⑰ HYDROTECHNIK

EN

MultiSystem 5060 *Plus*
Universal Portable Measuring System

Operating Instructions

Safety

Introduction

Description of the measuring instrument

Commissioning

Operation

Operating software

EN

Special functions

Cleaning and maintenance

Safety

General safety and warning information

- Never cut, damage or modify the power pack cables or place things on it.
- Never touch the power pack with wet or moist hands.
- Only connect the power pack to power supplies for which it is suited (see Chapter **Technical data** on page 24),
- Unplug the mains cable from the outlet during a thunderstorm.
- Unplug the mains cable if you detect smoke or smell, or if the mains cable is damaged.
- Ensure sufficient grounding of your installations. Inadequate grounding may lead to measuring peaks.

Handling information for the MultiSystem 5060 *Plus*

- Never expose the instrument to excessive heat or moisture and observe the technical data.
- Do not store the instrument in humid or dusty locations or at temperatures below freezing point.
- Never submerge the instrument into water or other liquids. Never let liquids come into the instrument.
- Never open the instrument.
- Do not use the instrument if it has been dripped or if the casing is damaged.
- Avoid strong magnetic fields. Keep the instrument away from electric motors or other devices which generate electromagnetic fields. Strong magnetic fields may cause malfunctions and influence measuring values.
- Prevent the formation of condensed water. If condensed water has formed you should let the instrument acclimate before you switch it on.

Information about the use of sensors and cables

- Protect the sensors from exceeding the allowed power range, mechanical overload and incorrect pin assignment.

- Make sure you enter the sensor parameters correctly when using sensors without ISDS (Intelligent Sensor Detection System).

- The measuring cables MK 01 and MKS may not be lengthened. Otherwise the shielding will be interrupted.

- The data of an ISDS sensor are read in when the measuring instrument is switched on. If sensors are reconnected the measuring instrument must be switched off and on again to allow the sensor data to be adopted.

Information about handling batteries

- Always keep batteries away from heat sources and open fire.
- Never submerge batteries into water.
- Never disassemble, repair or modify the batteries.
- Never short-circuit the contacts of batteries.
- Use only batteries that are installed or delivered by HYDROTECHNIK.
- Only charge the battery while it is mounted in the instrument.
- Dispose of used batteries as hazardous waste. Cover the contacts with insulation tape.

Disposal information
Do not dispose of this product with your household waste.
You can find more detailed information on disposal on our website at:
www.hydrotechnik.com

Information about the connection of printers

The measuring instrument supports printers with USB interface. Due to the wide variety of printers on the market, it is not possible to ensure support for all of them. In addition, the basic USB specifications are not fulfilled and maintained completely by all manufacturers. For this reason, HYDROTECHNIK only guarantees the full support of the printer *PIXMA iP4200* from *Canon Inc.* Please ask our customer service, whether your printer is supported.

Introduction

ℹ The information contained in this section is important. If you neglect them, you might loose possible guarantee demands.

Range of validity

The manual on hand is valid for measuring instruments named **MultiSystem 5060** *Plus*. It is intended for the operator of this instrument, that means the person who works with the instrument. The manual is not a technical manual. Please contact our customer service for questions, that go beyond the contents of this manual.

Copyright

The technical state by the time of delivery of instrument and manual is decisive, if no other information is given. Technical changes without special announcements are reserved. Earlier manuals are no longer valid.

The general conditions of sale and delivery of HYDROTECHNIK GmbH are valid.

Limitation of liability

We guarantee the faultless functioning of our product in accordance with our advertising, the product information by Hydrotechnik GmbH and this manual. Further product features are not guaranteed. We take no liability for the economy and faultless function if the product is used for a different purpose than that, described in the chapter **Intended use**.

Compensation claims are generally excluded, except if intention or culpable negligence by HYDROTECHNIK is proved, or if assured product features are not provided. If the product is used in environments, for which it is not suited or which do not represent the technical standard, we shall not be responsible for the consequences.

We shall assume no liability for damages to installations and systems in the surroundings of the product, which are caused by a fault of the product or an error in this manual.

We are not responsible for the violation of patents and/or other rights of third persons outside the Federal Republic of Germany.

We are not liable for damages, which result from improper operation and non-compliance with the instructions in this manual. We are not liable for lost profits and for consequential damages that arise from non-compliance with safety and warning information. We shall assume no liability for damages which result from the use of accessories and wear parts that were not delivered and/or approved by HYDROTECHNIK.

The products of HYDROTECHNIK GmbH are designed for a long life. They represent the state-of-the-art and their functions have been individually checked before delivery. The electrical and mechanical construction corresponds to the current norms and regulations. HYDROTECHNIK conducts ongoing product and market research for the further development and continuous improvement of its products.

In case of faults and/or technical trouble please contact HYDROTECHNIK customer service. We can assure that we will take immediate measures. The guarantee conditions of HYDROTECHNIKapply; if desired, we will gladly send you these.

Intended use

The measuring instrument **MultiSystem 5060** *Plus* is a mobile, hand-held instrument for the recording, storage and evaluation of measuring data, collected by sensors connected to the device.

You can connect a large variety of different sensors to the instrument, but they have to meet the requirements defined in the section **Technical data**. Any other use of the measuring instrument is considered improper. If you have any question or want to use the measuring instrument for a different purpose, please do not hesitate to contact our service staff. We will be happy to assist you with any possibly necessary configurations.

EN

Warranty

EN

In accordance with our warranty conditions, we guarantee the condition without defects for this measuring instrument for a duration of six months. Wearing parts and storage batteries are excluded from this warranty. The warranty becomes void if repair work or interventions are executed by unauthorized persons.

Within the warranty period we will repair damage or defects which are caused by a manufacturing fault. We only accept warranty claims if they are reported to us immediately after their discovery, but no later than six months after delivery. The warranty benefit is by our choice through free repair of defective parts or replacement by sound parts.

Please send the devices, for which you have made a guarantee claim, to us carriage paid and with a copy of the invoice resp. the delivery slip to the HYDROTECHNIK customer service. You can find the address at the end of this manual.

Customer obligations

The operating authority of this product has to assure, that only persons who

- know the regulations on working safety and accident prevention
- have been instructed in the operation of this product
- have read and understood this manual

are permitted to operate this product. Persons who operate this instrument are obliged to

- obey all regulations on working safety and accident prevention
- read this manual completely, especially the safety instructions in the first chapter.

Authorized personnel

Persons are considered to be authorized if they have a professional education, technical experience, knowledge of the relevant norms and regulations and if they are able to estimate their duties and recognize possible danger at an early time.

Operator of the instrument

Persons are considered to be authorized if they have been instructed in the operation of the instrument and have read and understood this manual completely.

Personnel for installation and maintenance

Persons are considered to be authorized if they have been trained in all aspects of the instrument and have read and understood this manual completely.

Description of the measuring instrument

Properties of the MultiSystem 5060 *Plus*

The **MultiSystem 5060** *Plus* is a practice-oriented, user-friendly hand-held measuring instrument supporting the user in the daily measuring functions. When using sensors with ISDS (intelligent sensor detection), the **MultiSystem 5060** *Plus* automatically identifies the connected sensors during switch-on and adopts all parameters: Measurement range, physical measurement variables, unit of measurement, signal output and characteristic curve (linearisation). You can also connect sensors without ISDS designation. The entry of the sensor parameters is then done in clear operation menus.

All measurements can be conveniently transferred to a PC using a USB cable. The software **HYDRO***com* is delivered for free with the instrument and offers comprehensive support with functions for the evaluation, presentation and printing of the measured values.

You can connect up to eight sensors and store all measured values. Calculations from the measured values as difference, sum and performance, and a first differentiation (e.g. speed from distance) are available as additional special channels for display and storage. The buffering of extreme values of the minimum and maximum measurands is always active and can be displayed by the corresponding key selection.

Connections
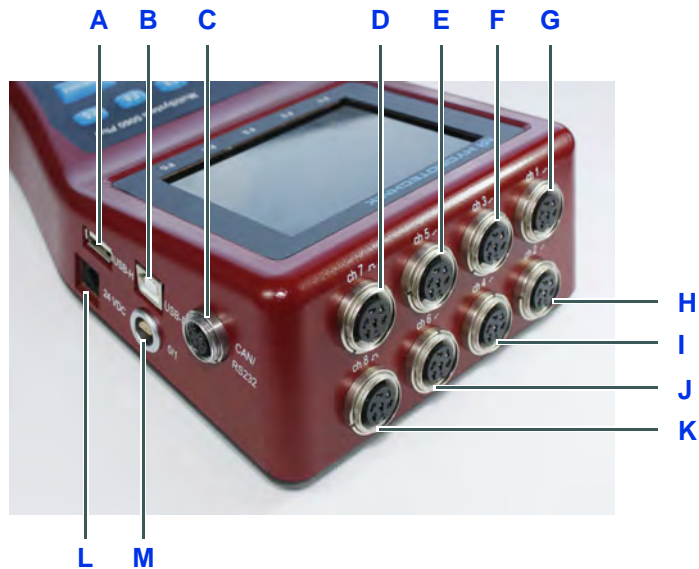
|			
A	USB – host interface	**H**	Input C2 – analogue input highspeed
B	USB – device interface	**I**	Input C4 – analogue input
C	Combi-jack CAN/RS232	**J**	Input C6 – analogue input
D	Input C7 – frequency input	**K**	Input C8 – frequency input
E	Input C5 – analogue input	**L**	Power supply – power pack
F	Input C3 – analogue input	**M**	Digital input and output
G	Input C1 – analogue input highspeed		

Characteristics of highspeed analogue inputs
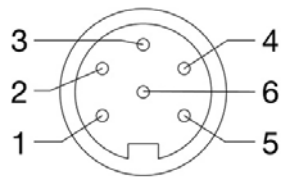
Number	2 (C1, C2)
Signal input	Switchable 0/4 … 20 mA; 0/2 … 10 V; ± 10 V; 0.5 … 4.5 V; 1 … 5 V
Resolution	13-bit analogue/digital converter (12-bit + sign)
Measuring rate	Max. 10,000 values per second
Filter function	Input filter 50 kHz (dynamic mode)
Hardware filter	Connectable: 5 kHz (standard mode) / 50 Hz (damped mode)
Software filter	Adjustable: Mean value filter 1... 16 ms
Connector	6 pin device plug
Protection type	IP40

Pin assignment

Pin	Function	R_i	C_i	Limitation	Protection type
1	Signal I [mA]	110 Ω	2 nF	5.6 V DC	Transile diode
2	Ground				
3	Ub [a]			100 mA	Current limiting
4	Signal U [V]	22 kΩ	2 nF	± 20 V DC	Transile diode
5	Shield				
6	ISDS				

[a] Power supply during mains operation 24 V

Characteristics of analogue inputs
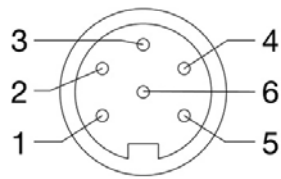
Number	4 (C3, C4, C5, C6)
Signal input	Switchable 0/4 … 20 mA; 0/2 … 10 V; ± 10 V; 0.5 … 4.5 V; 1 … 5 V
Resolution	13-bit analogue/digital converter (12-bit + sign)
Measuring rate	Max. 10,000 values per second
Filter function	Input filter 5 kHz (standard mode)
Hardware filter	Connectable: 50 Hz (damped mode)
Software filter	Adjustable: Mean value filter 1... 16 ms
Connector	6 pin device plug
Protection type	IP40

Pin assignment

Pin	Function	R_i	C_i	Limitation	Protection type
1	Signal I [mA]	110 Ω	32 nF	5.6 V DC	Transile diode
2	Ground				
3	Ub [a]			100 mA	Current limiting
4	Signal U [V]	22 kΩ	32 nF	± 20 V DC	Transile diode
5	Shield				
6	ISDS				

[a] Power supply during mains operation 24 V

Characteristics of frequency inputs
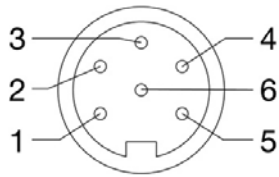
Number	2 (C7, C8) frequency/counter inputs with switchable direction detection
Signal input	5 – 30 VDC 0.25 Hz – 5 kHz with direction detection 0.25 Hz – 20 kHz without direction detection
Filter function	Adjustable period measurement for averaging
Connector	6 pin device plug
Protection type	IP40

Pin assignment

Pin	Function	R_i	C_i	Limitation	Protection type
1	Signal I [mA]	4.7 kΩ	1 nF	33 V DC	VDR Transile diode
2	Ground				
3	Ub [a]			100 mA	PTC
4	Signal U [V]	4.7 kΩ	1 nF	33 V DC	VDR Transile diode
5	Shield				
6	ISDS				

[a] Power supply during mains operation 24 V

Characteristics of digital signal input

<table>
<tr><td bgcolor="#003399">Note</td></tr>
<tr><td>Possible damage to the instrument!
This input may not be connected directly to inductive loads (e.g. coil of a magnetic valve). Otherwise there is the risk of damage to the instrument!</td></tr>
</table>

Pins of the digital input/output.
The digital signal input is isolated.

Pin assignment
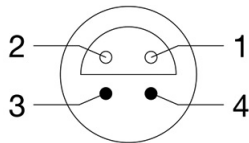
Pin	Function	Limitation	Protection type
3	Signal [a]	33 V DC	VDR Transile diode
4	Ground		

[a] 1 mA constant current

Characteristics digital signal output

Jacks of the digital input/output.

Pin assignment
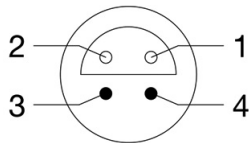
Pin	Function	Limitation	Protection type
1	Ground		
2	Signal	Ub/10 mA	VDR Transile diode

Characteristics combi-jack CAN / RS 232

8-pin M12x1

Pin assignment
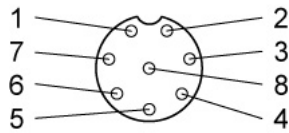
Pin	Function
1	Ground
2	Power supply for MultiXtend or CAN sensors [a]
3	DTR
4	CAN_H
5	TXD
6	RTS from PC (input)
7	CAN_L
8	RXD

[a] ~ 21,5 VDC / 200 mA (power pack) / ~ 13 VDC / 180 mA (battery)

EN

Characteristics USB interfaces

USB Type A: Host interface

Function	Designation	Remarks
Signal D+	green	twisted cable
Signal D–	white	twisted cable
VCC	red	~ 5 VDC / 120 mA
Ground	black	–

USB Type B: Device interface

Function	Designation	Remarks
Signal D+	green	twisted cable
Signal D–	white	twisted cable
VCC	red	max. 500 mA for terminal equipment power supply (not used)
Ground	black	–

Display

The instrument is equipped with a colour display where all information and measured values are displayed.
Graphical presentations can be configured individually.

