC-06	3	60.000
PPC-08	4	125.000
PPC-12	6	250.000

3 Functions and settings



1. **„ON / OFF“** is used to switch the instrument on and off.
2. **„SETUP / OPTION“** is used to change system settings.
3. The **„arrow“ keys** are used to select lines and functions.
4. The **„arrow“ keys** are used to select lines and functions.
5. **„START / ENTER“**:

   „START“ is used to start data (measurement) recording.

   „ENTER“ is used to poll sub-functions and accept (memorize) changed function values.
6. **„STOP / ESC“**:

   „STOP“ is used to stop data (measurement) recording.

   „ESC“ is used to stop the function value changing and to close sub-functions. The previous menu is displayed.

   !!! Changed settings won't be recalled !!!
7. **„I1-I2 / I1=I2“** is used for calculation of the difference between measurement channel 1 and measurement channel 2. The value displayed on channel 2 is the difference I1 – I2. It is possible to align I2 on I1. The **I1=I2 key** sets measurement channel 2 equal to measurement channel 1 (balancing function).
8. After pressing and holding **“TEMP“** the temperature data of all channels are shown.
9. **„DATA OUTPUT“** is used to start data output to PC, printer or display.
10. **„RECORD“** is used to record and store measurements.
11. **„MIN/MAX ACTUAL / RESET“:**

    „MIN/MAX ACTUAL“ switches display to ACTUAL, MINIMUM and MAXIMUM.

    „RESET“ deletes MIN/MAX-values.
12. Up to 6 sensors from the PPC 06/08/12 -program can be simultaneously connected to the **“SENSOR INPUTS“.** They are automatically recognised by the instrument. An adapter is necessary for auxiliary sensors, current and voltage measurements.
13. **„LOW-VOLTAGE SOCKET“** enables external voltage supply and battery charging via power supply unit.
14. External instruments like PC, printer, etc. are connected to the **“DATA OUTPUT SOCKET“**.
15. The **Graphic LCD display** shows measurement values, settings and graphics.

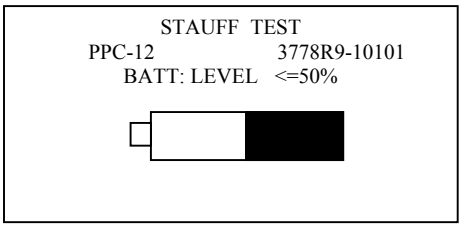
3.1 Operating the PPC-06/08/12

The main functions of the instrument, such as measuring and displaying, recording measurements („RECORD“), data output („DATA OUTPUT“) and changing the instrument settings („SETUP / OPTION“) are selected directly through the keyboard. The **„arrow“ keys** select the desired menu. **„ENTER“** brings up the selected menu item. The menu item accompanying function value (parameter) is highlighted.

Changing of the function values is done with the **“arrow“ keys**. Pressing “**ENTER“** confirms and stores the selected value.

3.1.1 Switching on the PPC

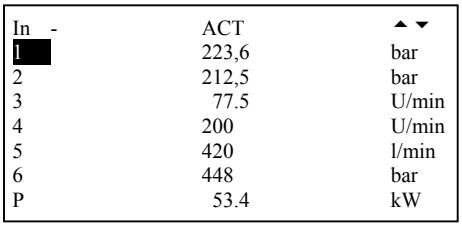
Press **“ON / OFF“** for <u>two seconds</u> to switch on the instrument. The current battery state of the rechargeable battery is shown on the display for a short time.



The version number indicates the internal manufacturing key.
The current battery state is given in percent and illustrated with the black section of the battery on the display. If the battery state is lower than 40 % you will find the message “BAT. SERVICE STATUS” on the display.

If the battery state is 0 % you have to use an external voltage supply. The rechargeable battery will then be charged automatically.

After approx. 8 seconds the display switches to simple measured value representation and shows the actual measurement values (ACT-values)



3.1.2 Display

The graphic LCD-display of the instrument has a maximum resolution of 128 x 64 pixel. The visible area is 72 x 40 mm. Using an 8-line representation (status, 6 channels (inputs), optional line) the digit height is 4,2 mm. Indicated values are adapted to the display size through an automatic digit height setting, for example if there are less then four channels for the actual values the numbers on the display will have double the size.

The text mode is separated into 8 lines and 4 columns. The first column shows the selected channel. The second and third columns show the corresponding measured values. Here it is possible to choose between four different options:

ACT	→ actual measured value (third column empty)
ACT - MIN	→ actual measured value – minimum value
ACT - MAX	→ actual measured value – maximum value
MIN - MAX	→ minimum value – maximum value

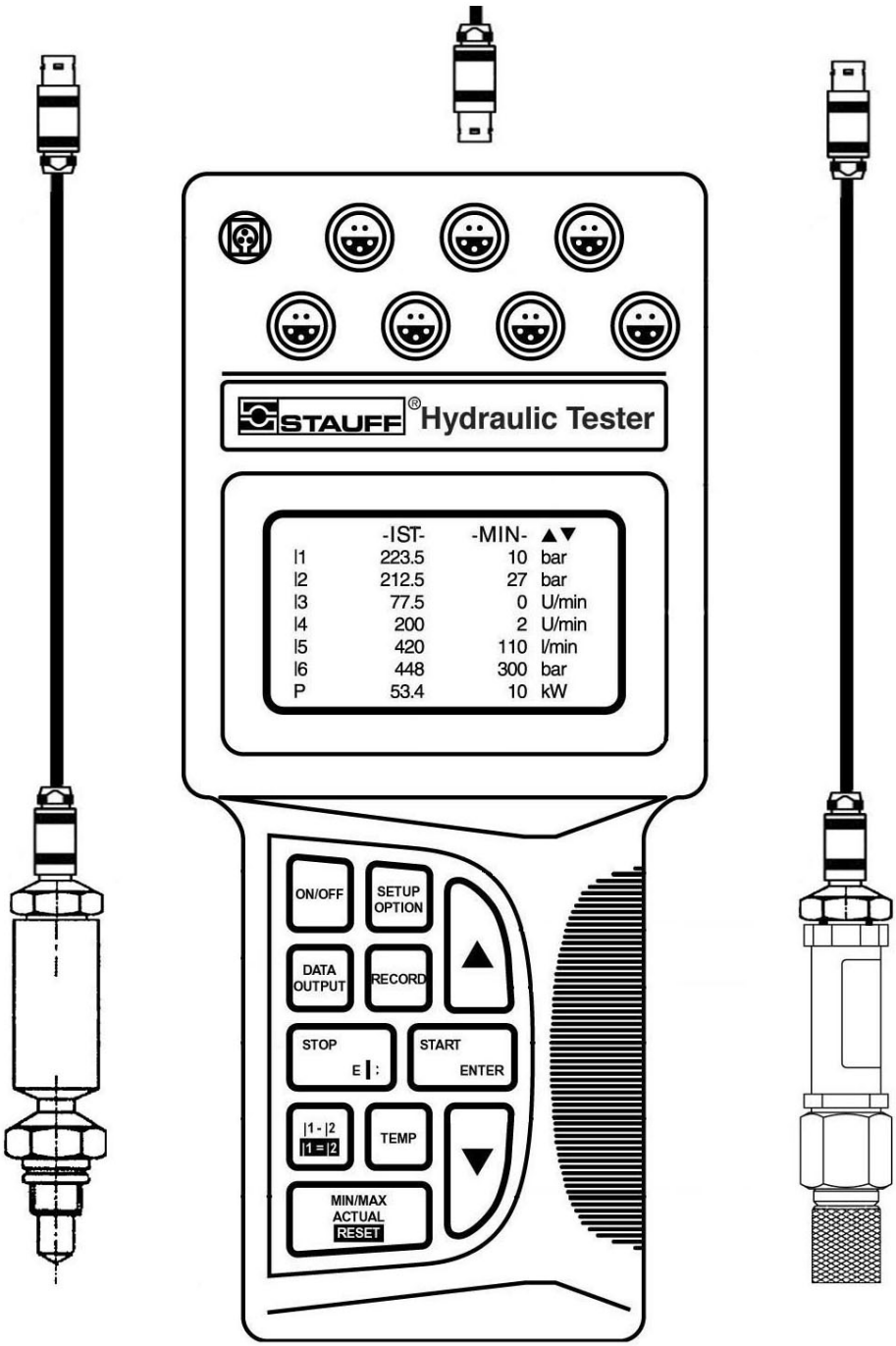
Column four shows the UNITS of the measured values.

The first line of the display shows the status (i.e. recording, memorizing), the measured value identifier (ACT, MIN, MAX) or the menu name. Lines 2 – 7 show the measured values. Line 8 is an optional line, in which calculated values like P (power) and V (volume) are shown.

Curves from measured values can be displayed in the graphic mode

3.1.3 Connection of sensors

The sensors are connected to the input jack of the PPC-06/08/12 via an interconnection cable. The red points on the plugs must correspond with the red points on the sockets. The measuring range is scaled through automatic sensor recognition and the measured value will be shown on the display.



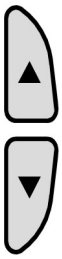
Attention!!
Safety Instructions for using sensors (i.e. the 1.000 bar pressure sensor):
Please pay attention to built in test points acc. to rated nominal pressure and specified safety factors.

3.1.4 Operation and display control

The navigating and programming of the PPC-06/08/12 unit is basically done as follows.
For example look at the „SETUP“ menu:

Pressing **„SETUP / OPTION“** opens the „SETUP“ –menu.

```
ESC      -- SETUP --                ▲▼
CONTRAST (%)                        50
AUX. SENSOR>
COMBINATION>
RECORD SETUP>
DEVICE SETUP>
BATT.SERVICE>
SYSTEM SETUP>
```



By pressing the **„arrow“-keys** the Cursor can be navigated through the menu.

```
ESC      -- SETUP --                ▲▼
CONTRAST (%)                        50
AUX. SENSOR>
VERKNUEPFUNG>
RECORD SETUP>
DEVICE SETUP>
BATT.SERVICE>
SYSTEM SETUP>
```

By pressing **„arrow“ –key** up, the cursor jumps from „AUX.SENSOR“ to „CONTRAST (%)“

```
ESC      -- SETUP --                ▲▼
CONTRAST (%)                        50
AUX. SENSOR>
COMBINATION>
RECORD SETUP>
DEVICE SETUP>
BATT.SERVICE>
SYSTEM SETUP>
```

By pressing **„Start / Enter“** the cursor jumps right to the function value, contrast can now be adjusted with the arrow keys.
By pressing **„Start / Enter“** once again, the value will be confirmed and the cursor jumps back to „CONTRAST (%)“.

```
ESC      -- SETUP --                ▲▼
CONTRAST (%)                        50
AUX. SENSOR>
COMBINATION>
RECORD SETUP>
DEVICE SETUP>
BATT.SERVICE>
SYSTEM SETUP>
```

Depending on the menu item, after pressing **„Start / Enter“,** a new menu is opened.

```
ESC      -- SETUP --                ▲▼
CONTRAST (%)                        50
AUX. SENSOR>
COMBINATION >
RECORD SETUP>
DEVICE SETUP>
BATT.SERVICE>
SYSTEM SETUP>
```

The submenu „INPUT“ of the menu item „AUX.SENSOR>“ is opened.

```
ESC      -- INPUT                   ▲▼
ANALOGUE>                           I1
FREQUENCY>
```

By pressing **„Stop / ESC“** the current menu is closed and the prior menu is displayed.

```
ESC      -- SETUP --                ▲▼
CONTRAST (%)                        50
AUX. SENSOR>
COMBINATION >
RECORD SETUP>
DEVICE SETUP>
BATT.SERVICE>
SYSTEM SETUP>
```

The programming of numbers and text is described in chapter 3.1.5, and 3.1.6 respectively.

3.1.5 Number input

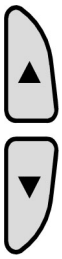
When configuring auxiliary sensors (chapter 4.1) the measurement range (i.e. 0 ... 250 bar) and the corresponding initial and end value (i.e. 0 ... 20 mA) have to be programmed.

The next example shows the number input of an auxiliary sensor.

After selecting a number, this number is highlighted. By pressing the **„arrow“ keys**, the former number is deleted, the first digit is highlighted and changed. The first digit of the number has to be confirmed by pressing **„START / ENTER“** and the following digit is highlighted.
„STOP / ESC“ terminates the input and stores the new number.

Example:

```
ESC     -- ANALOGUE --          ▲ ▼
In1
UNITS:                          bar
    FROM:                       0
    TO:                         600
SIGNAL:                         mA
    FROM:                       4
    TO:                         20
```

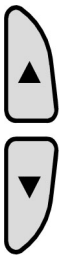


select number

```
ESC     -- ANALOGUE --          ▲ ▼
In1
UNITS:                          bar
    FROM:                       0
    TO:                         600
SIGNAL:                         mA
    FROM:                       4
    TO:                         20
```

confirm number

```
ESC     -- ANALOGUE --          ▲ ▼
In1
UNITS:                          bar
    FROM:                       0
    TO:                         600
SIGNAL:                         mA
    FROM:                       4
    TO:                         20
```

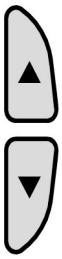


change first digit

```
ESC      -- ANALOGUE --
In1
UNITS:                          bar
    FROM:            5 _ _ _ _ _ _
    TO:                         600
SIGNAL:                         mA
    FROM:                       4
    TO:                         20
```

confirm first digit

```
ESC      -- ANALOGUE --
In1
UNITS:                          bar
    FROM:            5 0 _ _ _ _ _
    TO:                         600
SIGNAL:                         mA
    FROM:                       4
    TO:                         20
```



change second digit

```
ESC      -- ANALOGUE --
In1
UNITS:                          bar
    FROM:            5 5 _ _ _ _ _
    TO:                         600
SIGNAL:                         mA
    FROM:                       4
    TO:                         20
```

confirm second digit

```
ESC      -- ANALOGUE --
In1
UNITS:                          bar
    FROM:            5 5 _ _ _ _ _
    TO:                         600
SIGNAL:                         mA
    FROM:                       4
    TO:                         20
```

complete number input

```
ESC      -- ANALOGUE --
In1
UNITS:                          bar
    FROM:                       55
    TO:                         600
SIGNAL:                         mA
    FROM:                       4
    TO:                         20
```

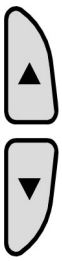
3.1.6 Text input

For functions like auxiliary sensors (chapter 4.1), data recording (chapter 5.3) and user ID (see chapter 6.3.3), text input is mandatory.