Various information can be displayed as icons in the bottom line of the display:

	Recording bar	indicates status and progress of a running recording:
	• Red bar	Filling the pretrigger
	• Green bar	Pretrigger is full, trigger event did not happen yet
	• Yellow bar	Recording in progress
	Timer	Timer triggering; the remaining time until the trigger event is displayed beside the icon
	Printer	Printer detected at USB interface (host)
	Highspeed	Hardware filter set for peak pressure measurements to 10 kHz (highspeed mode)
	PowerCAN	Power supply of connected CAN sensors is switched on
	USB stick	USB stick at USB interface (host) detected
	USB	Instrument is connected to a PC via the USB interface (device)
	Battery	Loading state of the battery; when the icon turns red and start flashing, the batteries should be charged immediately
	Power supply	Instrument power supply with external power pack; batteries are charged

In normal operation, either the battery or power pack icon is displayed. If the battery icon flashes during mains operation, the batteries are either missing, defective or deep-cycled. Possibly the battery cable isn't plugged correctly.

Keyboard

The membrane keyboard is resistant to moisture and dirt; the keys are assigned as follows:

F1	Function key 1	F2	Function key 2
F3	Function key 3	F4	Function key 4
F5	Function key 5		

ON	Switch device on	MENU	Open main menu; within a menu: switches to the second assignment of the function keys
◁	Cursor / page to the left	△	Highlight upward
ENT	Store input		
▽	Highlight downward	▷	Cursor / page to the right
OFF	Switch device off	ESC	Cancel input/function without storing

1	Input 1	2	Input 2 or ABCÄ
3	Input 3 or DEF	4	Input 4 or GHI
5	Input 5 or JKL	6	Input 6 or MNOÖ
7	Input 7 or PQRSß	8	Input 8 or TUVÜ
9	Input 9 or WXYZ	0	Input 0 or space a)
-.	Dash, period, special characters	CLR	Delete single character

a) Use the [0] key to enter special digits, e.g. ( ) * / @ ° …

HYDROcom software package

After transferring the measuring data to a PC, you can use this software to evaluate, process and present the data graphically.

Technical data

Casing	ABS plastic
Weight	1.277 g
Protection type	IP40
CE conformity mark	CE conformity complies with directive 2004/108/EG (electro-magnetic compatibility); applied norms: EN 61326-1:2006; field of use: Industry
Internal power supply	NiMh-batteries, 14.4V / 2,150 mAh
External Power supply	24 V DC / 630 mA
Dimensions	~ 270 x 140 x 69 mm (L x W x H)
Interfaces	USB 2.0, CAN
Ambient temperature	-10 °C – 50 °C
Relative humidity	0 – 85 % (not condensing)
Storage temperature	-20 °C – 50 °C
Measured values display	5-digit
Trigger	2 channels as start/stop, or with the connections AND or OR; time trigger
Scanning rate	Selectable between 100 µsec and 999 min
Measuring rate	Analogue input max. 10 kHz Frequency inputs 0.25 Hz … 20 kHz (without direction) / 0.25 Hz … 5 kHz (with direction)
Measured value memory	SD card 2 GB, max. 200 series of measurements, max. 8MB per series of measurements (2 million values)
Tolerances	Analogue ± 0.15 % of final value, digital ± 0.02 % of measured value (resolution 20 ns)

Commissioning

Check delivery

The measuring instrument is delivered by HYDROTECHNIK and transported by suited shipping companies. At the time of delivery to you, you should check:

- Does the number of delivered items corresponds with the HYDROTECHNIK delivery note?
- Is the packing free of visible damage?
- Are measuring instrument and accessories free of visible damage?
- Are there any indications of rough treatment during transportation (e.g. burn marks, scratches, colour)?

To maintain all claims against the shipping company you should document all possible transportation damage (e.g. by taking photos and signing a written protocol), before you unpack the measuring instrument.
HYDROTECHNIK is not responsible for transportation damage and will assume no liability.

Scope of delivery

Carefully remove the transportation packing. Please observe all rules and regulations for the disposal of packing materials. After unpacking you should find the following parts:

- Measuring instrument **MultiSystem 5060** *Plus*, 3160-00-79.00
- CD with software **HYDRO***com*, 8874-16-00.01
- Power pack, 230 VAC / 24 VDC, 625 mAh, 8812-20-02.00
- USB data transmission cable, 8824-F8-01.50

Check the scope of delivery against the delivery note and the order documents. Please report any discrepancies immediately to HYDROTECHNIK. Subsequent claims about incomplete delivery cannot be accepted.

Charge batteries

Note
Battery performance endangered! Charge the instrument batteries for 14 to 16 hours before you put the instrument into operation. Otherwise, there is the risk of excessive discharge, which would impair the battery performance.

EN

ℹ️ The battery integrated in the measuring instrument will be charged, as soon as the instrument is supplied by a HYDROTECHNIK power pack.

The instrument is equipped with an internal NiMH battery. This has only been slightly charged at the factory. Charge the instrument batteries for 14 to 16 hours before you put the instrument into operation. A battery with low power will be indicated by a flashing, red battery symbol.

Information about handling instrument batteries

The life cycle of NiMH cells can be very long, but it depends greatly on the conditions of use.

Avoid a complete discharge, continuous charging and immediate re-charging after every use. This causes a memory effect with a minimization of the battery capacity and possible permanent damage.

You can regenerate the battery by several discharge and charge cycles.

A nearly empty battery will be indicated by a flashing, red battery symbol. In this case you should maintain a 16 hour charging time.

In case of longer periods without use you should discharge and charge the batteries monthly.

Operation

This section will provide you with all information about the daily use of the measuring instrument. The following operations are explained:

- **Switch the instrument On and Off**
- **Select operating language**
- **Connect sensors**
- **Enter sensor parameters**
- **Record measuring data**
- **Connect a PC and transfer measurement data**
- **Delete measuring data**
- **Print measuring data**
- **Reset device**

In chapter **Operating software**, you will find a complete description of the instrument software with a chronological presentation and explanation of all menus.

> The software **HYDRO**_com_ which is part of delivery will not be explained in this manual. Please refer to the online help and the separate software documentation.

Switch the instrument On and Off
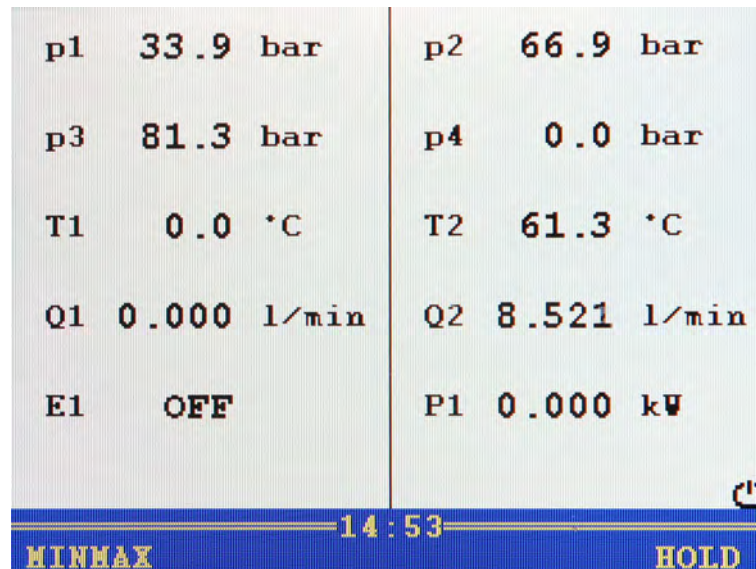
🛈 Make sure that the desired sensors are connected appropriately before switching on (see section Chapter **Connect sensors** on page 32).

🛈 If you are using ISDS sensors, the sensor parameters will be set automatically. If you use other sensors, you will first have to program the sensor parameters before you can carry out measurements.

1 Switch on: `ON` (> 2 sec.).

2 Wait until measured value display appears after self-test.

3 Use instrument.

4 Switch off: `OFF` (> 2 sec.).

∎

Calibration interval A message about the calibration interval may appear after the self-test.

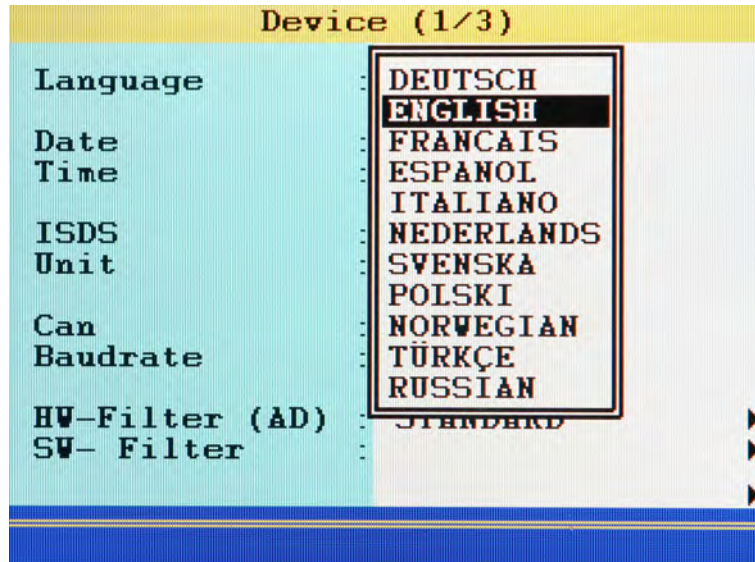Confirm this message with `F5` and check the data and settings in the **Setup (2/2)** dialogue.

⇨ See **Dialogue Setup (2/2) - Calibr. interval** on page 86.

The measuring instrument may possibly need to be calibrated by the manufacturer.

⇨ See **Manufacturer address and customer service** on page 165.
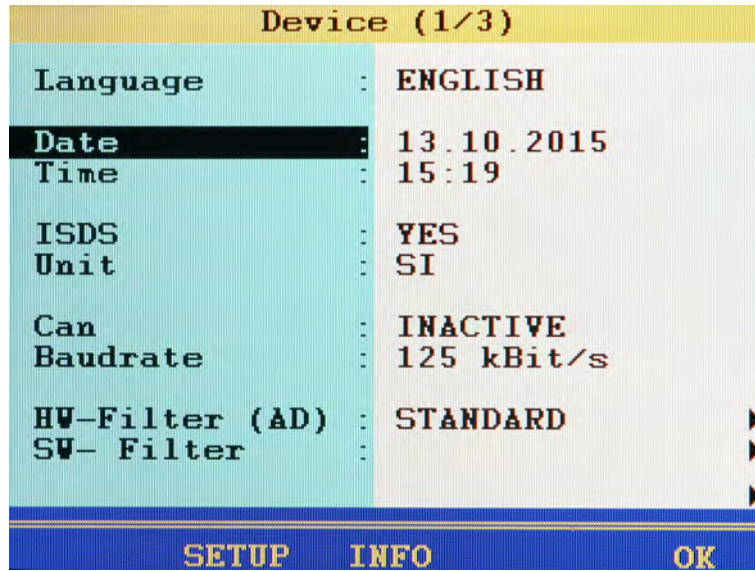
Select operating language

1 Invoke function: MENU △▽ ENT ENT

2 Make selection: △▽

3 Confirm selection: ENT

4 Apply changes: F5

5 Return to measured values display: ESC

■

Set date and time

Device (1/3)

Language	:	ENGLISH
Date	:	13.10.2015
Time	:	15:19
ISDS	:	YES
Unit	:	SI
Can	:	INACTIVE
Baudrate	:	125 kBit/s
HW-Filter (AD)	:	STANDARD
SW- Filter	:	

SETUP   INFO   OK

1 Invoke function: MENU △▽ ENT △▽ ENT

2 Enter date and ENT .

3 Switch to time entry: △▽ ENT

4 Enter time and ENT .

5 Apply changes: F5

6 Return to main menu: ESC

■

EN

Connect sensors

1 Switch the instrument off.

2 Connect the desired sensors to the inputs.

⇨ See Chapter **Connections** on page 15.

3 Switch the device on.

∎

Enter sensor parameters

ℹ️ If you have connected ISDS sensors, the sensor parameters will be detected automatically when the instrument is switched on. Then you can skip this section.

ℹ️ If you have connected sensors without ISDS function, you will have to program the sensor parameters manually. You find the required information e.g. on the type plate or the calibration certificate of your sensor.

```
Channels (1/2)
C1:  p1     0/20mA        0/200
C2:  p2     0/20mA        0/200
C3:  p3     0/20mA        0/600
C4:  p4     0/20mA        0/600
C5:  T1     0/20mA        0/200
C6:  T2     0/20mA        0/200
C7:  Q1     n.D.             134    L
C8:  Q2     n.D.             100
C9:  Trigger input
C10: Trigger output
C11: P1    POWER (C1*C7/600)
C12: --
```

```
Channel 1
Measurand       : p[bar]
Index Variable  : 1
Name            : OIL PUMP
Signal type     : 0/20mA
Meas.range      : 0.000    200.0
Zero point      : 0.0
Linearisation   : NO

HELP    LOAD    SAVE           OK
```
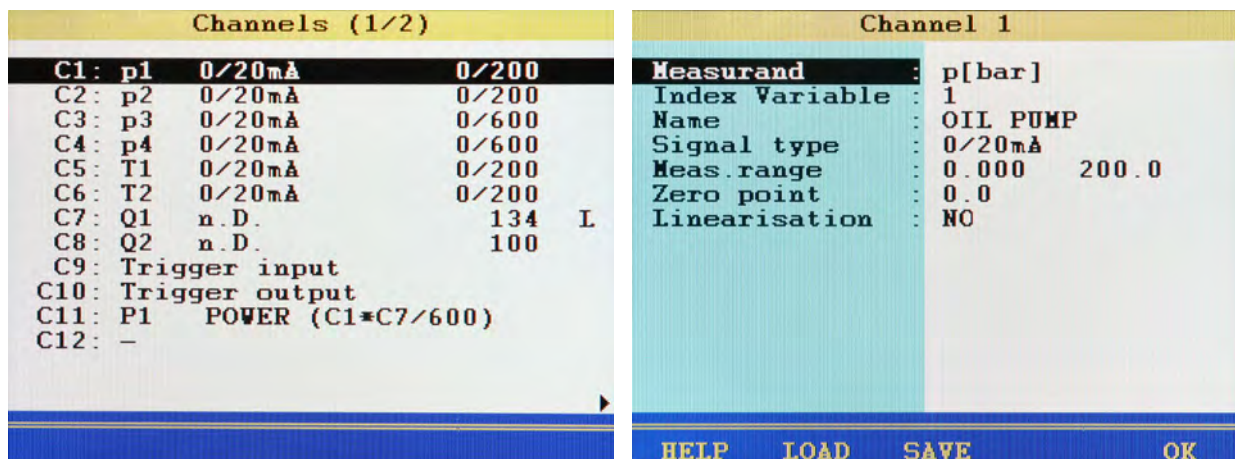
1 Open **Channel** menu: MENU ENT

2 Highlight channel: △▽

3 Start programming: ENT

4 Highlight menu item: △▽

5 Select function: ENT

6 Highlight setting: △▽,
  or enter value, e.g. 12.5

7 Confirm setting or value: ENT

8 Apply changes: F5

∎

Available measurands   The instrument is able to process ~ 40 different measurands including pressure, volume flow rate, temperature and rotational speed. Make sure you select the measurand and unit corresponding to the sensor.