After selecting a text line, the menu “TEXT” is displayed.

```
-- TEXT --
AaBbCcDdEeFfGgHhIiJj
KkLlMmNnOoPpQqRrSsTt
UuVvWwXxYyZz%/_
0123456789.-+
STORE = STOP/ESC
15 CHARS MAX
TEXT: MASCH3
```

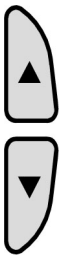
New text is shown on the bottom line next to „TEXT“ as it is entered. New character’s can be selected by pressing the **„arrow“ keys**. By holding down the **arrow key** the cursor moves faster through the text input field. **„START / ENTER“** confirms the selected character and highlights the next character. „_“ represents a space. The text input can be completed by pressing **„STOP / ESC“.** The text displayed under the heading TEXT is stored and then the display returns to the previous active menu.



select new character

```
-- TEXT --
AaBbCcDdEeFfGgHhIiJj
KkLlMmNnOoPpQqRrSsTt
UuVvWwXxYyZz%/_
0123456789.-+
STORE = STOP/ESC
15 CHARS MAX
TEXT: MASCH3 _ _ _
```

confirm new character



select next character

```
-- TEXT --
AaBbCcDdEeFfGgHhIiJj
KkLlMmNnOoPpQqRrSsTt
UuVvWwXxYyZz%/_
0123456789.-+
STORE = STOP/ESC
15 CHARS MAX
TEXT: MASCH3 _ _ _
```

confirm character

terminate text input and store text

3.2 Measurement and display

The following chapters describe the different presentation of measured values.

3.2.1 Display of measured values (ACT – MIN - MAX)

The measured values in the display can be shown as ACT (actual), MIN (minimum) and MAX (maximum) values. There are several display options. The basic configuration shows the ACT values.

In -	ACT	▲▼
1	223,6	bar
2	212,5	bar
3	77.5	U/min
4	200	U/min
5	420	l/min
6	448	bar
P	53.4	kW

When pressing **"MIN/MAX ACTUAL / RESET"** the following values are shown:

This display shows the ACT value and the MIN value.

In -	ACT	MIN	▲▼
1	223,6	10	bar
2	212,5	27	bar
3	77.5	0	U/min
4	200	2	U/min
5	420	410	l/min
6	448	300	bar
P	53.4		kW

The following display shows the ACT and MAX value.

In -	ACT	MAX	▲▼
1	223,6	320	bar
2	212,5	220	bar
3	77.5	80,0	U/min
4	200	400	U/min
5	420	420	l/min
6	448	555	bar
P	53.4		kW

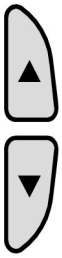
The next display shows the MIN and MAX value.

In -	MIN	MAX	▲▼
1	10	320	bar
2	27	220	bar
3	0	80,0	U/min
4	2	400	U/min
5	410	420	l/min
6	300	555	bar
P			kW

By pressing **„MIN/MAX ACTUAL / RESET“** once again all actual values of channel 1 are shown. Using the **„arrow“** keys shows the values of the sensors.

I1 ▲▼

345,6 bar
Min=131 Max=434
T=55°C



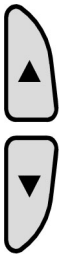
select different sensor

I3 ▲▼

162,6 bar
Min=145 Max=201
T=63°C

By pressing **„STOP / ESC“** all channels can be shown on the display again.

The display of all actual measured values from one sensor can be obtained by selecting the corresponding input with **“ENTER“.**



select Sensor / Input I2

In -	ACT	▲▼
1	223,6	bar
2	212,5	bar
3	77.5	U/min
4	200	U/min
5	420	l/min
6	448	bar
P	53.4	kW

START
ENTER

confirm sensor / input I2

I2

212,5 bar
Min=131 Max=434
T=55°C

The values of the other sensors are shown by using the **“arrow“ keys**.

By pressing **“STOP / ESC“** the values of all sensors return on the display.

STOP
ESC

back to previous display

In -	ACT	
1	223,6	bar
2	212,5	bar
3	77.5	U/min
4	200	U/min
5	420	l/min
6	448	bar
P	53.4	kW

3.2.2 Deleting MIN / MAX memory

To delete the MIN and MAX values, **„MIN/MAX ACTUAL / RESET“** has to be pressed for more than 4 seconds.


```
ESC – MIN – MAX RESET

MAN-MAX VALUE
RESET ?

ENTER = YES
ESC = NO
```

delete MIN /MAX values and return to previous display

or

return to previous display without deleting MIN / MAX values

3.2.3 Temperature

Some sensors measure temperature in addition to their primary function. To read temperature of all sensors / inputs press and hold **„TEMP“** key**.**

press and hold **„TEMP“-key**

```
-- TEMPERATURE --
I1      22 °C
I2      55 °C
I3      99 °C
I4      --- °C
I5      --- °C
I6      --- °C
```

By releasing the „**TEMP“-key** the instrument will return to the previous display.

3.2.4 Differential values

In order to calculate the differential value between channel 1 and channel 2 press „**I1-I2** / **I1=I2**“. The result of the calculation (=I1-I2) can be found as „Δ“ in input 2, line 2 on the display.

Attention!!
Both channels must have the same measurement range

display and calculation of I1-I2

In -	ACT	MIN	▲▼
1	223,6	10	bar
Δ	11.1	17	bar
3	77.5	0	U/min
4	200	2	U/min
5	420	410	l/min
6	448	300	bar
P	53.4		kW

Pressing „**I1-I2** / **I1=I2**“ again leads to display of channel 2.

return to display of channel 2

In -	ACT	MIN	▲▼
1	223,6	10	bar
2	212,5	27	bar
3	77.5	0	U/min
4	200	2	U/min
5	420	410	l/min
6	448	300	bar
P	53.4		kW

If the sensors are not compatible there is a message on the display:

SENSORS INCOMPATIBLE

3.2.5 Alignment of I1 and I2

Holding „**I1-I2 / I1=I2**“ for more than 4 seconds leads to alignment of channel 1 and channel 2. Channel 2 (I2) takes the actual measured value of channel 1 (I1) → **I2=I1**. If the measured value of channel 2 is changing, the difference „Δ“ to channel 1 is measured. This function is like the tare-function of a scale.

alignment
(press approx. 4 seconds)

```
-- ALIGNMENT --
I2 = I1 ?

ALIGHM.VALUE:
        9,2 bar

ENTER = YES
ESC = NO
```

carry out alignment,
measured „Δ“ -values
of the second sensor are 0

In -	ACT	MIN	
1	223,6	10	bar
Δ	0	0	bar
3	77.5	0	U/min
4	200	2	U/min
5	420	410	l/min
6	448	300	bar
P	53.4		kW

stop alignment

If the sensors are not compatible there is a message on the display:

```
SENSORS  INCOMPATIBLE
```

3.2.6 Optional channel (combination)

The optional channel allows the calculation of volume (V in [litre]) and power (P in [kW]), which is shown in line 8 of the display.

optional channel

```
In  -        ACT        ▲▼
1            223,6      bar
2            212,5      bar
3             77.5      U/min
4            200        U/min
5            420        l/min
6            448        bar
P             53.4      kW
```

Pressing "**SETUP OPTION**" can do the setting for the optional setting channel.

press „**SETUP / OPTION**"

```
ESC  -- SETUP --                ▲▼
CONTRAST (%)                     50
AUX. SENSOR>
COMBINATION >
RECORD SETUP>
DEVICE SETUP>
BATT.SERVICE>
SYSTEM SETUP>
```

select menu item
„COMBINATION"

```
ESC  -- SETUP --                ▲▼
CONTRAST (%)                     50
AUX. SENSOR>
COMBINATION >
RECORD SETUP>
DEVICE SETUP>
BATT.SERVICE>
SYSTEM SETUP>
```

confirm menu item
„COMBINATION"

```
ESC                 - COMBINATION -  ▲▼
DISPLAY:            VOLUME (L)

FORMULA:
    VOLUME(L)=t* I3
    P(kW)=      (I1-I2)* I3
    P(kW)=          I1* I2
```

Calculation options are as follows.

1. **Run-out volume** based on time * flow:

V = Time [s] * Q [l/min]

Input Channel for Q: **Ix**
Configuration optional line: **V = t * Ix (Ix = I1 to I6)**

2. **Power:**

a) Hydraulic power based on differential pressure * flow:

P (kW) = △P [bar]* Q [l/min] / 600 [s]
P = △P * Q

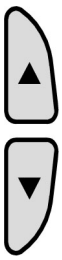
P = (I1-I2) * Ix (Ix = I3 to I6)

b) Hydraulic power based on pressure * flow:

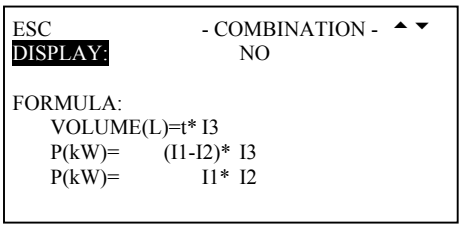
P (kW) = P [bar]* Q [l/min] / 600 [s]
P = P * Q

P = I1 * Ix (Ix = I2 to I6)

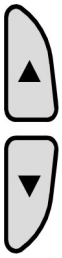
Calculated and output values are set by pressing “DISPLAY” (VOLUME, P(kW)=(I1-I2)*Ix, P(kW)=I1*I2, NO).



select menu item „DISPLAY“



confirm menu item „DISPLAY“



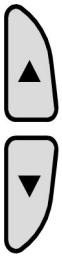
press „**arrow“ key** until desired display is selected.

```
ESC                    - COMBINATION -
DISPLAY:                    VOLUME (L)

FORMULA:
    VOLUMEN(L)=t*    I3
    P(kW)=      (I1-I2)* I3
    P(kW)=          I1* I2
```

confirm change

To select the channel number for the volume formula highlight “VOLUME(I)=t*”.

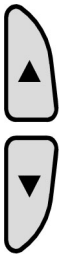


select menu item „VOLUME(I)=t*“

```
ESC                    - COMBINATION -
DISPLAY:                    VOLUME (L)

FORMULA:
    VOLUMEN(L)=t*    I3
    P(kW)=      (I1-I2)* I3
    P(kW)=          I1* I2
```

confirm menu item „VOLUME(I)=t*“



Press „**arrow“ key** to select desired channel (I1, I2, I3, I4, I5, I6)

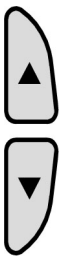
```
ESC                    - COMBINATION -
DISPLAY:                    VOLUME (L)

FORMULA:
    VOLUMEN(L)=t*    I4
    P(kW)=      (I1-I2)* I3
    P(kW)=          I1* I2
```

confirm change

!!! The time (t) is running continuously in the background and is set to zero in the display by pressing "RESET"!!

The channel number for the power equation is selected by highlighting “P(kW)=(I1-I2)*”.



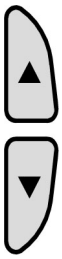
select menu item
„P(kW)=(I1-I2)*“

```
ESC                    - COMBINATION -
DISPLAY:                   VOLUME (L)

FORMULA:
    VOLUMEN(L)=t*    I3
    P(kW)=      (I1-I2)* I3
    P(kW)=          I1*  I2
```

confirm menu item „P(kW)=(I1-I2)*“,
assign measurement channel and confirm once again

The channel number for the power equation is selected by highlighting “P(kW)=I1*”.



select menu item „P(kW)=I1*“

```
ESC                    - COMBINATION -
DISPLAY:                   VOLUME (L)

FORMULA:
    VOLUMEN(L)=t*    I3
    P(kW)=      (I1-I2)* I3
    P(kW)=          I1*  I2
```

confirm menu item „P(kW)=I1*“,
assign measurement channel and confirm once again

The data of the optional line is **<u>not</u>** transferred to the online and memory mode, respectively.

If display and sensors do not correspond, there is a message on the display:

```
SENSORS  INCOMPATIBLE
```

3.3 Data output

The PPC-06/08/12 can transfer the measured values to a PC or printer via interface RS 232. There are two data output possibilities:

1. Online output
2. Memory output

With the online output the actual measured values are transferred directly to the connected instrument. The measured values will be printed numerically in a table.

With the memory output the saved data can be transferred to the PC or printer. The measured values will be printed as a graph (curve).

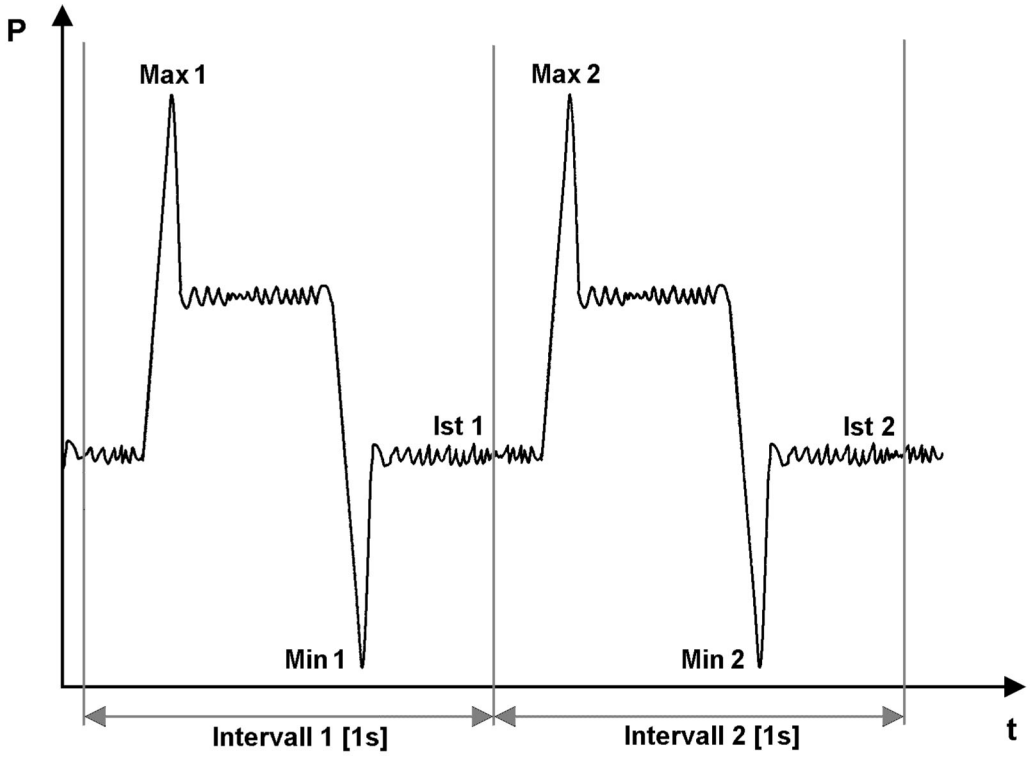
If the PPC-06/08/12 is connected with a PC in conjunction with PPC-Soft (chapter 7) it is possible to display the data in the desired format. Numerical line-by-line as well as graphical format is possible with both output possibilities: online and memory output.

The following examples describe the sequence and settings when using online output.

The description of memory output can be found in the chapter 5.4.

3.3.1 Online function

Transfer of the actual measured values to a printer or a PC is carried out with the online function. During online measurement MIN and MAX values and the ACT value are transferred within a measurement interval (IST1 to IST2). This guarantees the transfer of all information during the printing of a measurement interval.



Recorded measured values at online measurement			
ACT 1	MIN 1	MAX 1	Interval 1
ACT 2	MIN 2	MAX 2	Interval 2
…	…	…	…

The data is numerically presented as a table when using a printer. Graphic presentation is possible when using PPC-Soft software (chapter 7).

3.3.2 Online function with PC / Laptop

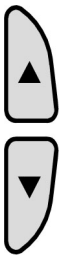
For a correct data transfer, the baud rate for the PC to the PPC has to be adapted. (chapter 6.1). This adaptation can be done with an interface test when using PPC-Soft software (chapter 7.2).

When pressing „**DATA OUTPUT**“ the online output will be activated. The menu „DATA OUT“ is displayed.

press „**DATA OUTPUT**“

```
ESC      -- DATA OUT --
DATA FROM:          MEMORY
OUTPUT TO:          Thermo
MEASUREMENT:        12
In>                 1 2
DISPL.TYPE          MIN-MAX
FORMAT:             NORMAL
START>
```

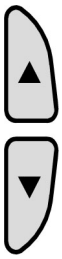
“DATA FROM” shows the data source (MEMORY = measured value memory or ONLINE = actual measured value).



select menu item “DATA FROM”

```
ESC      -- DATA OUT --
DATA FROM:          MEMORY
OUTPUT TO:          Thermo
MEASUREMENT:        12
In>                 1 2
DISPL.TYPE          MIN-MAX
FORMAT:             NORMAL
START>
```

confirm menu item “DATA FROM”



select function value “ONLINE”

```
ESC      -- DATA OUT --
DATA FROM:          ONLINE
OUTPUT TO:          Thermo
MEASUREMENT:        12
In>                 1 2
DISPL.TYPE          MIN-MAX
FORMAT:             NORMAL
START>
```

START ENTER

confirm change

“OUTPUT TO” selects the output instrument.

select menu item
„OUTPUT TO“

```
ESC      -- DATA OUT --
DATA FROM:          ONLINE
OUTPUT TO:          Thermo
TRANSFER:RATE:      5
PRINT/PC START>
```

START ENTER

confirm menu item „OUTPUT TO“

select function value PC

```
ESC      -- DATA OUT --
DATA FROM:          ONLINE
OUTPUT TO:          PC
TRANSFER:RATE:      5
PRINT/PC START>
```

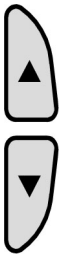
START ENTER

confirm change

„TRANSF.RATE” defines how often the measured values are transferred.

Example:
„TRANSF.RATE“ = 5 → the values are transferred every 5 seconds

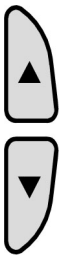
up to 3 channels → every 1 to 3600 seconds
more than 4 channels → every 2 to 3600 seconds



select menu item
„TRANSF.RATE“

```
ESC      -- DATA OUT --
DATA FROM:          ONLINE
OUTPUT TO:          PC
TRANSFER:RATE:      5
PRINT/PC START>
```

confirm menu item „TRANSF.RATE“

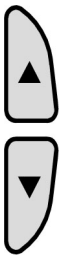


select function value
(1 to 3600 seconds)

```
ESC      -- DATA OUT --
DATA FROM:          ONLINE
OUTPUT TO:          PC
TRANSFER:RATE:      10
PRINT/PC START>
```

confirm change

“PRINT/PC” starts online output.



select menu item “PRINT/PC”

```
ESC      -- DATA OUT --
DATA FROM:          ONLINE
OUTPUT TO:          PC
TRANSFER:RATE:      10
PRINT/PC START>
```

START
ENTER

start transfer

FOR DATA TRANFER
READY

CANCEL = STOP

In	-	ACT	MIN	▲▼P
1		223,6	10	bar
2		212,5	27	bar
3		77.5	0	U/min
4		200	2	U/min
5		420	410	l/min
6		448	300	bar
P		53.4	0	kW

During the transfer a „**P**“ is blinking in the upper right corner of the display.

The online output can be terminated by pressing „**STOP / ESC**“.

4 Auxiliary sensors / current - voltage measurement

The PPC-06/08/12 can be used with auxiliary sensors. For this, the current / voltage module PPC 06/12-AUX-A adapter is required.
Sensors generally have an outgoing signal like voltage or current value. These must be adjusted to the PPC-06/08/12. Due to the galvanic disconnection, the PPC-06/08/12 allows measurements from 0/4 to 20 mA and 0 to 10 V DC. The scaling of the output signal should be taken into consideration.

	Measurement range (Unit:)	**Unit**	**Signal (SIGNAL:)**	**Unit**
Example	FROM: 0 TO: 250	bar	FROM: 0 TO: 20	mA
	FROM: 0 TO: 500	N	FROM: 4 TO: 20	mA
	FROM: 0 TO: 200	kg	FROM: 0 TO: 10	V
Current	FROM: 0 TO: 20	mA	FROM: 0 TO: 20	mA
Voltage	FROM: 0 TO: 10	V	FROM: 0 TO: 10	V

After correct configuration the auxiliary sensors (see chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**) work like Stauff sensors. The sensor identification is valid for the corresponding input channel.

For starting auxiliary triggered measurement recording, the trigger module PPC-06/12-TR-A adapter has to be used.

The trigger module starts the measurement recording via a make- and break- device with a floating contact, that is connected to the trigger module.

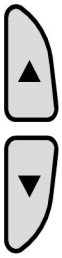
!!! Attention:
Use only floating contacts !! (for example relay contacts)
If not, the PPC can be destroyed !!

4.1 Configuration of auxiliary sensors

By pressing „**SETUP / OPTION**“ the settings for the configuration of auxiliary sensors can be achieved.

press „**SETUP / OPTION**“

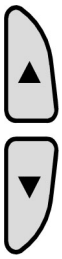
```
ESC      -- SETUP --                ▲ ▼
CONTRAST (%)                        50
AUX. SENSOR>
COMBINATION >
RECORD SETUP>
DEVICE SETUP>
BATT.SERVICE>
SYSTEM SETUP>
```



select menu item
„AUX. SENSOR“

```
ESC      -- SETUP --                ▲ ▼
CONTRAST (%)                        50
AUX. SENSOR>
COMBINATION >
RECORD SETUP>
DEVICE SETUP>
BATT.SERVICE>
SYSTEM SETUP>
```

confirm menu item
„AUX. SENSOR“

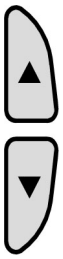


select menu item
„ANALOGUE“

```
ESC      -- INPUT --                ▲ ▼
ANALOGUE>                           I1
FREQUENCY    >
```

confirm menu item
“ANALOGUE“

```
ESC      -- INPUT --                ▲ ▼
ANALOGUE>                           I1
FREQUENCY>
```



select channel
(I1, I2, I3, I4, I5, I6)

```
ESC      -- INPUT --
ANALOGUE>                    I2
FREQUENCY>
```

confirm channel

```
ESC      -- ANALOGUE --
In2
UNITS:                       bar
    FROM:                    55
    TO:                      600
SIGNAL:                      mA
    FROM:                    4
    TO:                      20
```

By pressing the arrow keys, the menu item is chosen and with „**START / ENTER**“ it is confirmed.

For Number or Text input see number input (chapter 3.1.6) respectively text input (chapter 3.1.6).

The configuration of the auxiliary sensors is accomplished by modifying the „FROM“ and „TO“ values under the „UNIT“ and „SIGNAL“ headers.

Example:
If the auxiliary sensor produces a 4 to 20 ma output signal then under the „SIGNAL“ header „FROM“ is selected and set to 4, „TO“ is set to 20; If the pressure range to work within is 0 to 500 bar then under the „UNITS“ header, „FROM“ is set to 0 and „TO“ is set to 500. The tester input is now scaled to provide a 0 to 500 bar reading based on a 4 to 20 ma signal from the auxiliary sensor.

„UNITS:“	describes the UNIT of the displayed data
„UNITS FROM:“	represents the minimum measured value (smallest accepted value : -99,999).
„UNITS TO:“	defines the maximum measured value (largest accepted value : 999,999)
“SIGNAL:”	describes the unit of measured value given by the sensor.
„SIGNAL FROM:“	defines the minimum measured value (smallest accepted value : -20 mA or –10 V).
„SIGNAL TO:“	defines the maximum measured value (biggest accepted value : +20 mA or +10 V).

4.2 Frequency measurement

The rotational speed (n) [U/min] or the flow rate (Q) [l/min] can be measured by modifying the „FREQUENCY“ settings under the „AUX SENSOR“ setup option. The following instructions describe the procedure:

!!!!Attention: The frequency measurement is limited to channel 3!!

To calculate the correct rotational speed or the flow rate, the following values have to be specified.

Rotational speed:	Details about impulses per revolution (PULS./REV) and maximal rotational speed (RPM max)
Flow rate:	Details about K-factors, Impulse / Litre (CALIBR.:) and maximum flow rate (Q max)

By pressing **“SETUP”** the frequency settings can be adjusted.

SETUP OPTION

press **„SETUP / OPTION“**

```
ESC      -- SETUP --
CONTRAST (%)                50
AUX. SENSOR>
COMBINATION >
RECORD SETUP>
DEVICE SETUP>
BATT.SERVICE>
SYSTEM SETUP>
```

select menu item „AUX. SENSOR“

```
ESC      -- SETUP --
CONTRAST (%)                50
AUX. SENSOR>
COMBINATION >
RECORD SETUP>
DEVICE SETUP>
BATT.SERVICE>
SYSTEM SETUP>
```

START ENTER

confirm menu item „AUX. SENSOR“

Select menu item „FREQUENCY“

```
ESC      -- INPUT --
ANALOGUE>                   I2
FREQUENCY>
```

START ENTER

Confirm menu item „FREQUENCY“

```
ESC      - FREQUENCY -
In3
QUANTITY:          ROTAT.SPD
PULS/REV:          123
RPM MAX:           3000
```

Choose menu item „QUANTITY“ for selection of rotational speed or flow rate, respectively.

Inputs required for **„Rotation Speed (n)“**

```
ESC      - FREQUENCY -
In3
QUANTITY:          ROTAT.SPD
PULS/REV:          123
RPM MAX:           3000
```

„PULS/REV:“ input for Impulse / rotation (eg. # of teeth/revolution).
„RPM MAX:“ maximum speed range (eg. # of revs/min).

The number input is described in chapter (3.1.5) (accepted range: 1 to 999).

If “PULS/REV” * “RPM MAX” is exceeding 30,000 * 60, the error message „VALUES TOO BIG“ is displayed.

Inputs required for **„FLOW (Q)“**

```
ESC      - FREQUENCY -
In3
QUANTITY:          FLOW
CALIBR.:           123
Q MAX:             3000
```

The first step is the input of the CALIBR.-factor and the maximum flow rate, “Q MAX”.
When using Stauff flow turbines, the given calibration-factor has to be used. For different flow-turbines the CALIBR.-factor has to be calculated as follows:

I = Impulse / Litre (eg. 1000 pulses/litre for new turbine)
CALIBR.$_{(1000\ Hz)}$ =60.000 / I (Therefore, 60,000/1000 = 60; Enter 60 on “CALIBR” line)

“Q-MAX” is identified on the turbine; Must be litre/min.

The number input is described in chapter (3.1.5) (accepted range: 1 to 999).

5 Additional features of the PPC-06/08/12

The PPC-06/08/12 records and stores measured values (curves). The recorded data sets can be transferred to the PC (with PPC-Soft software (chapter 7).

For measurement recording and storing the user has two choices:

Manual recording and saving (“START/STOP”)

The manual recording is activated and stopped with “START/STOP” (see chapter 5.2).

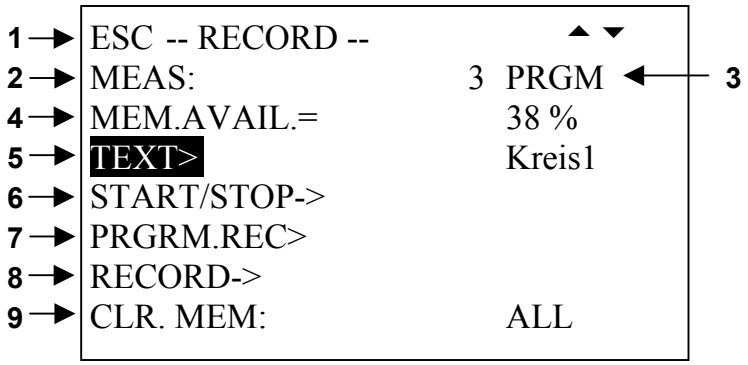
Software-driven recording and saving

With the software-driven recording, the PPC-06/08/12 controls the documentation of the data sets. Before starting the measurement, the user has to initialise the set up and measurement time (see chapter 5.3).

“RECORD” is pressed to start the recording. The menu RECORD is displayed.

press **„RECORD“**

```
ESC     -- RECORD --                    ▲ ▼
MEAS:                          3   PRGM
MEM.AVAIL.=                        38 %
TEXT>                              Kreis1
START/STOP->
PRGRM.REC>
RECORD->
CLR. MEM:                          ALL
```



1. Menu line

2. **„MEAS:“** shows the number of the latest stored measurement.

3. **“PRGM”** shows the actual (record-) status of the measurement memory:

   “PRGM” → Measurement memory will be programmed
   “FULL” → Measurement memory is full

4. **„MEM.AVAIL.=“** shows the remaining memory in %.

5. **„TEXT“** can enter a name for every input (channel).

6. **„START/STOP->“** prepares the manual recording

7. **“PRGM.REC>”** defines the initial setting and the measurement time as well as the type of software-driven recording.