Index variable   If several channels are programmed with the same measurand, these will be automatically indexed consecutively. The automatic indexing can be disabled in the device menu to allow manual assignment of index numbers.

Name   You can assign an individual name to each channel.

Signal types   Select between **0/20 mA**, **4/20 mA**, **0/10 V**, **± 10 V**, **0.5/4.5 V**, **1/5 V**, **2/10 V**.

Measuring range   Enter the beginning and end of the measuring range. Confirm these two entries with ENT.

Zero point   Press F4 to execute the automatic zero point equalization. A possible zero point deviation will be compensated by the software.

Linearisation   If a calibration table is available for the connected sensor, you can enter it here, after selecting **YES** at the menu item **Linearisation**.

⇨ Please observe the additional information in chapter Chapter **Linearisation table** on page 136.

Help   Press F1 to open a context-sensitive help screen with information to channel specifications and pin assignment.

Load   Press F2 to load sensor parameters from the sensor data base.

Save   Press F3 to save the current sensor parameters in the sensor database.

Record measuring data

```
                     Memory
Channels          : p1   p2   T1   Q1

Storing time      :  50 sec
1.Scanning rate:  100 ms
2.Scanning rate:  *10 (1000ms)
Trigger 1         : KEY
Type trigger      : —
Trigger value     : —
Pretrigger        : 0%
Trigger link      : NONE


                              OK
```
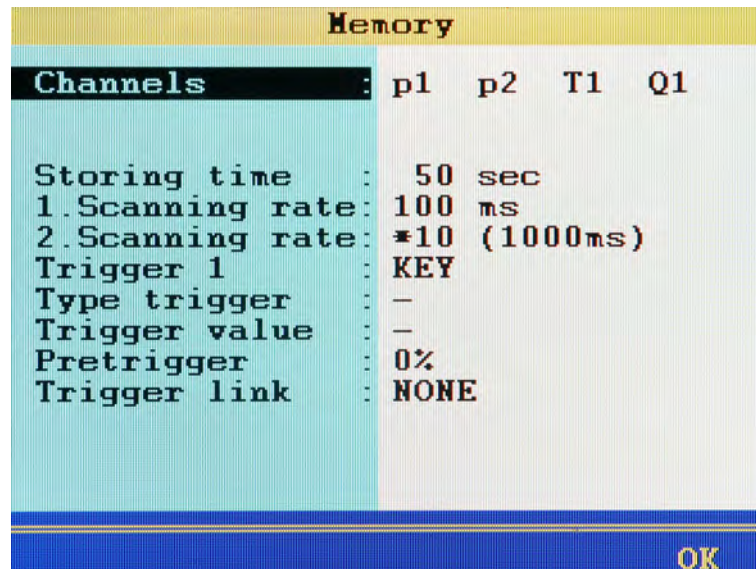
Data are collected in series of measurements. These can be configured in the memory menu.

1 Invoke function: `MENU` `△▽` `ENT`

2 Make selection: `△▽`

3 Confirm selection: `ENT`

4 Apply changes: `F5`

5 Return to measured values display: `ESC`

■

Channels   Activate the channels where the measurement data is to be recorded.

Storing time   Enter how long the measurement data is to be recorded. Select the desired time unit.

1. Scanning rate   Define how often the measurement data is to be recorded. Select the desired time unit.

> ℹ️   Storing time and scanning rate define, how often and how long measurement data is to be stored. Be aware that if you store too much measurement data, the later evaluation and presentation will become more difficult.

2. Scanning rate   If you want to record certain channels with a reduced scanning rate (e.g. temperature), you can enter a multiple of the **1st scanning rate** here. You can then assign the **2nd** scanning rate to the desired channels in the channel selection list.

Trigger 1   A trigger is a condition that has to happen to make the storing of measurement data start or stop. In this case, no trigger is defined.

⇨ Please see section Chapter **Configure digital signal output (C10)** on page 51 for further information on how to use the trigger function.

Connect a PC and transfer measurement data

You have to install the software **HYDRO***com* on your PC, before you can transfer measurement data to your PC.

1 Switch on measuring instrument and PC.

2 Plug the supplied USB cable into the connector on the side of the measuring instrument.

3 Plug the USB cable into an available USB port on your PC.

4 Wait until the measuring instrument has been detected by the PC.

5 Perform the data transfer as described in the software documentation.

■

Delete measuring data
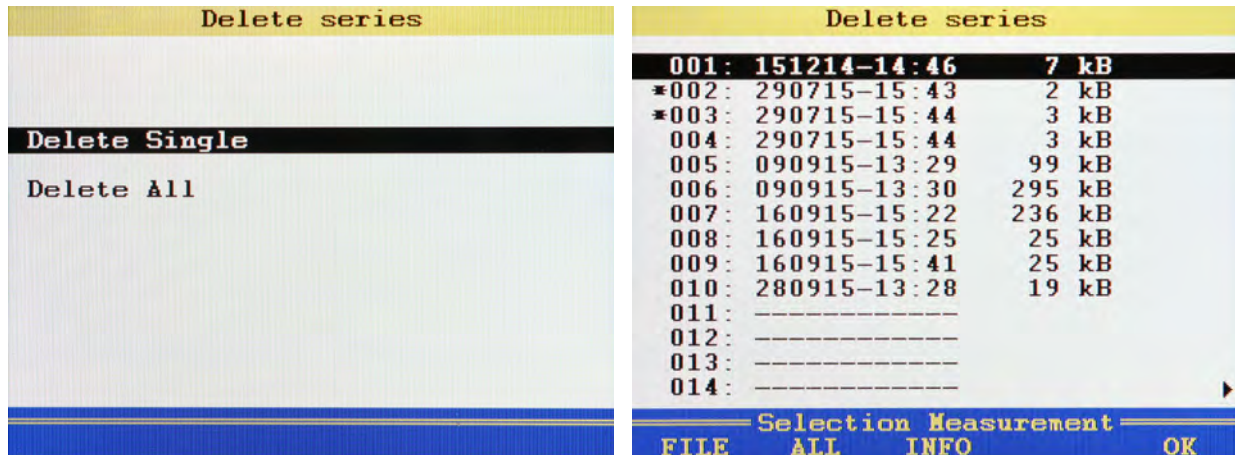
In the example shown, the series of measurement 002 and 003 has been selected for deletion already, an ***** is displayed next to the measurement. If you press `F1`, the names of the measurement files will be displayed; pressing `F3` will provide you more information about the highlighted measurement.

1 Invoke function: `MENU` `F3`

2 Delete single or all measurements: `△▽` `ENT`

3 Select measurement(s) (only for **Delete Single**): `△▽` `ENT`

4 Start deletion (only for **Delete Single**): `F5`

5 Confirm deletion: `F2`

6 Return to main menu: `ESC`

■

Print measuring data
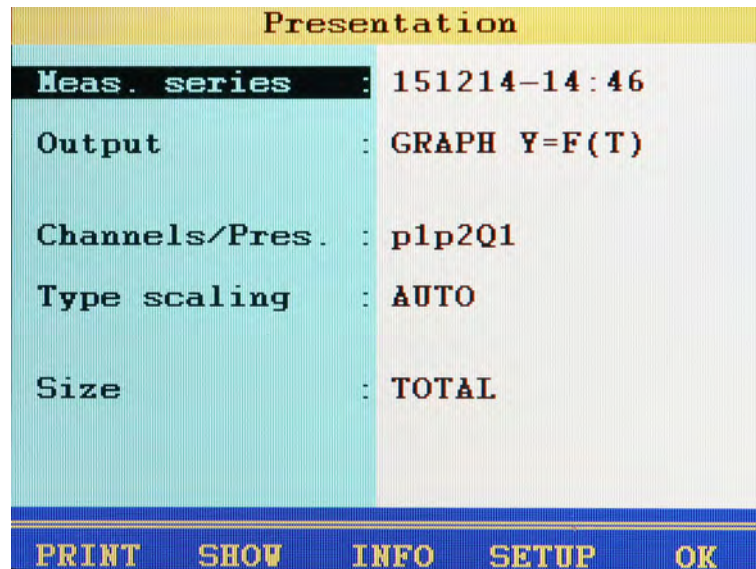
Before you can print measurement data, a printer must be connected and set up.

1 Open presentation menu: MENU F2

2 Select measurement: ENT △▽ ENT

3 Select presentation type (**output**): △▽ ENT △▽ ENT

4 Select channels and presentation: △▽ ENT △▽ ENT

5 Select size: △▽ ENT △▽ ENT;

- For size, select **CLIPPING**
- Enter time limits **From** and **To**.

6 Start printing: F1

■

Reset device

All user-defined parameters and settings (channels, display, memory, etc.) will be deleted by resetting the device. All data on the SD card remain unaffected (measured values, sensor and CAN database, projects, test runs, databases from test runs, etc.).

1 Switch device off: OFF

2 Switch device on: ON

3 Wait until the beginning of the initialisation is displayed and then press: 1 2 ABC 3 DEF

4 Confirm resetting: F2

The selection list of the available operation languages will be displayed, from where you may select the desired ones. Then the device will be reset and restarted.

■

Operating software

The operating software of the **MultiSystem 5060** *Plus* will be presented and explained chronologically on the following pages.

Measured values display

After switching on and initialisation, the currently measured values are displayed. You can select in the **Display** menu, which channels shall be displayed here.

You can choose from two different measured values displays:

- Measured values together with minimum and maximum values (MinMax)
- Measured values with their units

Measured values with MinMax

```
p1    78.4    32.5      p2   21.1     0.0
              125.7                   21.3

p3   156.7    15.4      p4    0.0     0.0
              157.1                   0.0

T1     0.0     0.0      T2   83.0    74.1
               0.1                   130.3

Q1   0.000   0.001      Q2  7.263   6.731
             0.001                  9.139

E1     OFF     OFF      P1  0.000   0.001
               OFF                  0.001

                          =10:49=
MEAS.V DELETE                        HOLD
```

To the right of each measured value display, the measured minimum value (upper left) and maximum value (bottom right) are displayed.

F1	**MEAS.V**	switches to display of measured values with their units
F2	**DELETE**	resets the displayed minimum and maximum values
F5	**HOLD**	"freezes" the measured values display; new measured values won't be displayed; the word "HOLD" flashes; press F5 again to display the current values.

Measured values with their units

```
p1   33.9 bar      p2   66.9 bar

p3   81.3 bar      p4    0.0 bar

T1    0.0 °C       T2   61.3 °C

Q1 0.000 l/min     Q2 8.521 l/min

E1    OFF          P1 0.000 kW


              =14:53=
MINMAX                        HOLD
```

The units are displayed to the right of each measured value.

F1	**MINMAX**	switches to display of measured values with MinMax
F5	**HOLD**	"freezes" the measured values display; new measured values won't be displayed; the word "HOLD" flashes; press F5 again to display the current values.

ℹ After pressing F5 **HOLD**, you can print out the contents of the screen by pressing F4 **PRINT**. A printer must be connected and available to use this function.

Menu
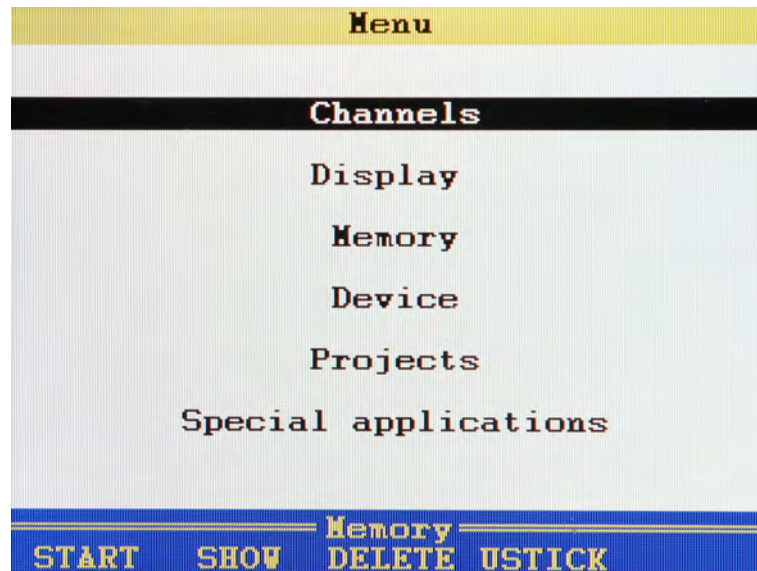
MENU	**MENU**	opens the **Menu**; you can operate all functions of the **MultiSystem 5060** *Plus* from here.

For the following explanations, it is assumed that the **Menu** is displayed.

Available submenus

Highlight the desired menu with △▽ and press (ENT).

Channels   Configuration of input and special channels

Display   Various settings of the measured values display

Memory   Configuration of several memory parameters

Device   Basic configurations of the device

Projects   Function for managing device configurations

Special applications   includes functions for the operation of optional features (e.g. CAN, automatic test procedures, particle counter)

Available functions

F1   **START**   starts the recording of measurement data; the configurations from the memory menu (channel selection, storing time, scanning rate, a.s.o.) are applied

F2   **SHOW**   opens the **Presentation Menu** for display and printing of the saved measurements

F3   **DELETE**   opens the **Delete Menu** for deleting individual measurements or all measurements

F4   **USTICK**   opens the submenu with the USB stick functions

➔ **Start a recording**
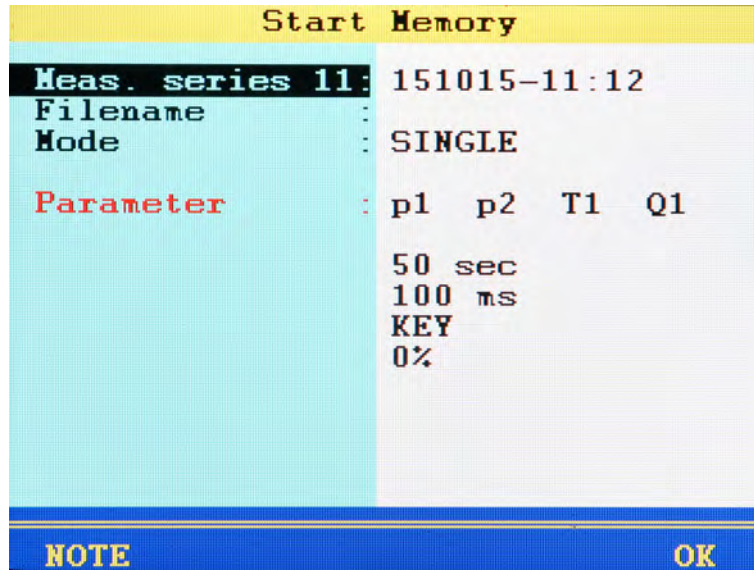
After initiating the recording with [F1] , a dialogue will be displayed, where the defined recording parameters (selected channels, recording time, trigger, etc.) are shown. The device proposes the current date and time as name of the measurement series.