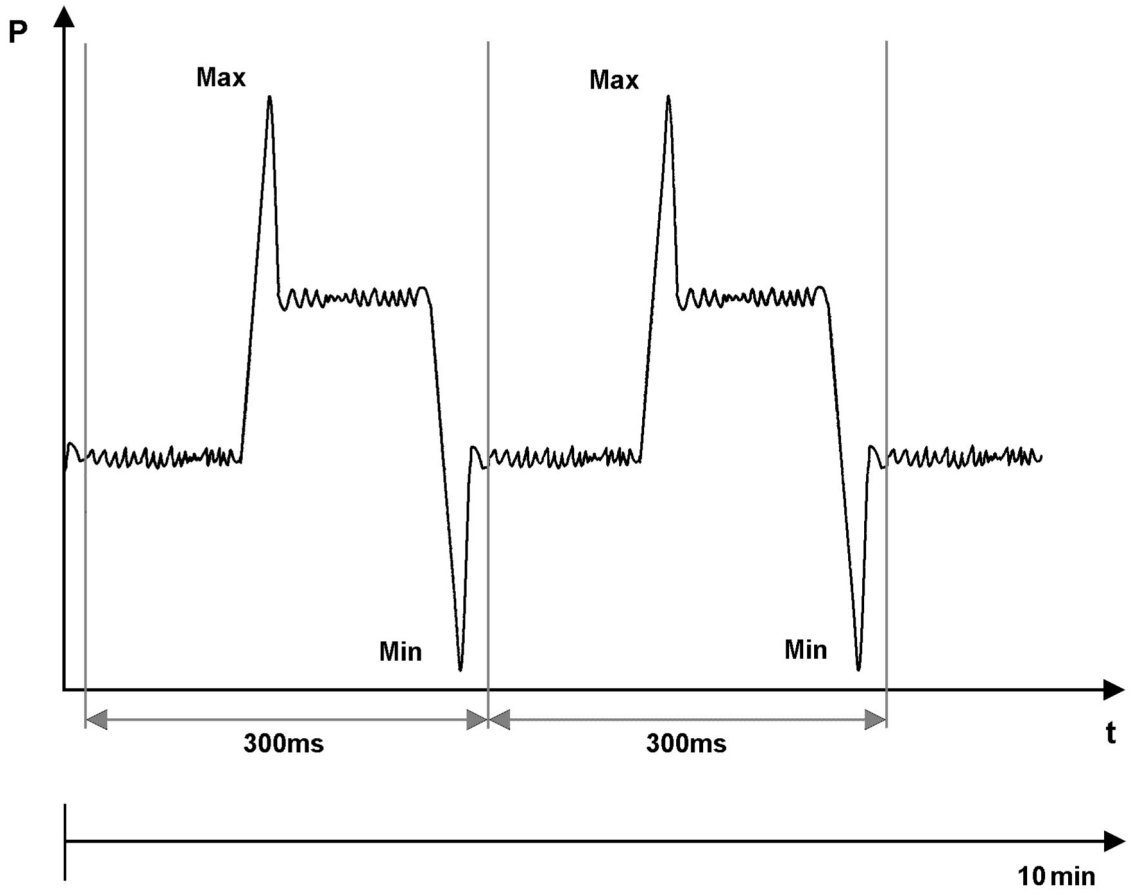
8. **“RECORD->”** starts the software-driven recording.

9. **“CLR. MEM:”** deletes single or all recorded measurements.

5.1 Memory capability

Dynamic memory capability of the PPC-06/08/12

The dynamic memory capability of the MIN / MAX values allows the user to choose a memory rate of 1,000, 2,000 and 4,000 values/channel. The MIN / MAX values for every storage interval is constantly recorded. Therefore, the **recording of all printed points is guaranteed**.
That means, for every memory interval 1 MIN value, 1 MAX value and the average value for every channel is recorded.



The **period of one memory interval** is dependent on the measurement time and measurement points. The memory rate is constant during each single measurement.

$$\text{Memory interval} = \frac{\text{Measurement time}}{\text{Measurement points}}$$

The memory capability setting is described in chapter (6.3.2)

For more information about the memory management please have a look to the technical appendix at the end of these Operating Instruction.

Calculation example:

I = Memory interval

MP = Measurement points/channel = 4,000 values/channel

t = Measurement time = 20 min
conversion to ms: 20 min = 20 * 60 * 1000 ms = 1,200,000 ms

$$I = \frac{t}{MP} = \frac{1{,}200{,}000}{4{,}000} = 300\text{ms}$$

In this example, the period of the memory interval is 300 ms. That means, that every 300 ms one value per channels is recorded.

Calculation of the maximum measurement numbers

To calculate the maximum measurement numbers, you have to know the maximum number of storage points:

PPC-06	60,000 points MIN and MAX measurement points
PPC-08	125,000 points MIN and MAX measurement points
PPC-12	250,000 points MIN and MAX measurement points

Calculation example :

Number of points= 250,000 MIN and MAX measurement points

Memory rate = 2,000 MIN and MAX measurement points /channel

n = Number of measurements

$$n = \frac{\text{number of MIN and MAX meas. points}}{\text{memory rate} * \text{number of channels}} = \frac{250.000\text{ points}}{2{,}000\text{ MIN and MAX meas. points/channel} * \text{channels}}$$

The maximum number of measurements is 240, when using a single channel and 1,000 MIN and MAX measurement points.

5.2 Manual recording of measured values

The user **starts and stops** the manual recording of measured values with the **"START"** and **"STOP" -key**.
To choose the manual recording options press **„RECORD"**. On the display the menu „RECORD" is shown.

press **„RECORD"**

```
ESC      -- RECORD --                ▲ ▼
MEAS:                          3   PRGM
MEM.AVAIL.=                        38 %
TEXT>                              Kreis1
START/STOP->
PRGRM.REC>
RECORD->
CLR. MEM:                          ALL
```

Names (with a maximum of 15 characters) for the measurement and channels can be provided by the menu item „TEXT".

Further text input is described in chapter 3.1.6

select „START/STOP" and start the manual recording mode with **„START / ENTER"**

```
MEAS:4     RECORD>START
1          223,6        10    bar
2          212,5        27    bar
3           77.5         0    U/min
4          448         300    bar
```

"STOP / ESC" stops the manual recording mode. On the display the menu "RECORD" is shown.

With **"MIN/MAX ACTUAL / RESET"** the different presentations of the measured values can be chosen on the display.

By pressing **"I1-I2 / I1=I2",** the difference between I1 and I2 is shown in the second line of the display. The calculated value is recorded as measurement value I2.

Pressing **"START / ENTER"** and "RECORD", respectively, starts the recording.

start recording

```
MEAS:4     RECORD
1          223,6        10    bar
2          212,5        27    bar
3           77.5         0    U/min
4          448         300    bar
```

Press **“STOP / ESC”** to stop the recording.

Stop recording

```
RECORD     END
MEAS: 4    SAVE?

ENTER = YES
ESC = NO
```

At this point, the user has to decide whether the measurement will be stored by the PPC 06/08/12. After saving, the display returns to the menu “RECORD”. Now, you can register further measurements. By pressing **“STOP / ESC”** you can exit the menu “RECORD” and the actual measurement values are shown.

5.3 Software-driven recording of measured values

By software-driven recording and storing of measured values four different settings can be chosen:

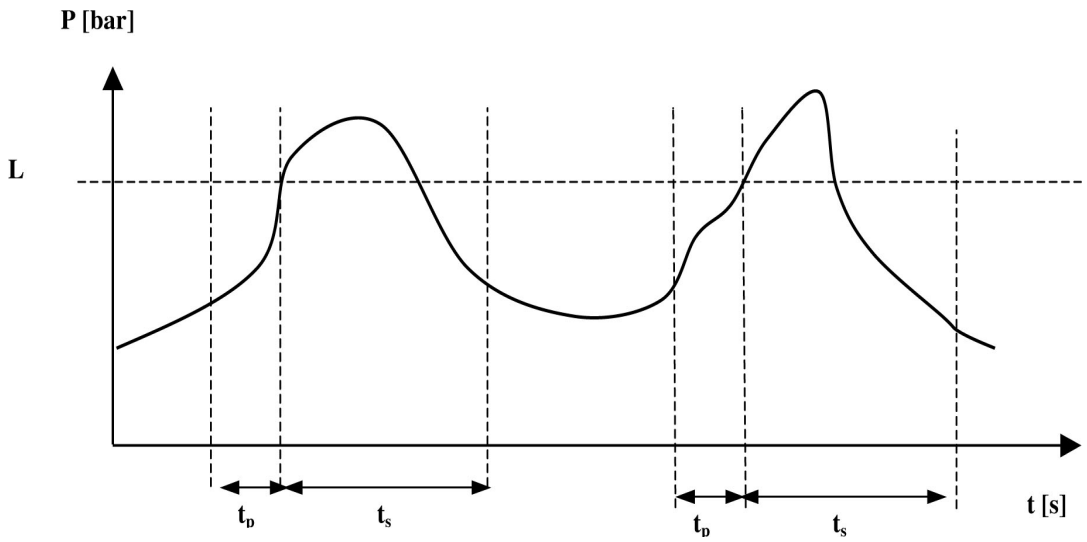
The following are the four recording options available.

1. Edge-triggered recording (increase/decrease) (chapter 5.3.1)
2. Externally triggered recording (chapter 5.3.2)
3. Manually triggered recording (chapter 5.3.3)
4. Time triggered recording (chapter 5.3.4)

5.3.1 Edge-triggered recording

The edge-triggered recording is initiated by rising above or falling below a programmed threshold.

Scheme for edge-triggered recording:



t_g → recording time
t_s → storage time
t_p → pre-trigger time
L → threshold

The **storage time t_g** defines the total recording time. **$t_g = t_s + t_p$**

In the **storage time t_s** the measured values will be recorded. The storage time is set by the user before recording ("DURATION").

The **pre-trigger time t_p** is the storage time **before** the measurement is initiated.

By passing (rise, fall) the **threshold L** the recording is initiated (see diagram → rising). The signal curve **before** crossing the **threshold L** will be recorded by the pre-trigger.

This example shows the edge-triggered pressure- /flow- measurement. Input I1 measures the pressure, input I3 measures the flow. By automatic triggering the measurement of input I1 will be started. In this example the initiating flank is increasing, the threshold is 50 bar and the measured values are recorded for 10 seconds.

By pressing **"RECORD"** the menu "RECORD" is shown on the display.

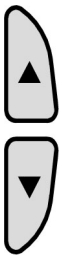
press "RECORD"

```
ESC      -- RECORD --                ▲▼
MEAS:                        3   PRGM
MEM.AVAIL.=                      38 %
TEXT>                            Kreis1
START/STOP->
PRGRM.REC>
RECORD->
CLR. MEM:                        ALL
```

Names (with a maximum of 15 characters) for the measurements can be given by the menu item „TEXT".

The further text input is described in chapter 3.1.6.

The start / stop parameters of the automatic measurement are set up under the menu item "PRGRM.REC>".



select menu item
"PRGRM.REC>"

```
ESC      -- RECORD --                ▲▼
MEAS:                        3   PRGM
MEM.AVAIL.=                      38 %
TEXT>                            Kreis1
START/STOP->
PRGRM.REC>
RECORD->
CLR. MEM:                        ALL
```

confirm menu item
"PRGRM.REC>"

```
ESC      - PRGM REC --               ▲▼
START REC                        AUTO
DURATION                         10 s
PRE-TRIGGER                      0.5 s
START In:                        I1
LEVEL:                           50 bar
STARTSLOPE:                      FALLING
AUTO READY                       NO
```

```
ESC      - PRGM REC --          ▲ ▼
START REC                       AUTO
DURATION                        10 s
PRE-TRIGGER                     0.5 s
START In:                       I1
LEVEL:                          50 bar
STARTSLOPE:                     FALLING
AUTO READY                      NO
```

„START REC“ defines the start parameter. When using the edge-triggered recording mode, the function value has to be set to “AUTO”.

„DURATION“ defines the recording time inclusive of trigger-time

„PRE-TRIGGER“ defines the storage time **before** the measurement is initiated.

„START In>“ choose the measurement channel, which initiates the storage when the defined settings are met (trigger channel).

„LEVEL:“ defines the threshold value. When reaching the threshold the recording will be initiated.

„STARTSLOPE:“ determines whether the measured value recording is initiated during increase or decrease of values.

„AUTO READY“ If “AUTO READY” is switched on “YES”, recording is repeated automatically. When **all** start criteria are compiled, the recording starts again. The measurement will not continue when memory is full or if STOP / ESC is used.

“STOP / ESC” finishes the setting and exits the menu.

return to menu „RECORD“

```
ESC      -- RECORD --                   ▲ ▼
MEAS:                          3   PRGM
MEM.AVAIL.=                        38 %
TEXT>                              Kreis1
START/STOP->
PRGRM.REC>
RECORD->
CLR. MEM:                          ALL
```

menu „RECORD->“ starts the recording mode.

```
MEAS:3     READY>START
1            223.6          10    bar
2                               bar
3             77.5           0    U/min
```

„STOP / ESC“ stops the recording mode. Then the menu „RECORD“ is displayed.

Pressing **„START / ENTER“** and **„RECORD“**, respectively, starts the recording.

start recording

```
MEAS:3      READY
1              223.6        10    bar
2                                 bar
3               77.5         0    U/min
```

The measurement instrument is in the stand-by mode. The instrument starts the recording when **all** previously programmed settings are met.

By pressing the **“STOP / ESC“ -key** the measurement can be stopped prematurely. Nevertheless, the recorded measured values can be saved. If the measurement is terminated after the measurement time has expired with the menu item “AUTO READY” switched off, the same menu is displayed.

stop current measurement

```
RECORD     END
MEAS: 4    SAVE?

ENTER = YES
ESC = NO
```

select function value (YES,NO).

the menu “RECORD”
is displayed“

```
ESC      -- RECORD --                  ▲ ▼
MEAS:                          3   PRGM
MEM.AVAIL.=                        38 %
TEXT>                              Kreis1
START/STOP->
PRGRM.REC>
RECORD->
CLR. MEM:                          ALL
```

If “AUTO READY” is switched on, recording is repeated automatically. When all start conditions are met the recording starts again. The measurement will be concluded when memory is full or if **“STOP / ESC”** is used.

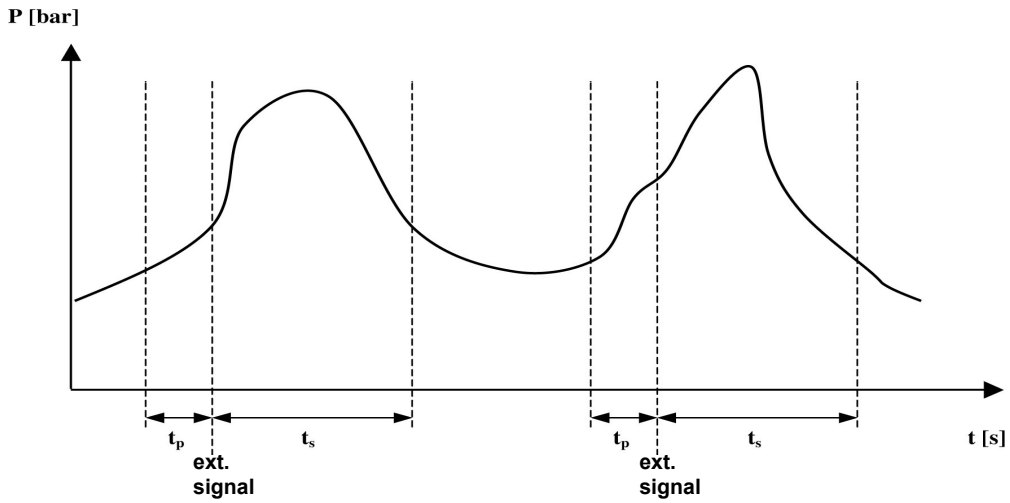
5.3.2 Externally triggered recording

The trigger adapter PPC-06/12-TR-A is needed for the externally triggered recording. Please note that the electrical connection is a floating output type, for example by connecting to a relay or a galvanic separated element.

Please pay attention to the PPC-06/12-TR-A adapter instructions.

The externally triggered recording will be started after an external signal (for example by opening or closing of a valve).

Scheme for externally triggered recording



t_g → recording time
t_s → storage time
t_p → pre-trigger time

The **storage time t_g** defines the total recording time. **$t_g = t_s + t_p$**

In the **storage time t_s** the measured values will be recorded. The storage time is set by the user before recording (“DURATION”).

The **pre-trigger time t_p** is the storage time **<u>before</u>** the measurement is initiated.

This example describes an externally triggered differential pressure measurement. The pressure is measured on input I1 and I2 , before and after the valve. The measurement is initiated by an external signal (open valve). For 10 seconds the measured values will be recorded.

By pressing **"RECORD"** the menu "RECORD" is shown on the display.

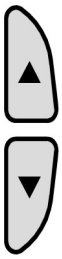
press **„RECORD"**

```
ESC      -- RECORD --                ▲ ▼
MEAS:                        3   PRGM
MEM.AVAIL.=                      38 %
TEXT>                            Kreis1
START/STOP->
PRGRM.REC>
RECORD->
CLR. MEM:                        ALL
```

Names (with a maximum of 15 characters) for the measurements can be given by the menu item „TEXT".

The further text input is described in chapter 3.1.6.

The start / stop parameters of the automatic measurement are set up under the menu item "PRGRM.REC>".



select menu item
"PRGRM.REC>"

```
ESC      -- RECORD --                ▲ ▼
MEAS:                        3   PRGM
MEM.AVAIL.=                      38 %
TEXT>                            Kreis1
START/STOP->
PRGRM.REC>
RECORD->
CLR. MEM:                        ALL
```

confirm menu item
"PRGRM.REC>"

```
ESC      - PRGM REC --               ▲ ▼
START REC                        AUTO
DURATION                         10 s
PRE-TRIGGER                      0.5 s
START In:                        I1
LEVEL:                           50 bar
STARTSLOPE:                      FALLING
AUTO READY                       NO
```

select menu item „START REC“ and select function value „EXTERN“

```
ESC      - PRGM REC --          ▲▼
START REC                       EXTERN
DURATION                        10 s
PRE-TRIGGER                     0.5 s
STARTSLOPE:                     CLOSE
AUTO READY                      NO
```

„START REC“ selects the memory procedure. For the external initiated recording the function value “EXTERN” has to be chosen.

„DURATION“ defines the recording time inclusive of the trigger-time

„PRE-TRIGGER“ defines the storage time **before** the measurement is initiated.

„STARTSLOPE:“ defines whether the recording is initiated by opening or closing valve.

„AUTO READY“ If “AUTO READY” is switched on “YES”, recording is repeated automatically. When **all** start criteria are complied, the recording starts again. The measurement will not continue when memory is full or if STOP / ESC is used.

“STOP / ESC” finishes the setting and exits the menu.

return to menu „RECORD“

```
ESC      -- RECORD --                ▲▼
MEAS:                        3   PRGM
MEM.AVAIL.=                      38 %
TEXT>                            Kreis1
START/STOP->
PRGRM.REC>
RECORD->
CLR. MEM:                        ALL
```

menu „RECORD->“ starts the recording mode.

```
MEAS:3     READY>START
1            223.6        10    bar
2                         bar
3             77.5         0    U/min
```

„STOP / ESC“ stops the recording mode. Then the menu „RECORD“ is displayed.

Pressing **„START / ENTER“** and **„RECORD“**, respectively, starts the recording.

start recording

```
MEAS:3      READY
1              223.6        10    bar
2                                 bar
3               77.5         0    U/min
```

The measurement instrument is in the stand-by mode. The instrument starts the recording when **all** previously programmed settings (external signal → valve opens) are met.

By pressing the **“STOP / ESC“ -key** the measurement can be stopped prematurely. Nevertheless, the recorded measured values can be saved. If the measurement is terminated after the measurement time has expired with the menu item “AUTO READY” switched off, the same menu is displayed.

stop current measurement

```
RECORD     END
MEAS: 4    SAVE?

ENTER = YES
ESC = NO
```

select function value (YES,NO).

the menu “RECORD”
is displayed“

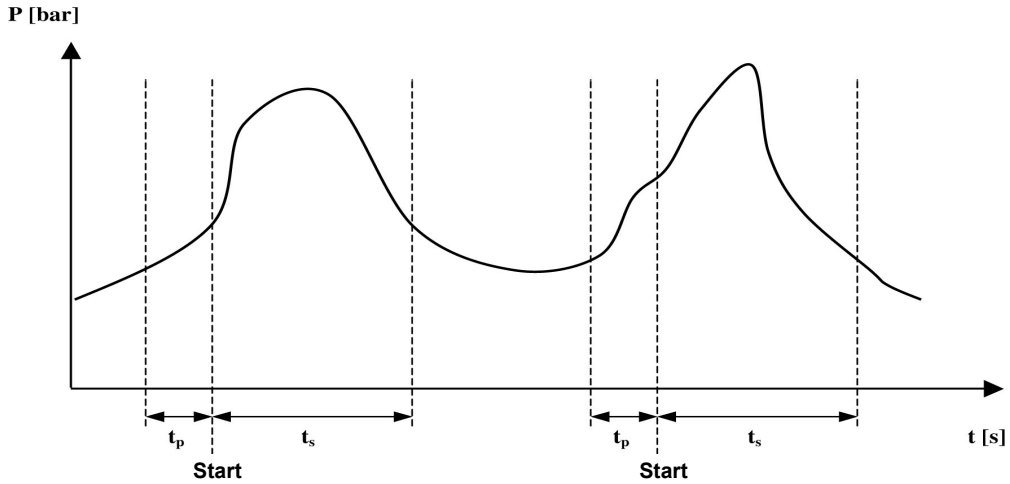
```
ESC      -- RECORD --                  ▲ ▼
MEAS:                          3   PRGM
MEM.AVAIL.=                        38 %
TEXT>                              Kreis1
START/STOP->
PRGRM.REC>
RECORD->
CLR. MEM:                          ALL
```

If “AUTO READY” is switched on, recording is repeated automatically. When all start conditions are met the recording starts again. The measurement will be concluded when memory is full or if **“STOP / ESC”** is used.

5.3.3 Manually triggered recording

Manually triggered and time controlled recording is initiated by pressing “START”.

Scheme for manually triggered and time controlled recording**:**



t_g → recording time
t_s → storage time
t_p → pre-trigger time

The **storage time t_g** defines the total recording time. **$t_g = t_s + t_p$**

In the **storage time t_s** the measured values will be recorded. The storage time is set by the user before recording (“DURATION”).

The **pre-trigger time t_p** is the storage time **before** the measurement is initiated. The signal curve **before** pressing **“START”** will be recorded by the pre-trigger.

This example describes a manual and time controlled recording. The user starts the measurement with **“START / ENTER”**. After 10 seconds the measurement will be stopped automatically.

By pressing **“RECORD”** the menu “RECORD” is shown on the display.

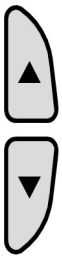
press **„RECORD“**

```
ESC      -- RECORD --                ▲ ▼
MEAS:                          3     PRGM
MEM.AVAIL.=                          38 %
TEXT>                                Kreis1
START/STOP->
PRGRM.REC>
RECORD->
CLR. MEM:                            ALL
```

Names (with a maximum of 15 characters) for the measurements can be given by the menu item „TEXT“.

The further text input is described in chapter 3.1.6.

The start / stop parameters of the automatic measurement are set up under the menu item “PRGRM.REC>”.



select menu item
“PRGRM.REC>”

```
ESC      -- RECORD --                ▲ ▼
MEAS:                          3     PRGM
MEM.AVAIL.=                          38 %
TEXT>                                Kreis1
START/STOP->
PRGRM.REC>
RECORD->
CLR. MEM:                            ALL
```

confirm menu item
“PRGRM.REC>”

```
ESC      - PRGM REC --               ▲ ▼
START REC                            AUTO
DURATION                             10 s
PRE-TRIGGER                          0.5 s
START In:                            I1
LEVEL:                               50 bar
STARTSLOPE:                          FALLING
AUTO READY                           NO
```

select menu item „START REC“ and select function value „MANU“

```
ESC      - PRGM REC --          ▲ ▼
START REC                       MANU
DURATION                        10 s
PRE-TRIGGER                     0.5 s
```

„START REC“ selects the memory procedure. For the manually triggered and time controlled recording the function value “MANU” has to be chosen.

„DURATION“ defines the recording time inclusive of the trigger-time

„PRE-TRIGGER“ defines the storage time **before** the measurement is initiated.

“STOP / ESC” finishes the setting and exits the menu.

return to menu „RECORD“

```
ESC      -- RECORD --                   ▲ ▼
MEAS:                          3   PRGM
MEM.AVAIL.=                        38 %
TEXT>                              Kreis1
START/STOP->
PRGRM.REC>
RECORD->
CLR. MEM:                          ALL
```

menu „RECORD->“ starts the recording mode.

```
MEAS:3     READY>START
1            223.6          10    bar
2                               bar
3             77.5           0    U/min
```

„STOP / ESC“ stops the recording mode. Then the menu „RECORD“ is displayed.

Pressing **„START / ENTER“** and **„RECORD“**, respectively, starts the recording.

start recording

```
MEAS:3      READY
1              223.6        10    bar
2                                 bar
3               77.5         0    U/min
```

The measurement instrument is in the stand-by mode. After pressing **“START / ENTER“** once again the measured values will be recorded.

By pressing the **“STOP / ESC“ -key** the measurement can be stopped prematurely. Nevertheless, the recorded measured values can be saved. If the measurement is terminated after the measurement time has expired with the menu item “AUTO READY” switched off, the same menu is displayed.

stop current measurement

```
RECORD     END
MEAS: 4    SAVE?

ENTER = YES
ESC = NO
```

select function value (YES,NO).

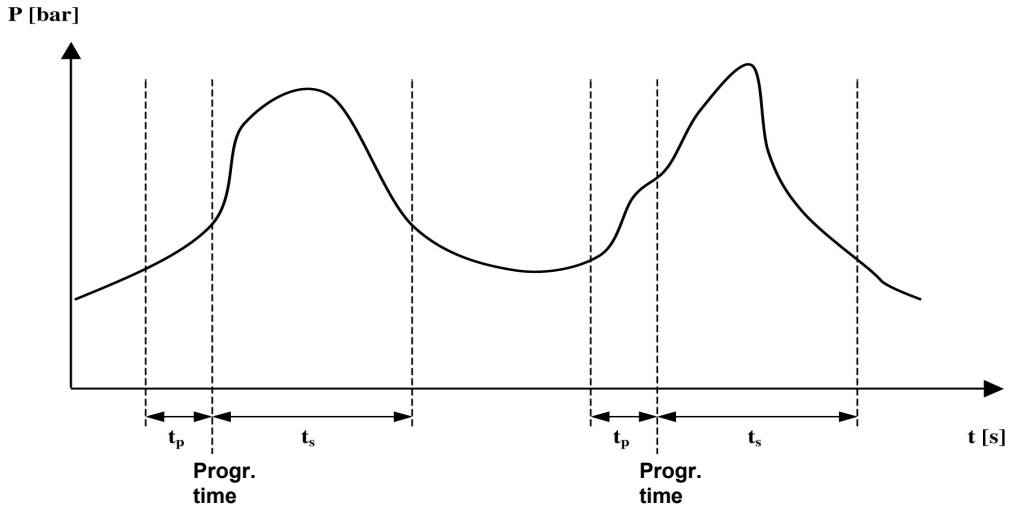
the menu “RECORD”
is displayed“

```
ESC      -- RECORD --                    ▲ ▼
MEAS:                          3   PRGM
MEM.AVAIL.=                        38 %
TEXT>                              Kreis1
START/STOP->
PRGRM.REC>
RECORD->
CLR. MEM:                          ALL
```

5.3.4 Time triggered recording

The time controlled recording is initiated and stopped by a timer.

Scheme for time recording



t_g → recording time
t_s → storage time
t_p → pre-trigger time

The **storage time t_g** defines the total recording time. **$t_g = t_s + t_p$**

In the **storage time t_s** the measured values will be recorded. The storage time is set by the user before recording ("DURATION").

The **pre-trigger time t_p** is the storage time **before** the measurement is initiated. The signal curve prior to the timer signal will be recorded by the pre-trigger.

This example shows a time triggered recording. The recording starts when the timer reaches the user given starting hour (16:00). After 10 seconds the measurement will be stopped automatically.

After pressing **"RECORD"** the menu "RECORD" is displayed.

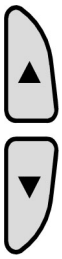
press **„RECORD"**

```
ESC      -- RECORD --                ▲ ▼
MEAS:                        3   PRGM
MEM.AVAIL.=                      38 %
TEXT>                            Kreis1
START/STOP->
PRGRM.REC>
RECORD->
CLR. MEM:                        ALL
```

Names (with a maximum of 15 characters) for the measurements can be given by the menu item „TEXT".

The further text input is described in chapter 3.1.6.

The start / stop parameters of the automatic measurement are set up under the menu item "PRGRM.REC>".



select menu item
"PRGRM.REC>"

```
ESC      -- RECORD --                ▲ ▼
MEAS:                        3   PRGM
MEM.AVAIL.=                      38 %
TEXT>                            Kreis1
START/STOP->
PRGRM.REC>
RECORD->
CLR. MEM:                        ALL
```

confirm menu item
"PRGRM.REC>"

```
ESC      - PRGM REC --               ▲ ▼
START REC                        AUTO
DURATION                         10 s
PRE-TRIGGER                      0.5 s
START In:                        I1
LEVEL:                           50 bar
STARTSLOPE:                      FALLING
AUTO READY                       NO
```

select menu item „START REC“ and select function value „CLOCK“

```
ESC      - PRGM REC --          ▲ ▼
START REC                       CLOCK
TIME>                           16:00 s
DURATION                        10 s
```

„START REC“ selects the memory procedure. For the manually triggered and time controlled recording the function value “MANU” has to be chosen.

„TIME“ sets the starting hour and minute for data recording.

„DURATION“ defines the recording period.

“STOP / ESC” finishes the setting and exits the menu.

return to menu „RECORD“

```
ESC      -- RECORD --                   ▲ ▼
MEAS:                          3   PRGM
MEM.AVAIL.=                        38 %
TEXT>                              Kreis1
START/STOP->
PRGRM.REC>
RECORD->
CLR. MEM:                          ALL
```

menu „RECORD->“ starts the recording mode.

```
MEAS:3     READY>START
1            223.6          10    bar
2                               bar
3             77.5           0    U/min
```

„STOP / ESC“ stops the recording mode. Then the menu „RECORD“ is displayed.

Pressing **„START / ENTER“** and **„RECORD“**, respectively, starts the recording.

start recording

```
MEAS:3      READY
1              223.6        10    bar
2                                 bar
3               77.5         0    U/min
```

The measurement instrument is in the stand-by mode. After pressing **“START / ENTER“** once again the measured values will be recorded.

By pressing the **“STOP / ESC“ -key** the measurement can be stopped prematurely. Nevertheless, the recorded measured values can be saved. If the measurement is terminated after the measurement time has expired with the menu item “AUTO READY” switched off, the same menu is displayed.

stop current measurement

```
RECORD     END
MEAS: 4    SAVE?

ENTER = YES
ESC = NO
```

select function value (YES,NO).

the menu “RECORD”
is displayed“

```
ESC      -- RECORD --                    ▲ ▼
MEAS:                          3   PRGM
MEM.AVAIL.=                        38 %
TEXT>                              Kreis1
START/STOP->
PRGRM.REC>
RECORD->
CLR. MEM:                          ALL
```

5.4 Memory output

The following chapters describe the possible memory output of the measurement values.