Meas. series x   Name of the measurement series; press [ENT] to overwrite the proposal

Filename   Here you may enter a (different) name for the measurement series data file

Mode   Choose from three options:

- **STANDARD**

    The defined recording and parameters will be applied to execute one single recording

- **CYCLIC**

    The defined recording parameters will be applied to execute a recording; then the recording will be repeated until the key **C-STOP** [F3] is pressed

- **SINGLE**

    The current value of each selected channel will be recorded when key is pressed

If you want to assign a note to the recording, press [F1] and enter the desired text. Start the recording with [F5] .

➜ **Open presentation menu**

⇨ See **Presentation function** on page 116.

➜ **Open delete menu**

⇨ See **Delete series function** on page 129.

➜ **Use an USB stick**

⇨ See **USB stick menu function** on page 130.

Channels submenu

```
          Channels (1/2)
  C1:  p1    0/20mA        0/200
  C2:  p2    0/20mA        0/200
  C3:  p3    0/20mA        0/600
  C4:  p4    0/20mA        0/600
  C5:  T1    0/20mA        0/200
  C6:  T2    0/20mA        0/200
  C7:  Q1    n.D.            134   L
  C8:  Q2    n.D.            100
  C9:  Trigger input
 C10:  Trigger output
 C11:  P1     POWER (C1*C7/600)
 C12:  —
                                 ▶
```

There are 24 channels available:

- **C1** ... **C8**

  Measuring channels; sensor connectors at the rearside of the device

- **C9**

  Trigger input

- **C10**

  Trigger output

- **C11** ... **C24**

  Special channels

Press △▽ to highlight a channel.

Press ◁▷ to switch between the pages of the submenu. The second page contains channels 13 to 24.

→ **Configure measuring channels (C1 ... C8)**

ℹ Measuring channels must only be configured if you use sensors without ISDS capabilities.

```
                    Channel 1
   Measurand      : p[bar]
   Index Variable : 1
   Name           : OIL PUMP
   Signal type    : 0/20mA
   Meas.range     : 0.000    200.0
   Zero point     : 0.0
   Linearisation  : NO



   HELP    LOAD    SAVE           OK
```
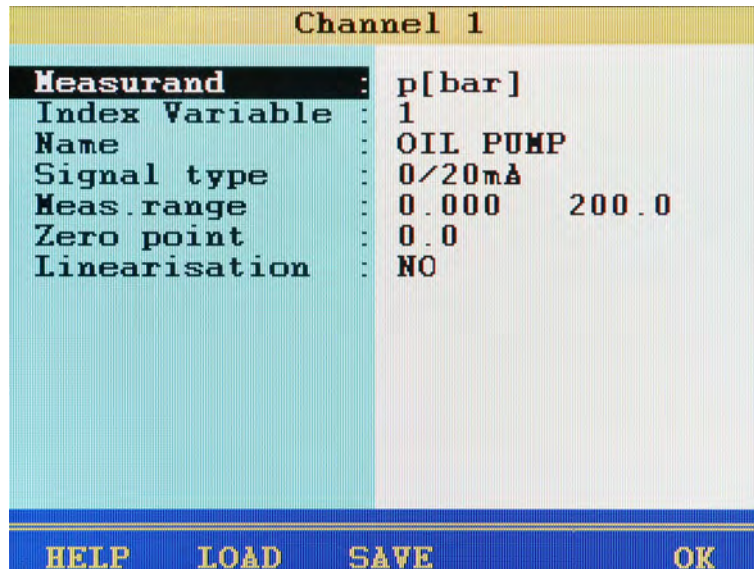
You may configure several parameters for each measuring channel:

Measurand   Selection of measurand and unit; select between 18 different measurands and up to five units per measurand

Index Variable   If manual channel numeration is activated in the setup menu (see section on page **Dialogue Setup (1/2)** on page 82), you can enter the index number of the channel here; if automatic channel numeration is activated, this function will not be displayed

Name   You may enter an individual name for each channel

The name will now be shown in the tile display of the measured values display.

⇨ See **Configure tile presentation** on page 59.

Signal type	Sensor-specific
	Select between (0/20 mA), (4/20 mA), (0/10 V), (±10 V), (0.5/4.5 V), (1/5 V) and (2/10 V)
	The correct signal type is given on the type plate of the sensor or in its documentation; for frequency sensors (channels C7 and C8), select between *with direction (w.D.)* and *no direction (n.D)* Direction detection

Meas. range	Enter the smallest and largest expected measured value (for analogue sensors, only)
Calibration value	Enter the factor for the calculation of the measuring value from the frequency signal (for frequency sensors, only)
Zero point	Manual zero point alignment of the sensor (see **Do zero point equalisation** on page 51)
Linearisation	If available, you may enter or select a linearisation table for the connected sensor. This may increase measuring accuracy.
	⇨ You can find more information in Chapter **Linearisation table** on page 136.

Additional functions

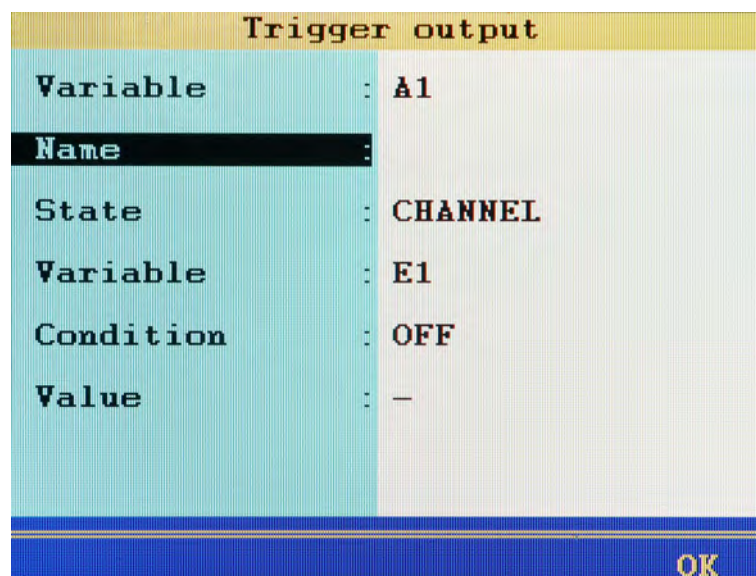| F1	**HELP**	opens a help screen with additional information
F2	**LOAD**	loads stored sensor parameters from the database
F3	**SAVE**	stores the current sensor parameters in the database
F5	**OK**	saves the channel settings and leaves the submenu

➔ **Do zero point equalisation**

After selecting the function (ENT) a display will appear for confirming the zero point alignment.

Press F4 to start the zero point alignment. This process is carried out fully automatically, the determined value will be displayed after a few seconds.

➔ **Configure digital signal input (C9)**

You can only assign one name to the digital signal input. Please observe the technical data (**Technical data** on page 24) for permitted input signals.

➔ **Configure digital signal output (C10)**


```
              Trigger output
Variable       : A1
Name           :
State          : CHANNEL
Variable       : E1
Condition      : OFF
Value          : —
                                    OK
```

Using the digital signal output, you can carry out event-dependent external control.

You are able to define up to 5 parameters here.

Variable	shows the internal measurand of the output
Name	You can assign an arbitrary name here

State	Source of the triggering event;

- **INACTIVE**

  Trigger off

- **CHANNEL**

  Channel is monitored for the occurrence of the triggering event,

- **SP-TRIG**

  Trigger is set if trigger was detected during saving.

  This allows multiple measuring instruments to be synchronised:

  – Master: Saving of triggering event X (e.g. p1>200) – trigger output: SP_TRIG;

  – Slaves: Saving of triggering event E1

- **MANUAL**: the trigger output is switched manually by pressing a key

Variable	Selection of which channel should switch the trigger output.

You can also select **Vbat** (battery voltage) or **Vnet** (mains power voltage) to switch the trigger output if the voltage falls below a defined value.

Condition	for trigger input **OFF**/**ON**

for measurement channels **GREATER THAN**/**LESS THAN**

Value	for measuring channels, e.g. 200

➔   **Configure special channels (C11 ... 24)**
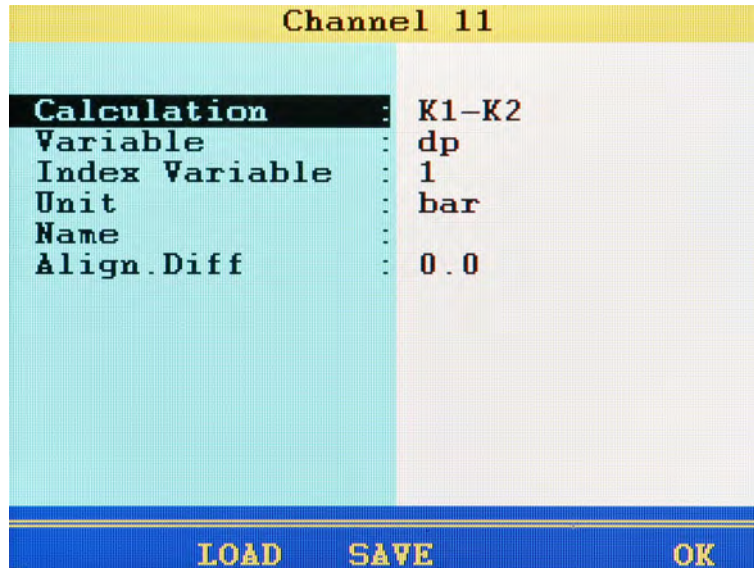
The special channels are used to mathematically combine the measured values of several sensors and do calculations with it, or to be configured as input channels for the CAN bus or the RS232 interface.

Calculation   Choose between the different occupations of the channel (see further below)
⇨ See **Possible assignments of the special channels** on page 55.

Variable   is entered automatically when using pre-programmed formulas and cannot be edited;

for individual formulas and assignment with CAN or Multimeter you may define the variable here that is provided on this channel

Index Variable   If numeration chn. is set in the setup menu (see **Dialogue Setup (1/2)** on page 82), you may enter the index number of the channel here

Unit is entered automatically when using pre-programmed formulas and cannot be edited;

define the unit for channels with individual formulas and assignment with CAN or Multimeter

Name You can assign an arbitrary name here

Align.Diff This functions automatically determines the measured value difference between the selected channels and use it as offset

Formula Enter the desired formula here (only displayed if **Calculation** is set to **FORMULA**, see **Possible assignments of the special channels** on page 55)
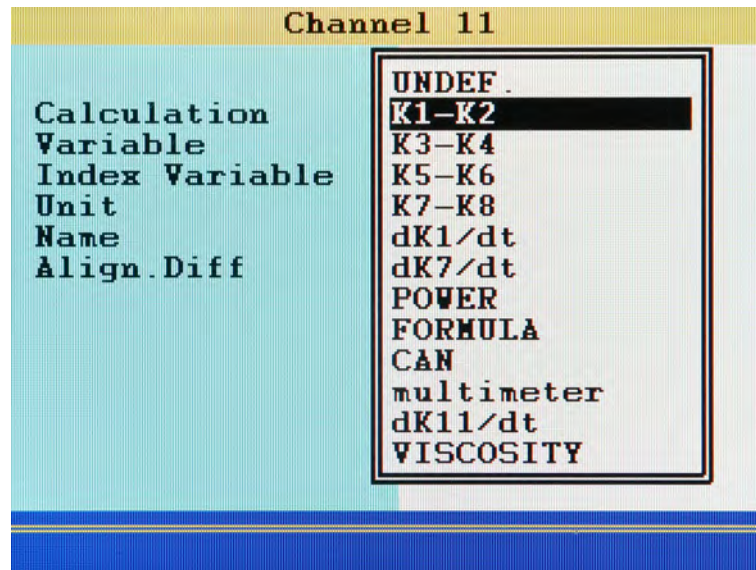
Additional functions

F2	**LOAD**	loads stored channel parameters from the database
F3	**SAVE**	stores the current channel parameters in the database
F5	**OK**	saves the channel settings and leaves the submenu

➔   **Possible assignments of the special channels**

UNDEF   Channel is not in use

K1-K2   forms the difference of the measured values from channel 1 and channel 2 (Delta-x)

Here, both channels must be assigned with the same measurand and unit; the resulting measurand and unit are determined automatically

the same applies to the assignments **K3-K4**, **K5-K6** and **K7-K8**

dK1/dt   forms the first derivative of the measured values from channel 1

analogously, the derivation of the channels C7 (**dK7/dt**) and C11 (**dK11/dt**) is also possible

POWER   uses the formula *C1 x C7 / 600* to calculate the hydraulic power

The pressure p in bar is measured on channel 1 and the volume flow rate Q in l/min is measured on channel 7

FORMULA	Input of an individual formula
	⇨ See **Calculations with formulas** on page 56.
CAN	Observe the information in chapter Chapter **Define CAN channel** on page 138
multimeter	If you have connected an external measuring instrument to the RS232 interface, you can assign its measurements to a channel;
	⇨ you can find additional information under **Connection of external measuring devices** on page 156.

➔ **Calculations with formulas**
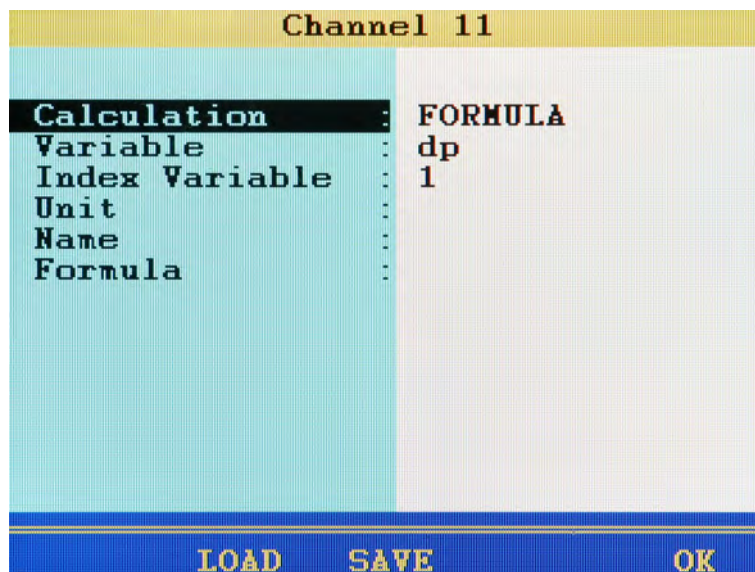
You may perform arbitrary calculations and use the values from all channels in your formula. You may use all basic arithmetic operations. Do not enter spaces. If you need additional mathematic functions, you may create the required calculated channels during the data evaluation with **HYDRO**com

Example of a formula   *C13/600*(C1-C5)*

ℹ️ Values from special channels can only be used if the ordinal number of the used channel is lower.
Possible formula on channel 14: *C12+C1*, impossible formula on C14: *C15+C1*.