There are three kinds of memory outputs:

1. DIN A4 printer
2. on display (curve)
3. on the PC / Laptop

For a correct data transfer the baud rate for the PC to the PPC-06/08/12 has to be adjusted (see chapter 6.1). This adjustment can be done by an RS 232 interface test (see chapter 6.1.1) when using PPC-Soft (chapter 7.).

When pressing **"DATA OUTPUT"** the memory output will be activated. The menu "DATA OUT" is displayed..

press **„DATA OUTPUT"**

```
ESC      -- DATA OUT --
DATA FROM:          MEMORY
OUTPUT TO:          Thermo
MEASUREMENT:        12
In>                 1 2
DISPL.TYPE          MIN-MAX
FORMAT:             NORMAL
START>
```

„DATA FROM:" shows the data source (MEMORY = measured value memory or ONLINE = actual measured value).

„OUTPUT TO:" selects the output instrument (Thermo, CanBJ85, HPDJ340, PC, DISPLAY)

„MEASUREMENT:" selects the desired individual measurement from the memory

„In>" defines the output channels:

DISPLAY	1 channel
PC	all channels are transferred

To change the number of channels, select menu item „In>". The menu „CHOOSING INPUT" is displayed.

select menu item „In>“ and confirm

```
In        - CHOOSING INPUT -
1         *
2
3
4
5
6
```

select the output channels

```
In        - CHOOSING INPUT -
1         *
2         *
3         *
4
5
6
```

stop selection

```
ESC      -- DATA OUT --                ▲▼
DATA FROM:          MEMORY
OUTPUT TO:          Thermo
MEASUREMENT:        12
In>                 1 2
DISPL.TYPE          MIN-MAX
FORMAT:             NORMAL
START>
```

“DISPL.TYPE” selects the output of the curves. The function value MIN-MAX results in MIN and MAX curves from every channel. The function value MEAN calculates the middle curve from the MIN and MAX curve and prints only this curve.

„FORMAT:“ selects the output format of the curves. With the function value ZOOM the curves are enlarged 3 times on the x-axis (3 fold length of the printout).

„START>“ starts the data transfer.

After the data transfer the display shows the actual measured values.

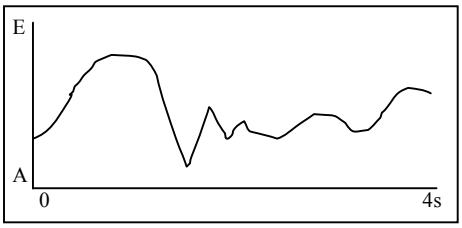
The following are some examples of memory outputs:

1. on display (curve)

before output is displayed, the parameters must be specified

ESC GRAPHIC PARAM	
GRAPH START>	
MEASUREMENT:	5
IN:	3
START:	0 bar
END:	600 bar
TIME FROM:	0 s
TIME TO:	2 s

only one Channel can be displayed



2. on the PC / Laptop

after starting the data output „DATATRANSFER“ is displayed

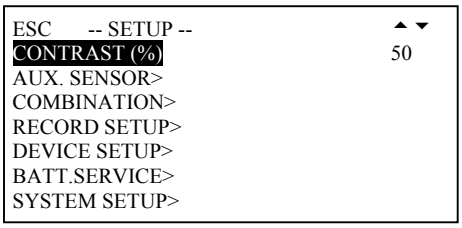
DATATRANSFER
PLEASE WAIT

CANCEL = STOP

6 Configuration PPC-06/08/12

Instrument configuration can be changed by pressing **"SETUP / OPTION"**. The menu SETUP is shown on the display. It is possible to set and change contrast, auxiliary sensors (chapter 4), calculations in the optional line (chapter 3.2.6), recording-, instrument- and system settings, as well as rechargeable battery service.

press **„SETUP / OPTION"**



„CONTRAST (%)" setup the display contrast (0-100, increments of 5)

„AUX. SENSOR>" see chapter 4

„COMBINATION>" see chapter 3.2.6

„RECORD SETUP>" see chapter 5.2

„DEVICE SETUP>" see chapter 6.1

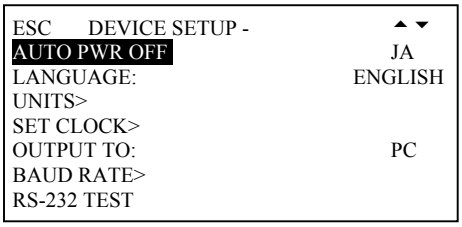
„BATTERY SERVICE>"see chapter 6.2

„SYSTEM SETUP>" see chapter 6.3

6.1 Device Setup

Menu item „DEVICE SETUP“ defines the automatic instrument shut-off, language, units, time, output instrument for data output and the baud rate. In addition, a RS 232 interface test (chapter 6.1.1) is also possible.

select menu item
„DEVICE SETUP“



„AUTO PWR OFF“ shuts the instrument off automatically when it is not used. The function is active, when YES is selected as the function value.

„LANGUAGE:“ choose between the languages German, English and French

„UNITS>“ The following units can be chosen:

PRESSURE=	bar, PSI
TEMPERATURE=	°C, °F
FLOW RATE=	l/min , GPM
ROTATIONAL SPEED=	U/min, RPM

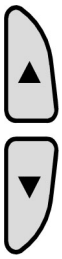
„SET CLOCK>“ set date and time

„OUTPUT TO:“ choose data output:
PC (with PPC-Soft (chapter 7.), DISPLAY

„BAUD RATE>“ When using the PC and Windows based PC printer it is possible to choose between the following baud rates:
1200, 2400, 4800, 9600, 19200, 38400 Baud.

6.1.1 RS 232 interface test

With the RS 232-test, the PC is adapted to the baud rate of the PPC-06/08/12. The PC sends a signal with the smallest baud rate possible and increases it until the PPC recognises the signal and then acknowledges the receipt. This test can only be used in connection with **PPC-Soft** Software packet (chapter 7.).



select menu item
”RS-232 TEST”

```
ESC     -DIVICE SETUP -          ▲▼
AUTO PWR OFF                     JA
LANGUAGE:                     ENGLISH
UNITS>
SET CLOCK>
OUTPUT TO::                       PC
BAUD RATE>
RS-232 TEST
```

start test

```
RS-232 TEST:  RUNNING
```

Interface test
ended successfully

```
RS-232 TEST: OK
```

6.2 Battery Service

The function “BATT.SERVICE” manages the actual charge rate of the rechargeable battery. If the main power supply is connected, the rechargeable batteries will be recharged. The instrument shuts off automatically when rechargeable batteries are empty.

!!! If the Battery Service is running all keys are locked!!!

Note :
When charging and recharging the NiCd cells very often, a memory effect can appear. The capacity of the rechargeable battery is decreasing dramatically and leads to shorter operating times. The full capacity can be restored by a complete discharging followed by charging the batteries.

SETUP OPTION

press **„SETUP / OPTION“**

```
ESC     -- SETUP --                ▲▼
CONTRAST (%)                       50
AUX. SENSOR>
COMBINATION
RECORD SETUP>
DEVICE SETUP>
BATT.SERVICE>
SYSTEM SETUP>
```

START ENTER

Select menu item
„BATT. SERVICE“

```
ESC     -BATT.SERVICE-             ▲▼

AUTO. BATTERY
ON CHARGE:                         YES

DONT INTERRUPT!
```

START ENTER

„YES“ starts the battery service

If the battery capacity is low, the PPC-06/08/12 shows the message “BAT. SERVICE STATUS” on the display when the instrument is switched on.

```
STAUFF  TEST
PPC-12              3778R9-10101
Ladezustand:        <=50%

START BATTERY SERVICE
```

6.3 System setup

With the menu “SYSTEM SETUP” you can reset your system, select the memory concept for the next measurement or set the user identification.

press **„SETUP / OPTION“**

```
ESC      -- SETUP --                ▲▼
CONTRAST (%)                        50
AUX. SENSOR>
COMBINATION >
RECORD SETUP>
DEVICE SETUP>
BATT.SERVICE>
SYSTEM SETUP>
```

Select menu item
„SYSTEM SETUP“

```
ESC      -- SYSTEM SETUP --         ▲▼

SYSTEM RESET>

CONCEPT:                    MEAS. POINTS
POINTS/In:                  2000

USER ID>
```

„SYSTEM RESET“ sets PPC-06/08/12 to the default (chapter 6.3.1)

„CONCEPT“ sets memory functions (chapter 6.3.2)

„USER ID“ sets the user identification (company etc.) (chapter 6.3.3)

6.3.1 System Reset

You can reset your system - with exception of language, units and time - to the default settings of STAUFF PPC-06/08/12 with the menu item “SYSTEM RESET>”. The instrument reverts to default settings when system reset is selected.

```
ESC      -- SYSTEM SETUP --          ▲▼

SYSTEM RESET>

CONCEPT:                    MEAS. POINTS
POINTS/In:                  2000

USER ID>
```

START ENTER

select „SYSTEM RESET“ and confirm

```
ESC      -- SYSTEM RESET --          ▲▼

SET PARAMETERS
(EXCEPT LANGUAGE,
CLOCK, UNITS) TO

FACTORY SETTINGS:                    NO
```

To set the PPC-06/08/12 to the default, set function value to „YES“

6.3.2 Memory setting

With the menu item „CONCEPT:“ you can choose between the memory function values „MEAS.POINTS“ and „STORE.RATES“.
By selecting the „MEAS. POINTS“ you can make a choice between 1000, 2000 and 4000 measurement points/channel per measurement.
For a better understanding see at example calculation in chapter 5.1.

By selecting the function value „STORE RATES“ you can choose the measurement memory rate, which can be varied from 1 to 10,000 ms.
A value of 500 ms means, that all 500 ms 1 MIN -value, 1 MAX -value and the average value per channel are stored.

If „MEAS. POINTS“ is selected as the menu item, then 1000, 2000 and 4000 measurement points per channel can be chosen.

```
ESC     -- SYSTEM SETUP --        ▲▼

SYSTEM RESET>

CONCEPT:                  MEAS.POINTS
POINTS/In:                2000

USER ID>
```

If „STORE RATES“ is selected in the menu item, then the store rate in ms can be chosen.

```
ESC     -- SYSTEM SETUP --        ▲▼

SYSTEM RESET>

CONCEPT:                  STORE RATES
STORE/ms:                 1

USER ID>
```

It is recommended to work with the „CONCEPT“ value „MEAS. POINTS“, which is also the selection in the default settings.

6.3.3 User identification

The menu item USER ID identifies the company and the user. This data is shown on any printout.

```
ESC      -- SYSTEM SETUP --

SYSTEM RESET>

CONCEPT:                    MEAS: POINTS
POINTS/In:                  2000

USER ID>
```

Select menu item „USER ID“ and confirm

```
ESC      -- USER ID --
INFO PRINTOUT
4 CHARACTERS max

1: Stauff Test
2: Germany
3:
4:
```

Further text input is described in chapter 3.1.6.

7 Quickstart PC-software PPC-SOFT

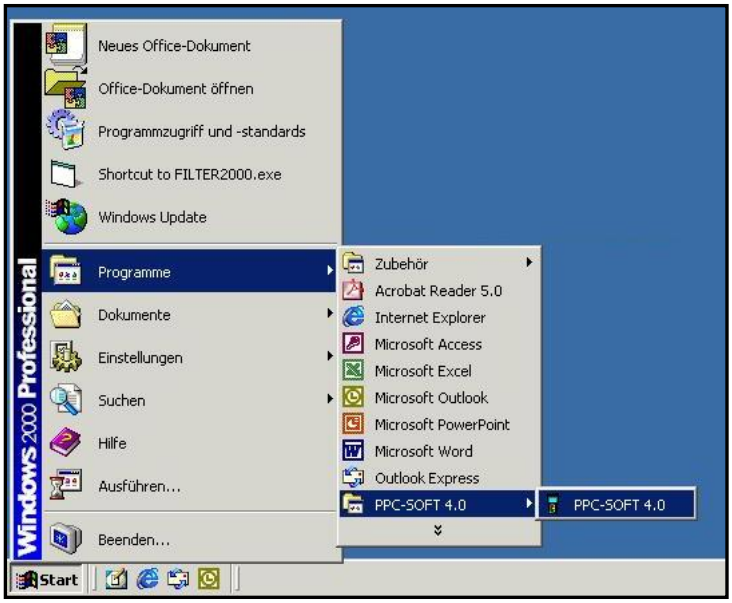
The PC-software PPC-Soft (for Windows 95® / 98® / XP® and Windows NT®) can be used to make graphic and tabular analysis of the measurement values. The values can be transferred from the memory of the PPC-06/08/12 or directly recorded by the online mode of the PPC-06/08/12.
This chapter shows a rough overview of the PC-software display possibilities and measurement analysis.
For more information please have a look at the online help of PC-Soft:

7.1 Installation

Please insert the provided installation-disk Nr.1, and start the file „Setup.exe“.

Now, please follow the installation instructions on the monitor.

After a successful installation please start the program via the Windows-Start menu:

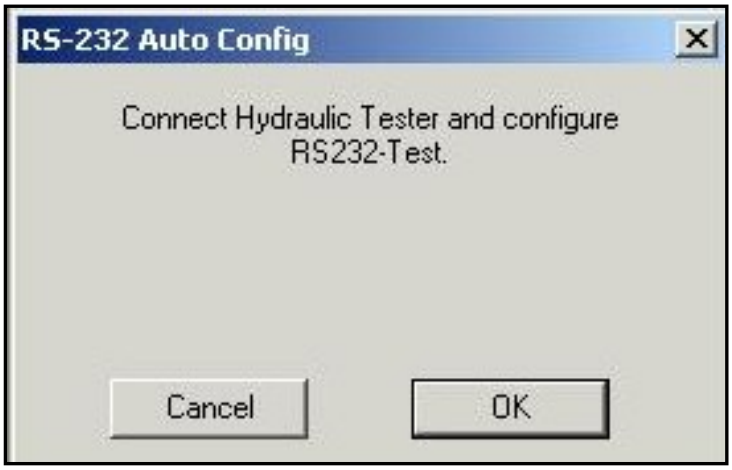


7.2 RS 232 interface test

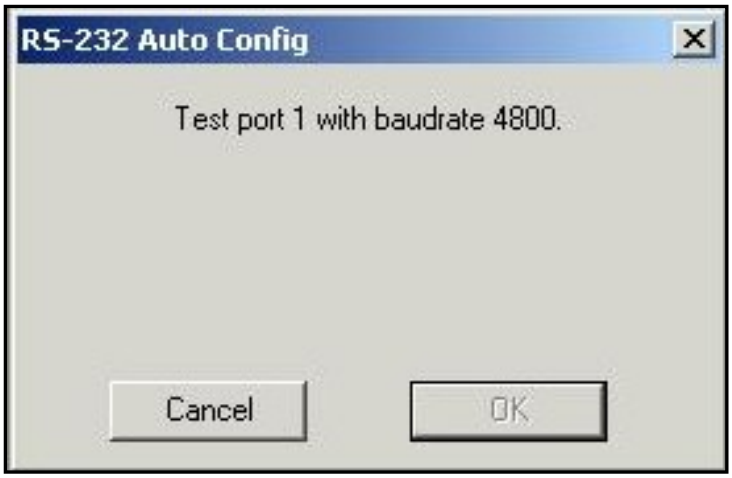
Before the measurements of the PPC-06/08/12 can be transferred to the PC, a RS 232 interface test should be done.
The provided RS 232 cable has to be connected to the COM port of the PC and the RS 232 interface of PPC-06/08/12.

select menu item „Hydraulic Tester Auto-Config...“:

following window is dispalyed:



Select the menu item RS 232 test on the PPC-06/08/12 and start the interface test on the device. (see chapter 6.1.1). After that confirm “OK“ on the PC.

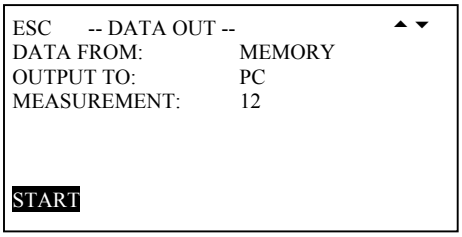


After finishing the RS 232 interface test, the PC and the PPC-06/08/12 are adjusted according to the baud rate. Now you can start working together with PC and PPC.

7.3 Measurement transfer from PPC-06/08/12 to PC-Soft

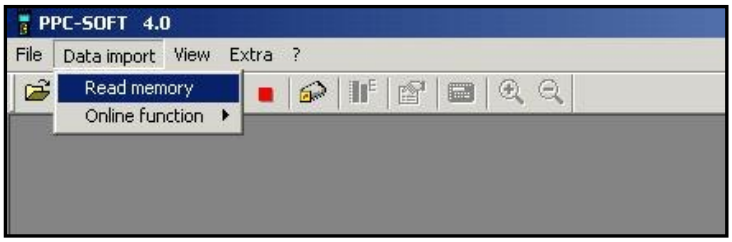
To transfer a measurement out of the PPC-06/08/12 memory press „DATA OUTPUT“.

press **„DATA OUTPUT“**

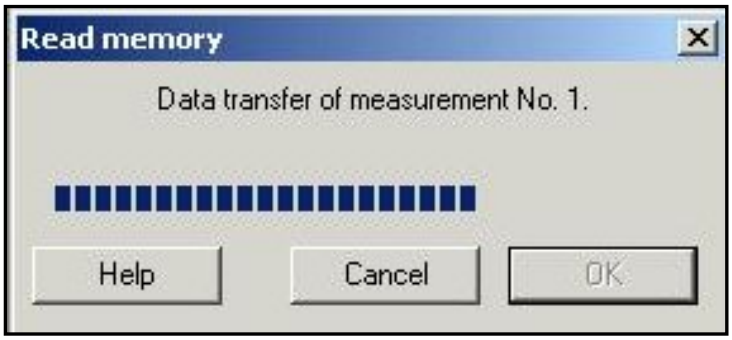


Make settings and start transfer (chapter 5.4).

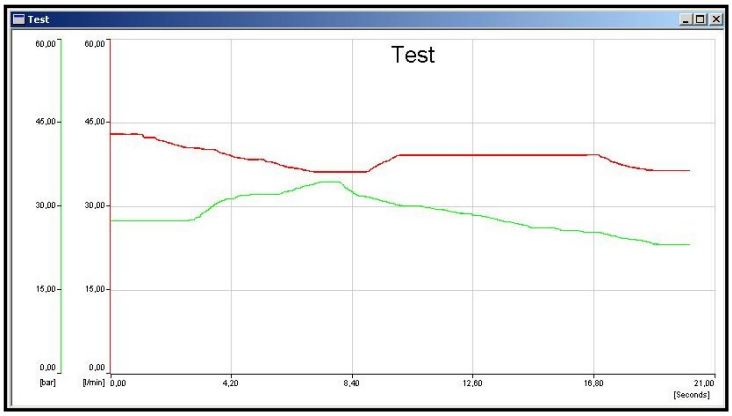
Select the menu „Read memory“ on PC.



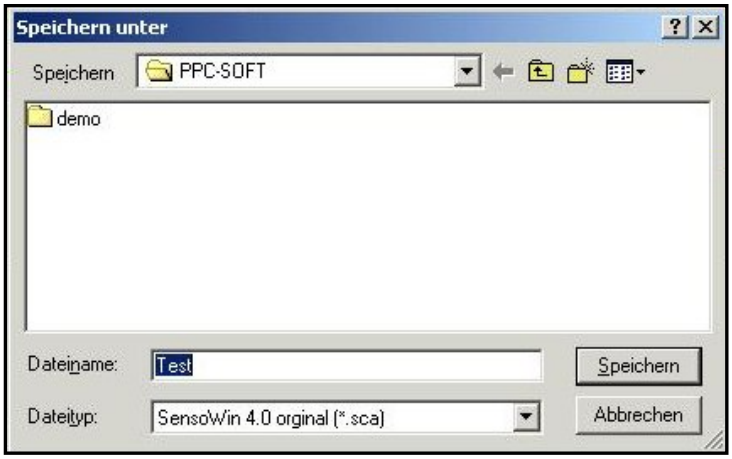
The following window shows the progress status.



After finishing, the transferred measurement is graphically displayed on the Monitor.



The user is asked to save the original measurement.

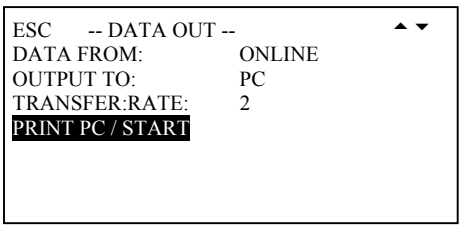


Please note!!!
There are two possibilities to save the measurements. The original file is basically saved with the suffix „.SCA“. It isn't possible to modify this file type.
If for example, values or calculations are inserted, or other things are changed in the measurement, the file can be stored only with the suffix ".SCB".
Therefore it’s guaranteed that original measurements can not be manipulated.

7.4 Measurement recording by online mode

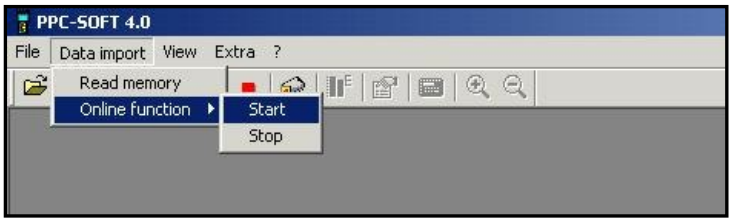
The online mode enables the PPC-06/08/12 to send measurements directly to the PC, therefore allowing real time display with PPC-Soft.

press **„DATA OUTPUT“**



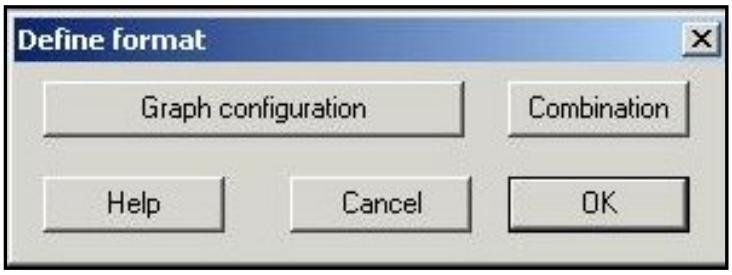
Make settings and start transfer (chapter 5.4).

Select the menu „Online Function / Start“ on PC.

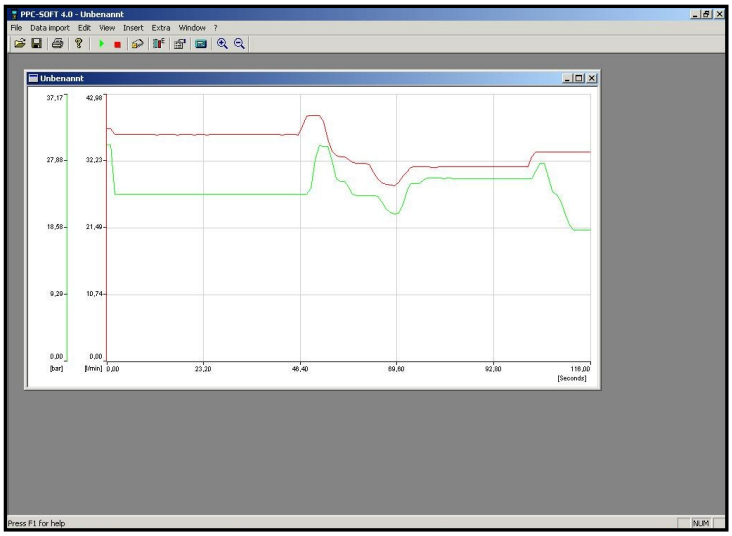


The following window is displayed:

Start the data communication on PPC 06/08/12 with " PC PRINT / START " and confirm on PC with "OK". In the next step the standard attributes like color, units, linkage etc. can be changed. After that confirm with "OK".

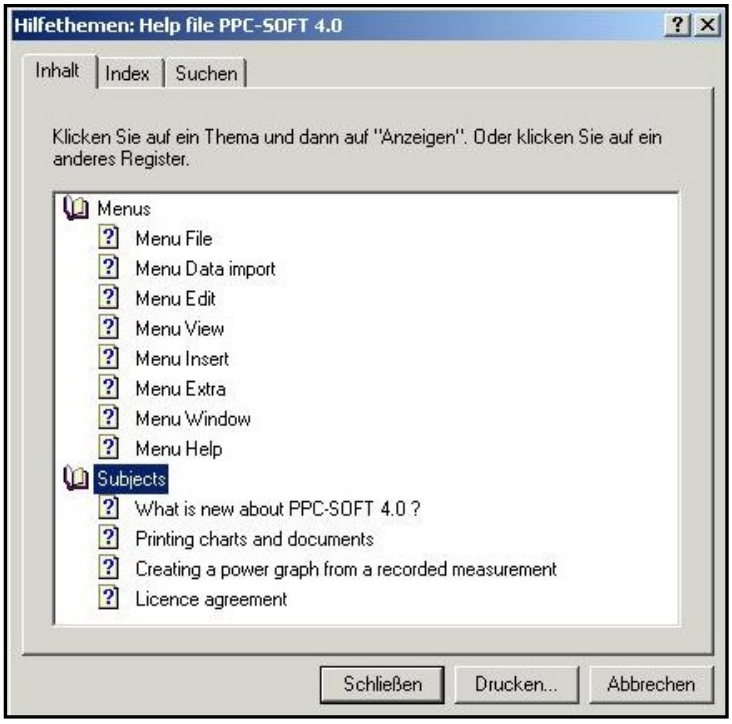


The measured values are displayed online with the chosen settings on the Monitor, so that the process can be shown in real time.



7.5 Online-Help

For further information about the operation and range of the PPC-Soft software, extensive online help is available.



8 Technical Appendix – Memory Management

8.1 Expressions and Definitions

All functions and setups concerning the memory management are described in order to use the most effective adjustment for data recording.

- **Scanning (sample) Rate:** Time distance between two readings.
  The PPC-06/08/12 operates with a constant scanning rate of 1 ms = 1000 readings per second. Each channel (Input) is scanned simultaneously.

- **Memory Interval:** Time distance between two readings is saved.
  This interval is not depending of the scanning rate. The memory interval has to be defined in a certain form.

- **Memory –Rate (Sample-Rate):** Number of readings per time which to be saved.
  A memory rate of 1 ms = sample rate of 1000 readings / sec.

- **Act Reading:** This is the actual figure, (Act-value), which is measured by the system.
  The reading (**Act-value**) is always at the beginning of a scanning or memory interval.

- **MIN/MAX-Reading**: The maximum and minimum reading per interval.
  (Sample- or memory -Interval).

- **Measuring Time/Recording Time:** Duration Time of recording session**.**
  The user selects the recording time. Maximum is 100 hours.

- **Memory Capacity (MIN and MAX pts):** Total memory capacity**.**
  The ServiceMaster's memory capacity is specified by MIN/MAX Points.

Recording (Measurement): Up to six channels can be recorded. All connected sensors are recorded and the data are saved.

8.2 Recording time, Memory -Interval and Memory capacity

$$\textbf{Recording Time} = \frac{\textbf{Memory Capacity}}{\textbf{Sample Rate}} = \frac{\textbf{250.000}}{\textbf{1000}\ \frac{\textbf{1}}{\textbf{sec}}} = \textbf{250 sec}$$

The memory -rate = sample -rate (1 ms = 1000 readings /sec). According to the available memory capacity of 250.000 Points (Readings) after 250 seconds the memory capacity runs out. (app. 4 min).