Press the 🔢 key once to enter a **C** (= channel), resp. press twice to enter a **5**. You can only enter numbers with the remaining number keys; special characters with 🔘 .

Confirm the input with 🔘 . The measuring system does not check the entered formula for plausibility.
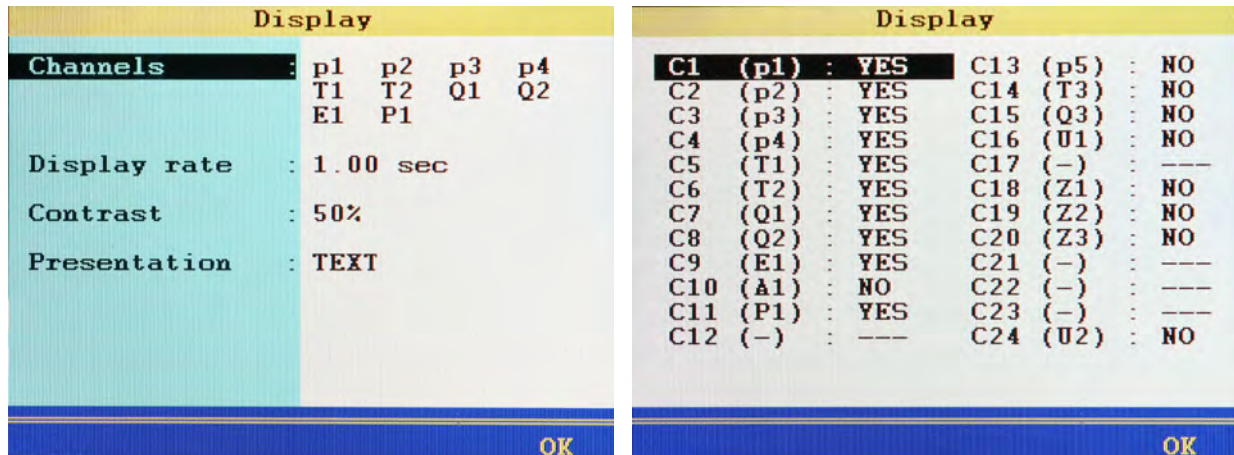
Example of a consumption measurement in [l/min]   Some measuring channels are absolutely required for this example. They are printed in **bold** letters:

- **Channel 7**: Measurement of volume V1 in litre (l)
- **Channel 8**: Measurement of volume V2 in litre (l)
- Channel 11: Calculation *C7 - C8 = dV1* in litre (l)
- Channel 12: Calculation *dC11/dt = Q1* in litre per second (l/s)
- Channel 13: Calculation *C12 * 60 = Q2* in litre per minute (l/min)

EN

HYDROTECHNIK

Display submenu

```
          Display                            Display
Channels    : p1  p2  p3  p4      C1  (p1) : YES    C13 (p5) : NO
              T1  T2  Q1  Q2      C2  (p2) : YES    C14 (T3) : NO
              E1  P1              C3  (p3) : YES    C15 (Q3) : NO
                                  C4  (p4) : YES    C16 (U1) : NO
Display rate : 1.00 sec           C5  (T1) : YES    C17 (-)  : ---
                                  C6  (T2) : YES    C18 (Z1) : NO
Contrast     : 50%                C7  (Q1) : YES    C19 (Z2) : NO
                                  C8  (Q2) : YES    C20 (Z3) : NO
Presentation : TEXT               C9  (E1) : YES    C21 (-)  : ---
                                  C10 (A1) : NO     C22 (-)  : ---
                                  C11 (P1) : YES    C23 (-)  : ---
                                  C12 (-)  : ---    C24 (U2) : NO

                          OK                                      OK
```

In the Display menu, you can select which channels you would like to have displayed in the measured values display. Basic configurations are also possible.

Channels　After opening this function, you can select the channels which are to be displayed in the measured values display.

All channels that have **YES** behind them will be displayed

Highlight a channel and use ⓔⓝⓣ to switch between **YES** and **NO**

Display rate　The display defines the refresh rate of the measured values display

Select one of the five possible values

Contrast　specifies the brightness value of the display

Select 10, 50 or 100 %

Presentation   You can choose between the following options here:

- **TEXT**: (The measured values are shown numerically
- Graphical presentation
    - **GRAPHIC Y = F(T)**
    - **GRAPHIC Y = F(X)**
    ⇨ See **Configure graphical presentation** on page 61.
- Tile presentation
    - **4 panels**
    - **9 panels**
    - **12 panels**
    ⇨ See **Configure tile presentation** on page 59.

➔   **Configure tile presentation**
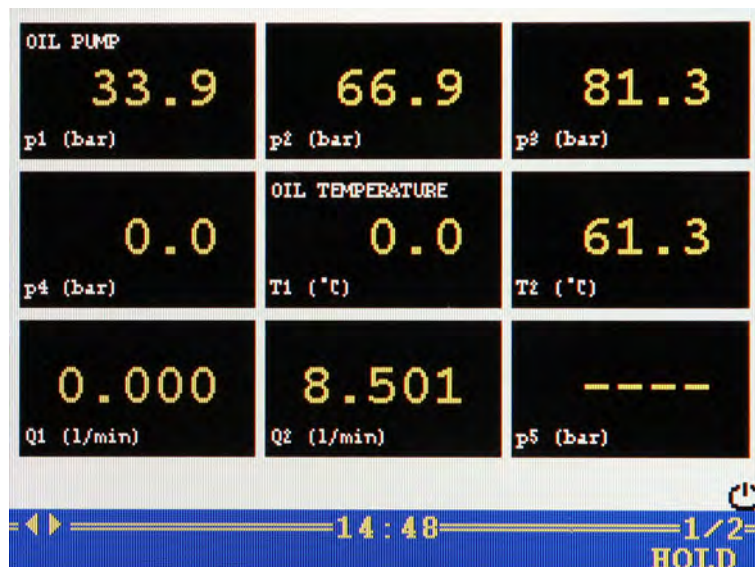
Here you have three possibilities for the tile presentation:

- **4 panels**

    Shows 4 tiles in the measured values display.

- **9 panels**

    Shows 9 tiles in the measured values display.

- **12 panels**

    Shows 12 tiles in the measured values display.

The measured values are shown in tiles. Measurands, index and units are displayed under each measured value.

The name of the measurement channel is displayed above the measured value. The name of the measurement channel must be configured in the **Channels** submenu.

⇨ See **Configure measuring channels (C1 ... C8)** on page 49.

If there are more channels selected for display than there are tiles shown, this will be displayed to the right in the toolbar: (current page/total pages).

Switch to the next page of tiles with ◁▷.

F5	**HOLD**	"freezes" the display; new measured values won't be displayed; the word **HOLD** flashes; press F5 again to display the current values.

> 🛈 After pressing F5 **HOLD**, you can print out the contents of the screen by pressing F4 **PRINT**. A printer must be connected and available to use this function.

➜ **Configure graphical presentation**

```
                    Display
Channels        : p1   p2   p3   p4
                  T1   T2   Q1   Q2
                  E1   P1

Display rate    : 1.00 sec

Contrast        : 50%

Presentation    : GRAPH Y=F(T)

Scaling         :                    ▶

Symbol/Color    :                    ▶


                                OK
```
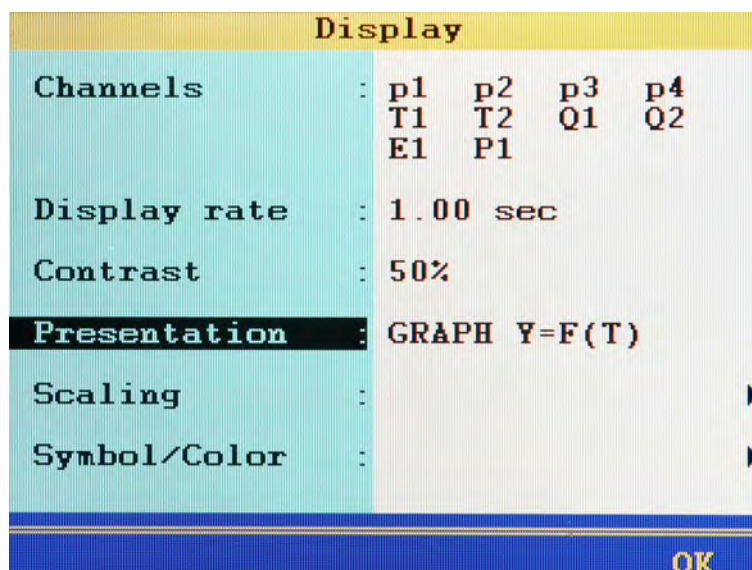
You have two possibilities for configuring the graphical presentation:

- **Y = F(T)**

  Presentation of the channels as a function of time

  The additional options **Scaling** and **Symbol/Colours** are displayed here

- **Y = F(X)**

  Presentation of the channels as a function of an arbitrary channel

  The additional options **X-axis**, **Scaling** and **Symbol/Colours** are displayed here.

X-axis Select the channel on which the function for the graphical presentation is to be based.

Scaling Select the measurement range of the channel which is to be displayed in the graphical presentation.

⇨ See **Display scaling dialogue** on page 62.

Symbol/Color You can assign symbols and colours to the channels here.

⇨ See **Graphic menu dialogue** on page 63.

Display scaling dialogue

```
                Scaling display (1/2)

Channel                          Min         Max
p1 (bar)              :            0         200
p2 (bar)              :            0         200
p3 (bar)              :            0         600
p4 (bar)              :            0         600
T1 (°C)               :          -50         200
T2 (°C)               :          -50         200
Q1 (l/min)            :            0         300
Q2 (l/min)            :            0          60
E1 ( )                :            0           1
A1 ( )                :            0           1
P1 (kW)               :            0         100
p5 (bar)              :            0         100
                                              ►

                     AUTO    AUTO-S    OK
```

You have defined the measuring range of a channel in the **Channels** submenu.

⇨ See **Configure measuring channels (C1 ... C8)** on page 49.

If desired you can now define a part of the measuring range to be displayed in the graphical presentation.

Press [F4] to do an automatic scaling for the selected channel, i.e., the device uses the measuring range defined in the channel parameters for the display scaling.

With [F3], the respective measuring range entered for all channels will be used.

1 △▽ [ENT] Select the desired channel.

2 Enter lower limit of display range – [ENT].

3 Enter upper limit of display range – [ENT].

4 Repeat **1** to **3** for all desired channels.

5 Confirm entries – [F5].

■

Graphic menu dialogue

```
Graphic-  Menu (1/3)

Symbols      :    YES


                    Symbol      Color
C1    (p1)   :        —        BLACK
C2    (p2)   :      CROSS      BLUE
C3    (p3)   :      CIRCLE     GREEN
C4    (p4)   :      SQUARE     CYAN
C5    (T1)   :      RHOMBUS    RED
C6    (T2)   :      STAR       MAGENTA
C7    (Q1)   :        —        BROWN
C8    (Q2)   :      CROSS      BLACK


◄                                    ►

                                  OK
```
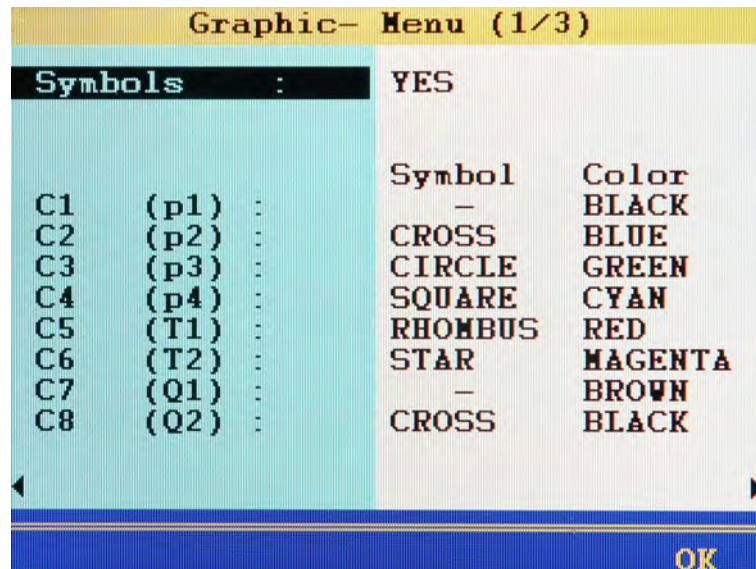
First, for the **Symbols** function, select:

* **YES**: Symbols and colours are used
* **NO**: Only colours are used

You can assign symbols and colours to the channels after making this basic selection:

Press **F2** AUTO to assign the standard settings to all channels. When a channel is highlighted, you can press **F3** or **F4** to open the selection lists 'Symbols' or 'Colours' to speed up the selection.

1 Highlight a channel – **ENT** .

2 Select a symbol – **ENT** .

   (only for activated symbols)

3 Select a colour – **ENT** .

4 Repeat steps 1 to 3 for all desired channels.

5 Confirm entries – **F5** .

∎

Memory submenu
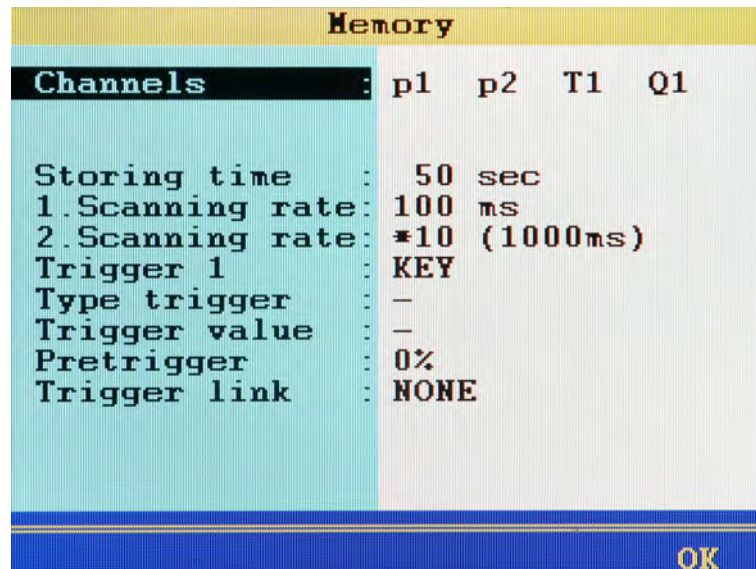
You can select channels in the memory menu that you want to store in series of measurements and set basic memory options.

Channels Select the channels that shall be stored in series of measurements; all channels will be displayed after opening the function; toggle between **YES** (channel will be stored) and **NO** (channel will not be stored).