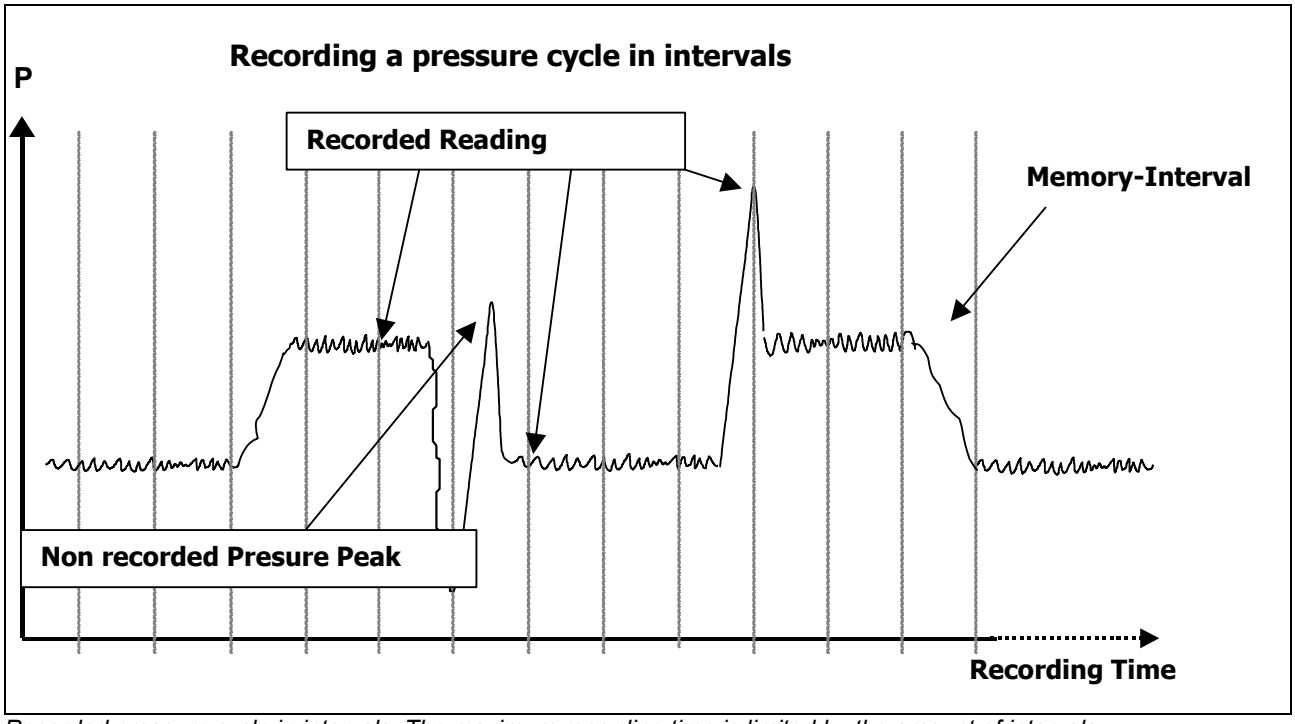
This calculation is valid for **one** Input (channel). Using more than one channel, the total recording time is getting less.

$$\textbf{Recording Time} = \frac{\textbf{Memory Capacity}}{\textbf{Sample Rate}} = \frac{\textbf{250.000}}{\textbf{1000}\ \frac{\textbf{1}}{\textbf{sec}}\ \textbf{x 3 channels}} = \textbf{83,3 sec}$$

$$\textbf{Recording Time} = \frac{\textbf{Memory Capacity}}{\textbf{Sample Rate}} = \frac{\textbf{250.000}}{\textbf{1000}\ \frac{\textbf{1}}{\textbf{sec}}\ \textbf{x 6 channels}} = \textbf{42,5 sec}$$

Capturing fast pressure peaks is a very important issue when analyzing your hydraulic system. The error will appear in a certain period, which is not predictable. Checking the hydraulic must be done several times in order to get the failure reason. In a production line which is running in a 3 shift operation mode failures appearing maybe after several hours. When measuring (recording the readings) in order to find the fail function, several parameters have to be recorded. (e.g. pressure, flow-rate and oil temperature).

There is a conflict between capturing of fast pressure peaks and required recording time.



Recorded pressure cycle in intervals. The maximum recording time is limited by the amount of intervals. Recorded readings are at the beginning of each interval. (Static memory)

Within this procedure the memory capacity is divided by the selected recording time. A pressure peak appearing between these intervals is not recorded.

In order to record (capture) pressure peaks in short time periods, the recording must be done very fast. (Memory rate = Sampling rate)

CONCLUSION:

- Common memory procedures are conditional recording fast pressure peaks.
- Only one reading per interval.
- Selecting a short interval, the recording time is limited.

Fast pressure peaks (millisecond time period) are **not** recorded for **longer recording times**.

8.3 Recording a fix number of MIN/MAX-readings per channel

This conflict is does not exist for the PPC-06/08/12, using a simple trick:

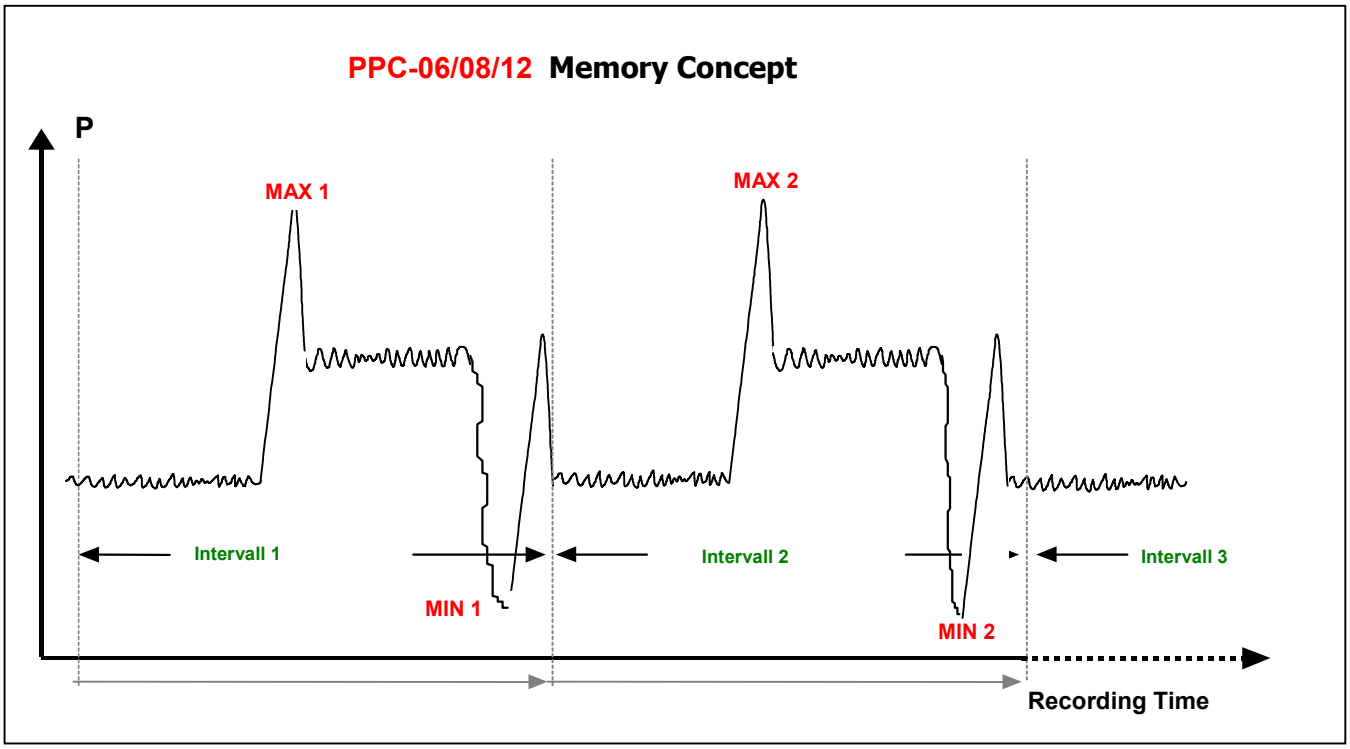
For every recorded channel the amount of data points (readings) is equal. Each interval is contents one minimum and one maximum reading. The time distance between every interval depends only from selected recording time. With the menu ***memory concept / Points*** the setup can be changed.

$$\textbf{Recording Time} = \frac{\textbf{Memory Capacity}}{\textbf{Sample Rate}}$$

$$\textbf{Sample Rate} = \frac{\textbf{Memory Capacity (1 Channel)}}{\textbf{Recording Time}}$$

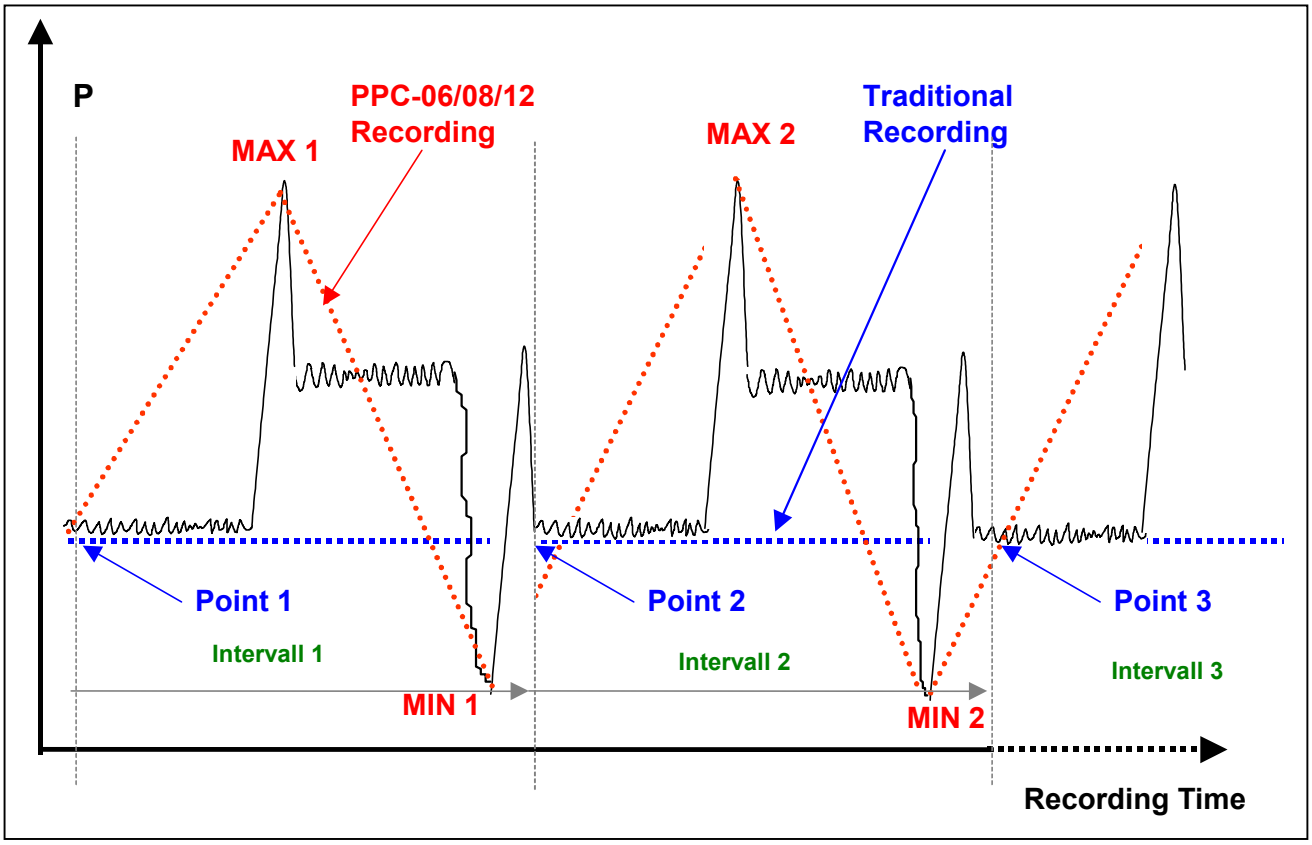
Fixing the memory capacity for one channel (e.g. 4000 points), the time period between saved readings is changing acc. to selected recording time.

$$\textbf{Sample Rate} = \frac{\textbf{4.000 (1 Channel)}}{\textbf{10 min} = \textbf{600 s}} = \textbf{6 Readings per second}$$



The maximum and minimum reading is present in each interval. The operator selects the recording time (Duration). The memory interval is adjusted automatically. Sorting the MIN and MAX readings in each interval capturing of all pressure peaks is guaranteed. (Dynamic Memory Management)

8.4 Traditional Memory Concept versus PPC-06/08/12 Memory Concept



PPC-06/08/12: MIN and MAX readings represent the graph.
The amount of MIN-and MAX readings per channel (Input) is selected.
The length of each interval is automatically according to selected recording time (Duration).
Up to 100 hours can be recorded running with six channels simultaneously.

Traditional: Actual readings (Points) represent the graph.
When recording long cycles the memory interval has to be adjusted acc. to the memory capacity.
Pressure peaks are not recorded if the reading is within this interval.
There is no guarantee in order to capture all pressure peaks during the recording time.

8.5 PPC-06/08/12 Setup

The menu SETUP/OPTION selecting SYSTEM SETUP the parameters can be changed. Selecting the item CONZEPT the user is able to choose two operation modes:

A Measuring Points
Adjusting measuring points for each channel (1.000 / 2.000 or 4.000 points)

B Memory Rate
Selecting a certain memory rate = storing rate (1 ms . . 10.000 ms)

8.5.1 Measuring Points

All PPC-06/08/12 -meters delivered with a default setting of **2.000 MIN/MAX Points per channel**.

The total memory-capacity is different acc. to the versions:

PPC-Version	Channel (Input)	MIN and MAX Points Capacity
PPC-06	3	60.000
PPC-08	4	125.000
PPC-12	6	250.000

How many Recordings are filling the Memory (Total Capacity) ?

Example: A PPC-12 with a 4-channel recording (2x pressure, flow and temperature).

$$\textbf{Recordings} = \frac{\textbf{Memory Capacity}}{\textbf{Measuring Points x operated channels}}$$

$$\textbf{Recordings} = \frac{\textbf{250.000}}{\textbf{2.000 (Channel) x 4 Channel}} = \textbf{31}$$

In reality the number of connected sensors varies. Therefore the remaining memory capacity depends also on always on the operated sensors. The available memory capacity is shown in percentage.

In this example the remaining memory capacity is calculated by:

$$\textbf{250.000 - 4x2.000} = \textbf{242.000} = \textbf{96\%}$$

4% of total Memory Capacity is consumed.

This consumption is not depending on Rec. Time!!

How many readings are transferred to the Memory (Sample Rate)?

$$\textbf{Sample Rate} = \frac{\textbf{2.000}}{\textbf{10 min} = \textbf{600 s}} = \textbf{3 Readings per scond}$$

What is the time interval for each storing?

$$\textbf{Sample Rate} = \frac{\textbf{10 min} = \textbf{600 s}}{\textbf{2.000}} = \textbf{0,30 sec.} = \textbf{300 ms}$$

8.5.2 Memory –Rate = storing rate

Selecting STORE RATE this time interval (sample rate) can be set. Now the numbers of measuring points are variable and depending of selected recording time.

$$\textbf{Memory consumption} = \frac{\textbf{100 s}}{\textbf{Sample Rate}} = \frac{\textbf{100 s}}{\textbf{10 ms}} = \textbf{10.000 MIN/MAX points}$$

10.000 Points are consumed. In a 4-channel operation for each channel we have:

$$\frac{\textbf{10.000 pts}}{\textbf{4 channels}} = \textbf{2,500 pts per channel}$$

Remaining memory capacity is given by:

$$\textbf{250.000 - 10.000} = \textbf{240.000} = \textbf{96\%}$$

For one recording in a 4-channel operation 4% of total memory capacity was used.

Please Note:

When using the concept ***storing rates*** 25.000 points limit the total memory capacity.

8.6 Customer's benefits based on PPC-06/08/12 memory management (Points/Channel)

Based on the PPC-06/08/12 memory technology **all important** criteria are fulfilled:

1. Capturing pressure peaks in a millisecond period
2. Recording long cycle times and point out pressure peaks in each interval
3. No calculation of memory intervals depending on the recording time.

The dynamic memory management permanently sort out the MIN and MAX reading in each memory interval. Traditional memory techniques sampling the first reading and assign it to the corresponding memory interval. The PPC-06/08/12 selects in each interval the highest and the lowest reading and assigns it to the interval.
Due to this technique acc. to permanently **MAX and MIN** registration, the PPC-06/08/12 is able to capture all pressure peaks since the recording was started.

The number of MIN/MAX readings is equal for each input. (e.g. 4000 MIN and MAX points).
The memory capacity of 250.000 points allows up to 40 independent recording cycles.