Storing time Storing duration; (ENT) enter time value (ENT) – △▽ highlight time interval unit (ENT)

1. Scanning rate Time distance between two measurements in a series; (ENT) enter time value (ENT) – △▽ highlight time unit (ENT)

EN

2. Scanning rate   If you want to record certain channels with a reduced scanning rate (e.g. temperature measurement), you can enter a multiple of the first scanning rate here; this second scanning rate can be assigned one or multiple channels (a factor of 500 results for the first scanning rate = 1 ms, a second scanning rate of 500 ms = 0.5 seconds)

> ⓘ Consider the storing capacity of the measuring device when setting these options. The amount of data will increase if you configure more channels, a longer storing time, and a shorter scanning time. Large amounts of data may make evaluation and estimation of measuring results more difficult. Use the 2nd scanning rate to reduce the amount of data at those channels where you expect less dynamic changes.

> ⓘ Scanning rates < 1 ms are selectable, when the measuring instrument works in the dynamic mode (hardware filter) and the software filters are switched off. Otherwise this option is blocked. At scanning rates < 100 ms, the hardware filters should not be set to dynamic to avoid malfunctions.

➔ **2. Assign scanning rate**

```
                    Memory
  C1   (p1)  :  YES      C13  (p5)  :  NO
  C2   (p2)  :  YES      C14  (T3)  :  NO
  C3   (p3)  :  NO       C15  (Q3)  :  NO
  C4   (p4)  :  NO       C16  (U1)  :  NO
  C5   (T1)  : *YES      C17  (-)   :  ---
  C6   (T2)  :  NO       C18  (Z1)  :  NO
  C7   (Q1)  :  YES      C19  (Z2)  :  NO
  C8   (Q2)  :  NO       C20  (Z3)  :  NO
  C9   (E1)  :  NO       C21  (-)   :  ---
  C10  (A1)  :  NO       C22  (-)   :  ---
  C11  (P1)  :  NO       C23  (-)   :  ---
  C12  (-)   :  ---      C24  (U2)  :  NO

         FAST                        OK
```

1 Highlight the **Channels** line and press (ENT).

2 Highlight the channel that shall be recorded with the 2nd scanning rate.

3 If **NO** is displayed to the right of the channel, press (ENT) to select the channel for recording (**YES**).

4 Press (F2) until **SLOW** is displayed.

5 Press (ENT) to assign the 2nd scanning rate.

A * will be displayed beside the **YES** (see channels C5 in the screenshot).

6 Press (F5) to save the settings.

∎
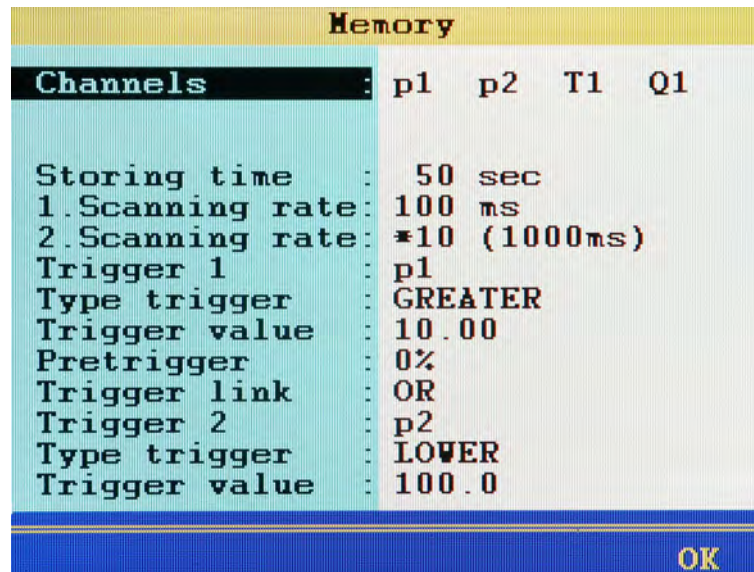
➔   **Trigger function**

You can use the trigger function to reduce the amount of stored data by letting the instrument start the storing, when the "interesting moments" are coming. Here you can define up to two triggers.

Triggers are defined events that can start or stop a storing.

You may define any measuring channel as trigger, e.g. "if measured value at channel 1 is greater than 10", use a timer function, or use a manual key press.

You can link two triggers logically, e.g. " if measured value at channel 1 is greater than 10 OR measured value at channel 2 is less than 100". The trigger will be started by the first of the two events.

1   Highlight the function **Trigger 1** – ⒺⓃⓉ .

2   Select a measuring channel, **KEY** (trigger is started by key pressure) or **TIMER** (storing starts at a certain time) – ⒺⓃⓉ .

   ∎

➔ **Definition of a measuring channel as trigger**

1 Open the function **Type trigger** and highlight the desired option. Then press Ⓔⁿᵗ.

- **GREATER**: Actuation when trigger value is exceeded
- **LOWER**: Actuation when trigger value is fallen below
- **RISING**: Actuation when trigger value is fallen below by more than 5 % and then exceeded, "rising edge"
- **FALLING**: Actuation when trigger value is exceeded by more than 5 % and then fallen below, "falling edge"

2 △▽ Ⓔⁿᵗ Enter trigger value Ⓔⁿᵗ.

∎

➔ **Definition of a trigger time**

1 Enter the date of the trigger time – Ⓔⁿᵗ.

2 Enter the time of day of the trigger time – Ⓔⁿᵗ.

Press F3 (SET) to enter the current system values for trigger date and time.

∎

➔ **Define pretrigger**

When a pretrigger is defined, the storing starts before the trigger event has happened. The percentage defined as pretrigger is used to store measured values before the trigger event.

1 Select a percent value as pretrigger – Ⓔⁿᵗ.

∎

➜ **Trigger link**

```
                    Memory
Channels          : p1   p2   T1   Q1

Storing time      :   50  sec
1.Scanning rate:  100  ms
2.Scanning rate:  *10  (1000ms)
Trigger 1         : p1
Type trigger      : GREATER
Trigger value     : 10.00
Pretrigger        : 0%
Trigger link      : OR
Trigger 2         : p2
Type trigger      : LOWER
Trigger value     : 100.0

                              OK
```
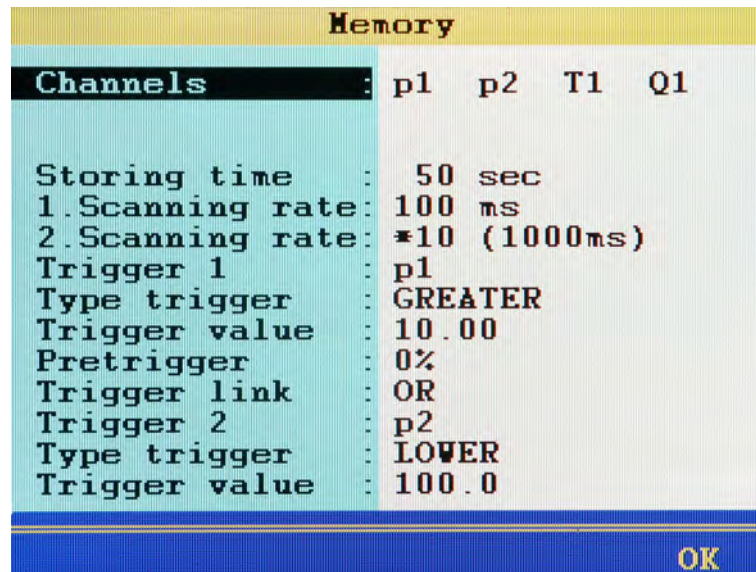
You can link **Trigger 1** with a second trigger:

1   Highlight an option of the **Trigger link** function and then press (ENT).

- **NONE**: Trigger 2 is not used
- **AND**: Trigger 1 and Trigger 2 must occur
- **OR**: Trigger 1 or Trigger 2 must occur
- **START/STOP**: Trigger 1 starts the storing, Trigger 2 stops it

2   Define trigger type and trigger value of Trigger 2.

⇨ See **Definition of a measuring channel as trigger** on page 68.

∎

Example of a trigger recording

A 2-minute recording is to be started when the measured value for p2 falls below 50 bar and temperature T1 rises above 30 °C. The recording is to start 60 seconds before the trigger incident.

Required programming:

Storing time	2 min.
Trigger 1	p2
Type trigger	LOWER
Trigger value	50.00
Pretrigger	50 %
Trigger link	AND
Trigger 2	T1
Type trigger	GREATER
Trigger value	30.00

EN

Device submenu
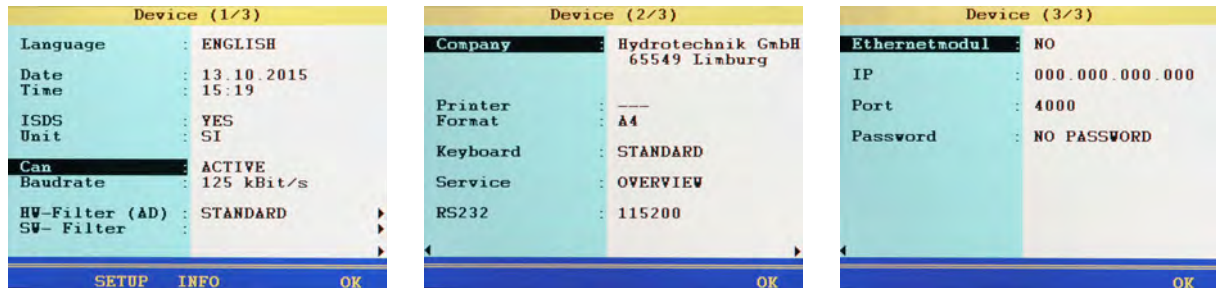
Configuration of the instrument is done with the **Device** menu:

Language   Operating language

Date   Current date

Time   Current time

ISDS   Automatic sensor detection

Unit   Select the unit system

CAN   Enable/disable CAN bus

Baud rate   Set transmission speed for CAN data

HW filter (AD)   Hardware filter selection for each measuring channel

SW filter   Software filter definition for each measuring channel

Press ◁▷ to switch to the 2nd page of the submenu.

Company   Enter the company name for the printouts

Printer   Printer selection

Format   Selection of the print format

Keyboard   Selection between STANDARD and COMFORT

Service   Selection between overview and detail

RS 232   Select the speed of the RS 232 interface

Press ◁▷ to switch to the 3rd page of the submenu.

Ethernetmodule   Select between **YES** and **NO**.

Connect the Ethernet module to the measuring instrument and select **YES**.

IP   Enter the IP address in the Ethernet network

Port   This is preassigned and displayed for information purposes only

Password   Enter the password for logging onto the network

Toolbar

F2	**SETUP**	Information for error analysis (for experienced technicians only)
F3	**INFO**	Information on the software of the measuring instrument
F5	**OK**	Confirm and save changes

EN

➔   **Select operating language**

1   Invoke function: `MENU` △▽ `ENT` `ENT`

2   Select language: △▽ `ENT`

3   Confirm changes and leave function: `F5`

■

➔   **Enter date**

1   Invoke function: `MENU` △▽ `ENT` △▽ `ENT`

2   Enter day and `ENT`.

3   Enter month and `ENT`.

4   Enter year and `ENT`.

5   Confirm changes and leave function: `F5`

■

➔   **Enter time**

1   Invoke function: `MENU` △▽ `ENT` △▽ `ENT`

2   Enter hour and `ENT`.

3   Enter minutes and `ENT`.

4   Confirm changes and leave function: `F5`

■

EN

→ **ISDS configuration**

When using ISDS sensors, the sensor parameters will be stored automatically after connecting the sensor and switching on the instrument. Enable this functionality here and select the unit if you want to use ISDS sensors.

1 Invoke function: [MENU] [△▽] [ENT] [△▽] [ENT]

2 Enable functionality **YES**: [ENT]

3 Switch to the enter the unit: [△▽]

4 Select desired unit: [ENT]

5 Confirm changes and leave function: [F5]

The new unit system will be used the next time the instrument is switched on again.

■

→ **CAN configuration**

You can define a calculation channel as CAN channel (see Chapter **Define CAN channel** on page 138). To enable this you have to activate the CAN bus here and set the data transmission rate.

1 Invoke function: [MENU] [△▽] [ENT] [△▽]

2 Activate CAN bus **ACTIVE**: [ENT]

3 Switch to select the baud rate: [△▽] [ENT]

4 Select desired baud rate: [△▽] [ENT]

5 Confirm changes and leave function: [F5]

■
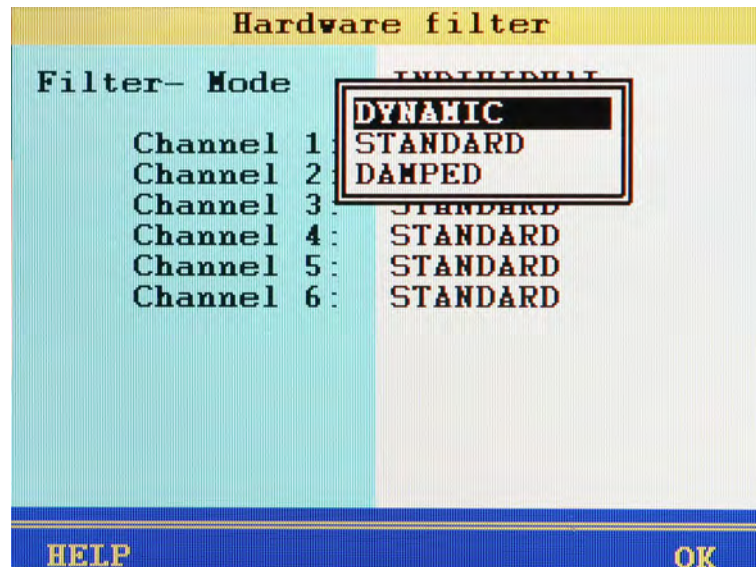
➔ **Set hardware filter**

ℹ You can set hardware filters so that measurements of peak pressures up to
10 kHz can be executed. This causes a high CPU load, calculations in the instru-
ment, presentation of graphs and transmission of data to a PC will slow down.

ℹ The filtering of the measuring values results from the sum of all active hardware
and software filters. You should disable all filters if you want to measure with very
short measuring rates.

You can execute several special measurements by applying filters.

Filter- Mode Each channel can be defined individually (**INDIVIDUAL**)

Filter Choose from three hardware filters:

- **DYNAMIC**

  No hardware filter; peak pressure measurements up to 10 kHz possible on C1 and C2 (only if software filters are switched off), on C3 to C6, up to 2 kHz possible

- **STANDARD**

  A 5 kHz hardware filter is applied to C1 and C2; peak pressure measurement up to 2 kHz possible on C1 to C6

- **DAMPED**

  A 50 Hz hardware filter is applied to C1 to C6; peak pressures are suppressed; ideal for static measurements or slow processes

This is how to set the desired hardware filter:

1 Invoke function: `MENU` `△▽` `ENT` `△▽` `ENT`

2 Select filter mode: `ENT`

   - For **INDIVIDUAL**, highlight channel: `△▽` `ENT`
   - Select filter mode for the channel: `△▽` `ENT`

3 Confirm changes and leave function: `F5`

■

EN

→   **Set software filter**
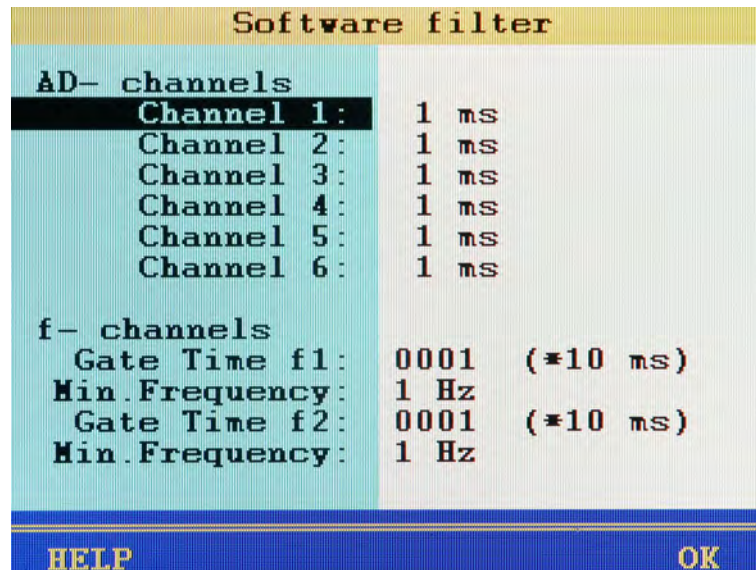
```
        Software filter

AD- channels
    Channel 1:      1 ms
    Channel 2:      1 ms
    Channel 3:      1 ms
    Channel 4:      1 ms
    Channel 5:      1 ms
    Channel 6:      1 ms

f- channels
  Gate Time f1:    0001   (*10 ms)
  Min.Frequency:   1 Hz
  Gate Time f2:    0001   (*10 ms)
  Min.Frequency:   1 Hz


HELP                              OK
```

> ⓘ   The filtering of the measuring values results from the sum of all active hardware
> and software filters. You should disable all filters if you want to measure with very
> short measuring rates.

Filter   The analogue inputs are scanned with 0.1 ms (10 kHz). By using the software
filter, you can equalise the measured values by averaging 10 to 160 measured
values. Frequencies are measured down to 0.25 Hz. This frequency is first de-
tected and displayed after a period duration of 4 s.

Min.Frequency   Frequencies that are less than the value **Min. Frequency** are displayed as
zero.

The value **Min.Frequency** can be set to **0.25**, **1**, **10** or **100** Hz.

For a minimum frequency of 1 Hz, the decrease to zero during the recording
is shown with a delay of 1 s. For a minimum frequency of 0.25 Hz, the delay is
4 s.

Gate Time   Frequency inputs are equalised by the gate time. The longer the gate time, the slower the measuring values will change, since a new value is only recorded after a delay. In the mean time, the measuring values remain constant. The result is a signal smoothing.

This is how to set the desired software filter:

1 Invoke function: `MENU` △▽ `ENT` △▽ `ENT`

2 Select AD channel: △▽ `ENT`

3 Select equalisation filter: △▽ `ENT`

4 Repeat steps 2 to 3 for all desired AD channels.

5 Select **Gate Time f1** (for measuring channel C7): △▽ `ENT`

6 Enter desired gate time (x 10 ms) and `ENT` .

7 Select **Min.Frequency** (for measuring channel C7): △▽ `ENT`

8 Select desired frequency: △▽ `ENT`

9 Repeat 5 to 8 for **Gate Time f2** and second minimum frequency (for measuring channel C8).

10 Confirm changes and leave function: `F5`

■

→ **Enter company**

Device (2/3)

Company	:	Hydrotechnik GmbH
		65549 Limburg
Printer	:	---
Format	:	A4
Keyboard	:	STANDARD
Service	:	OVERVIEW
RS232	:	115200

OK
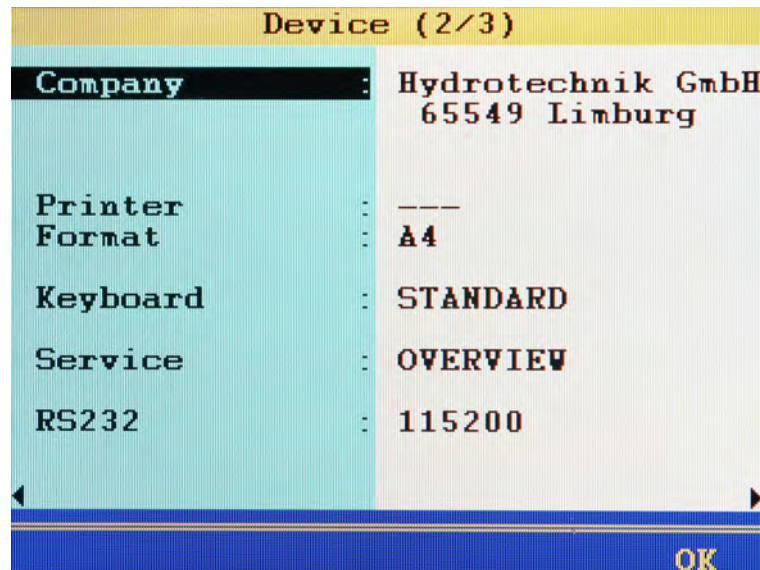
You can enter an individual text that will be shown on the printouts and in the stored protocols.

1 Invoke function: MENU △▽ ENT ◁▷ ENT

2 Enter text and ENT.

   Use F2 to toggle between capital and small letters.

3 Confirm changes and leave function: F5

■

→ **Select printer and format**

The printer will be detected automatically and must not be selected.

Select a format between DIN A4 and US Letter:

1 Invoke function: MENU △▽ ENT ◁▷ △▽ ENT

2 Select format: △▽ ENT

3 Confirm changes and leave function: F5

■

➜ **Select keyboard**

Here you can select whether the short-cut method for the **(COMFORT)** menu operation is to be activated. You no longer need to highlight functions with the arrow keys and select them with Enter, but can simply press the assigned number key. E.g. if you press 4 in the main menu, the device menu will be opened instantly.

1 Invoke function: (MENU) △▽ (ENT) ◁▷ △▽ (ENT)

2 Select keyboard function: △▽ (ENT)

3 Confirm changes and leave function: (F5)

■

➜ **Select Service**

Here you can set the amount of information that will be included in the service report of the instrument.

- **OVERVIEW** includes the most important settings and parameters
- **DETAIL** includes additional information for service cases

1 Invoke function: (MENU) △▽ (ENT) ◁▷ △▽ (ENT)

2 Select report type: △▽ (ENT)

3 Confirm changes and leave function: (F5)

While the item **Service** is highlighted, you can press (F1) to print the service information.

■

➜ **Set RS232 interface speed**

If you want to use the RS232 interface (e.g. to connect an external measuring device, Multimeter), you can set the data transmission speed here:

1 Invoke function: (MENU) △▽ (ENT) ◁▷ △▽ (ENT)

2 Select speed: △▽ (ENT)

3 Confirm changes and leave function: (F5)

■

➔ **Setting up Ethernet functionality**

```
                    Device (3/3)
 Ethernetmodul  :  NO

 IP             :  000.000.000.000

 Port           :  4000

 Password       :  NO PASSWORD




◄
                                        OK
```
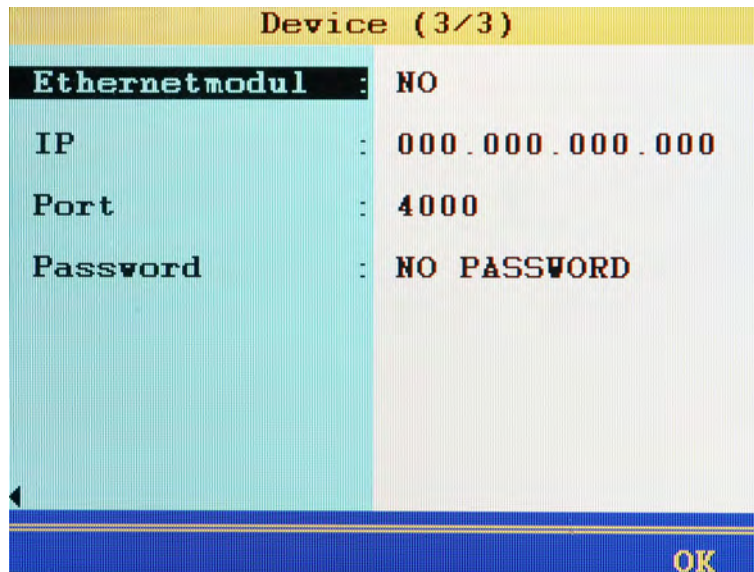
EN

If you want to use an Ethernet network module connected to the RS232 port, you can configure it here:

These options can be set:

Ethernetmodule Select whether an Ethernet module is connected (**YES**)

IP Enter the IP address that the **MultiSystem 5060** *Plus* is to have in the Ethernet network

Port This is preassigned and displayed for information purposes only

Password Enter the password for the Ethernet network, if a password is required

1 Display the Ethernet options: MENU △▽ ENT ◁▷

2 Select the desired option: △▽ ENT

3 Select the desired setting or enter the required information.

4 Confirm the setting/entry: ENT

5 Confirm changes and leave function: F5

■

EN

Dialogue Setup (1/2)

Note
Loss of data possible The internal data carrier can be formatted in the Setup menu. This will delete permanently delete all contained data and cannot be undone.

```
          Setup(1/2)              ▶

USBStick          :  DATA

Storage medium    :  SD: 2.1 GB

Power CAN         :  OFF
CANopen Device    :  MANUAL
CAN Tx Msg        :                ▶
Numeration chn.   :  AUTO

Lock Menus        :                ▶




                                 OK
```
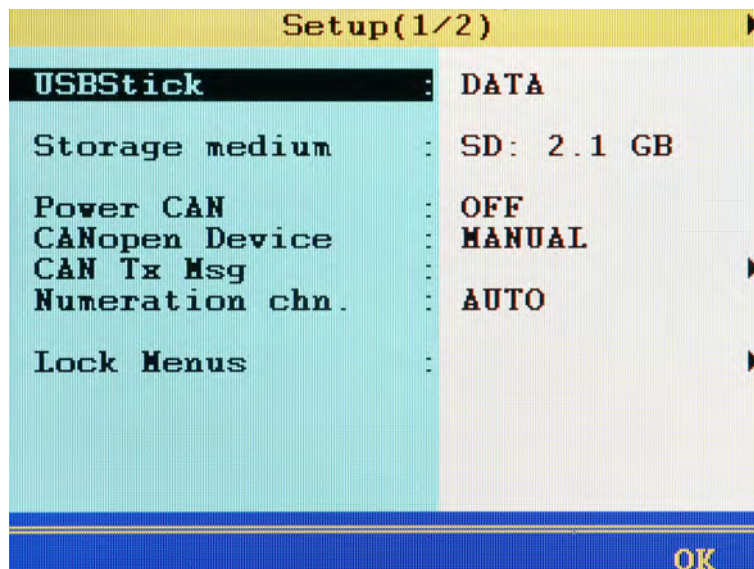
You can carry out a variety of basic functions in the **Setup** menu:

1 Open setup: MENU △▽ ENT F2

2 Select function: △▽ ENT

3 End selection: F5

4 Leave function: ESC ESC

■

EN

➔ **Use USB stick for firmware update**

If an USB stick had been detected at the instrument, its name is displayed in the first line. Press **ENT** to read the data from the USB stick.

Then you can then start the firmware update:

1 Highlight the desired firmware version: △▽

2 Confirm the desired firmware version: **ENT**

3 Start the firmware update: **F5**

⇨ Observe the additional information in chapter Chapter **Firmware update using the USB Stick** on page 150

■

➔ **Select storage medium**

If an USB stick had been detected at the instrument, you may select between the internal SD card and the stick as storage medium. Highlight the item **Storage medium** and press **ENT** to toggle between the two media.

> ⓘ When recording measured values to the USB stick directly, it is not possible to use triggers and only a minimum scanning rate of 100 ms is supported.

➔ **Format SD card**

When the menu item **Storage medium** is highlighted and the SD card is selected as storage medium, you can press **F3** to format the internal SD card. This will delete all data contained on the card (e.g. measurement data). The formatting cannot be undone.

EN

➔   **PowerCAN function**

Use this function to switch the power supply of connected CAN sensors ON and OFF. Highlight the function with ⬘⬙ and press ⓔ to toggle between **ON** and **OFF**.

> ⓘ   The following functions are present for compatibility reasons. Please use the corresponding functions in the **Special applications submenu**.

➔   **Function CANopen Device**

Here you can trigger the start command into the CAN bus that requests the connected sensors and adaptor boxes to send data. Highlight the function and then press ⓕ₃.

➔   **Function CAN Tx Msg**

This function is now in the **Special applications submenu**. See Chapter **Load valve** on page 105.

➔   **Function Numeration chn.**

As a standard, the MS 5060 Plus numerates all channels with a letter and an index number. If three pressure sensors are connected, the channels will be numerated as p1, p2 and p3 automatically. If you now connect, e.g. a temperature sensor instead of p1, this channel will become t1. The two other channels will be renamed, p2 will become p1 and p3 will become p2.

By changing the Numeration chn. from **AUTO** to **MANUAL**, you can assign fixed index numbers to the channels (see Chapter **Configure measuring channels (C1 ... C8)** on page 49). These will remain even after the channel assignment has changed. In the example shown above, the three channels would be numerated as t1, p2 and p3.

Highlight the function with ⬘⬙ and press ⓔ to toggle between **AUTO** and **MANUAL**.

➔ **Locking menus**

```
          Menu Lock functions
 Release code:                . . . . . .

 Channels:                    —
 Display:                     —
 Memory:                      —
 Device:                      —
 Projects:                    —




                                      OK
```
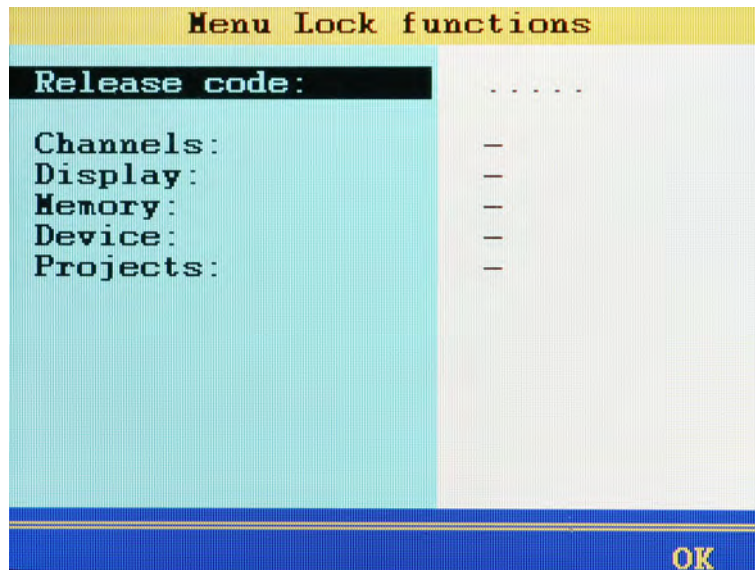
Assignment of the function keys:

F1	**HELP**	Opens a help screen for the alphanumeric entry
F2	**abcd**	Toggles between the entry of capital and small letters
F3	**<--**	Deletes the last entered digit
F4	**INSERT**	Inserts a digit in front of the flashing digit
F5	**DELETE**	Deletes all digits of the release code

After opening the submenu, you first have to define the release code:

1 Start release code definition: **ENT**

2 Enter release code; observe the assignment of the function keys.

3 Confirm release code: **ENT**

4 Highlight displayed menus: △▽

5 Press **ENT** to toggle between **–** (menu released) and **LOCKED**. When try-ing to do changes in a locked menu, a corresponding warning will be displayed after pressing **ENT**.

6 Confirm changes and leave function: **F5**

■

Dialogue Setup (2/2) - Calibr. interval
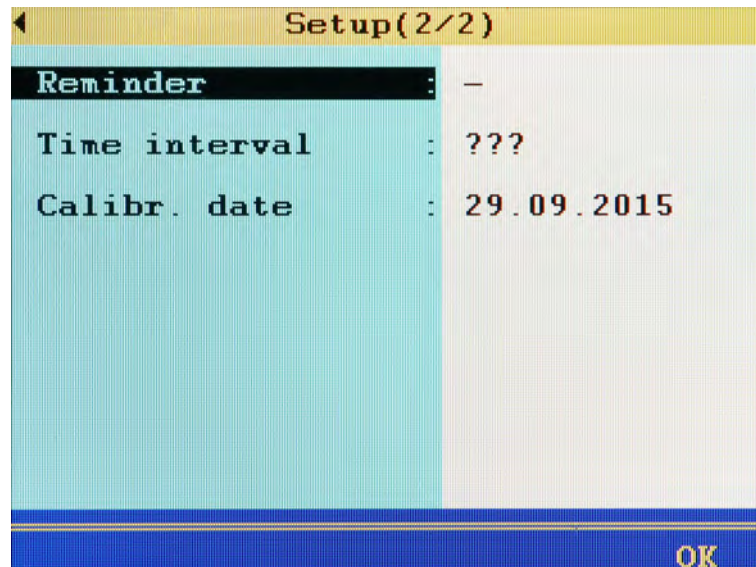
The measuring instrument was calibrated before it was shipped by the manu-facturer. The calibration interval is the period of time after which the measuring instrument is to be re-calibrated by the manufacturer.

You can only define the calibration interval once. After that, it can no longer be changed.

The measuring instrument is also ready for use if no calibration interval is set.

Reminder   If a calibration interval is exceeded, the measuring instrument displays the message *Calibrate* after switch-on:

You can suppress the message for the selected number of days.

Time interval   6, 12, 18, 24, 30 or 36 months can be set as the calibration interval.

> The calibration interval cannot be changed. Do not set a calibration interval if you are unsure which interval is right for you.

Calibr. date   Displays the date of the last calibration.

Software Info dialogue
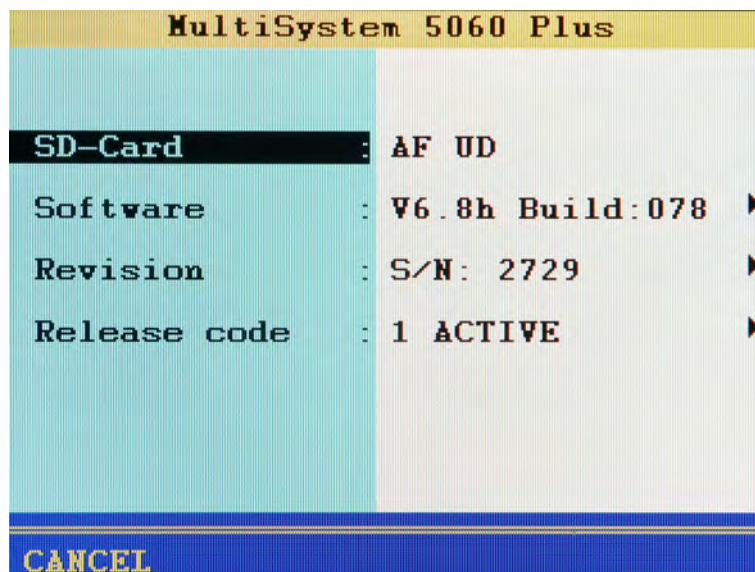
When calling the HYDROTECHNIK customer service department, you should have the required device information available. This is shown on the software information screen:

1 Display information: MENU △▽ ENT F3

2 Display desired information: △▽

3 End display: F5

4 Leave function: ESC

■

Projects submenu

```
            Projects (1/8)
Project    : CL-V109

           <Channels>
           C1:p1   0/20         0/200
           C2:p2   0/20         0/200
           C3:p3   0/20         0/600
           C4:p4   0/20         0/600
           C5:T1   0/20         0/200
           C6:T2   0/20         0/200

           C7:Q1   n.D.  L      134
           C8:Q2   n.D.         100

           ◄        (CL-V109)           ►
SELECT            DELETE   LOAD
```
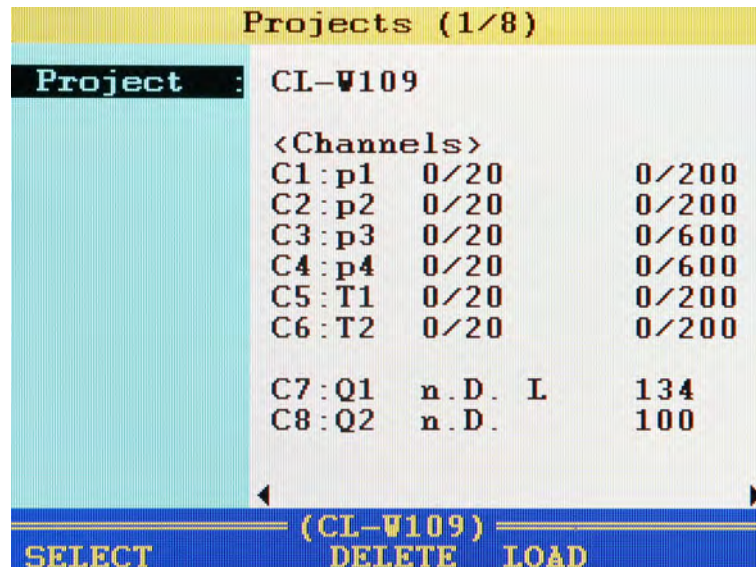
In the Project menu, you can view all settings of the measuring instrument and save the settings record with a name. You can save up to twelve projects and load or delete them.

Save a new project

1 Open project menu: [MENU] [△▽] [ENT]

2 Start saving: [ENT]

3 Enter project name and [ENT].

   Use [F2] to toggle between capital and small letters.

4 Save project: [F2]

5 Leave function: [ESC]

■

Load a saved project

1 Open project menu: MENU △▽ ENT

2 Start project selection: F1

3 Highlight and select project: △▽ ENT

4 Leave function: F4

■

Delete a saved project

1 Open project menu: MENU △▽ ENT

2 Start project selection: F1

3 Highlight and select project: △▽ ENT

4 Delete project: F3

The project is immediately deleted after pressing F2 .

5 Leave function: F4

■

Use an USB stick to transfer a project to another measuring instrument

1 Save the desired project in the project menu.

2 Open the USB stick menu.

⇨ See Chapter **USB stick menu function** on page 130.

3 Select the mode **Save** and data type **Project**.

4 Select the desired project and start copying.

5 Plug the USB stick into the instrument where you want to use the project.

6 Open the USB stick menu.

7 Select the mode **Save** and data type **Project**.

8 Start the copy procedure.

9 Open the project menu on the target device and load the desired project.

■

Special applications submenu
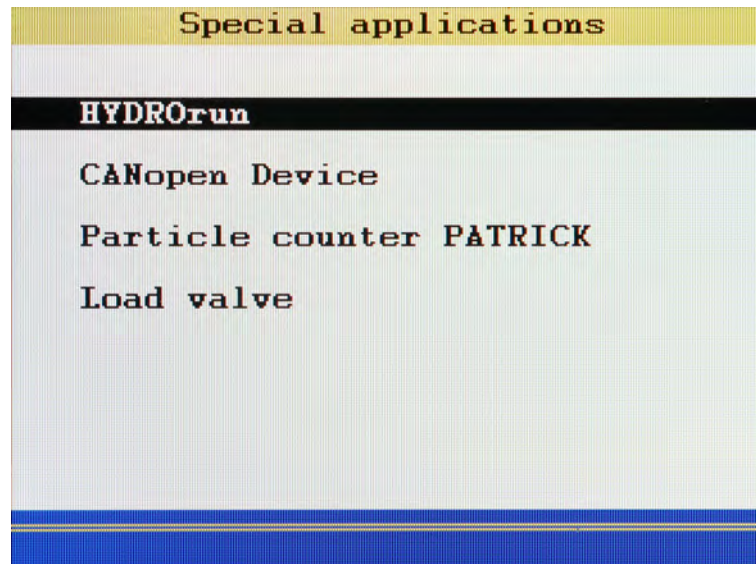
This submenu contains several functions which enhances the functionality of the MS 5060 Plus or which are required for the operation of external devices:

Use △▽ to highlight the desired submenu and then press 🔵ENT.

HYDROrun   Execution of pre-defined test sequences

CANopen device   You may start and stop a connected CANopen device here

Particle counter PATRICK   Display and save the data of the particle counter

Load valve   Readout of the data and activation of the HYDROTECHNIK load valve **HySense QL 326**

HYDROrun

Use the **HYDROrun menu** to select, setup, start and evaluate predefined test procedures. The measuring system is delivered with some example test procedures that provide insight into the virtually unlimited possibilities of the software package **HYDRO**gen/**HYDRO**run.

EN

> ℹ **License required**
> You need a valid license for your measuring system to use the **HYDRO**run functionality. The license includes a release code which you can enter in the **HYDRO-run menu** (see **HYDROrun settings** on page 93). Please contact your HYDROTECHNIK partner for more information.
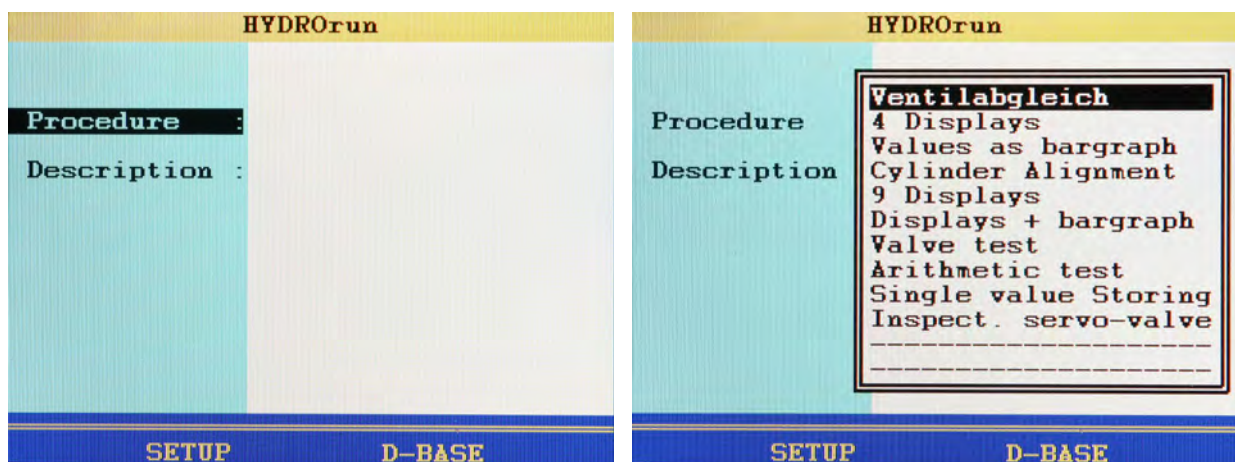
Open the menu

Open the menu (MENU △▽ ENT) and a screen with two menu entries and two (four if a test procedure is already loaded) functions will be displayed:

Procedure   Opens and loads a test procedure

Description   Shows the description of the loaded test procedure

The functions [F1] and [F3] are only shown, if a test procedure is loaded:

[F1]   **START**   Starts the loaded test procedure

[F2]   **SETUP**   Opens a submenu with important **HYDRO**run settings

[F3]   **DELETE**   Deletes the loaded test procedure

[F4]   **D-BASE**   Results of test procedures can be saved in databases; with this function you can select and display these databases

Select test procedure

1   Open **HYDROrun menu**: [MENU] [△▽] [ENT]

2   Start the selection of a test procedure: [ENT]

3   Highlight and select a test procedure: [△▽] [ENT]

■

HYDROrun settings

Setup– Menu for HYDROrun

Release code : No PASS

HYDROrun–Memory

Test procedures : 2 MB

Measurements : 1 MB

Databases : 1 MB

OK
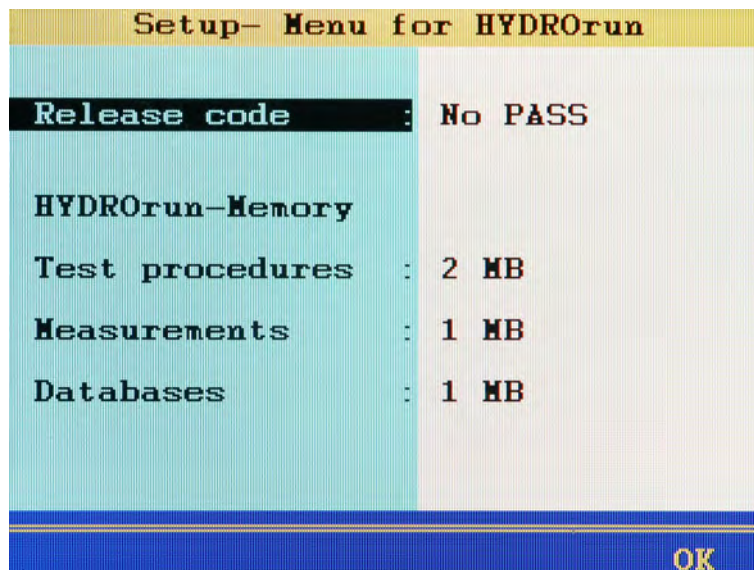
After pressing [F2] in the **HYDROrun Menu**, a screen will be displayed where you can enter the **HYDRO***run* release code and configure the memory reserved for the **HYDRO***run* .

If no release code has been entered yet, the memory configuration can not be modified. If a release code has been entered, this cannot be selected and modified.

You can decide, how much space can be reserved for **HYDRO***run* on the SD card:

Test procedures   Memory that is to be reserved for test procedure files

Measurements   Memory that is to be reserved for temporary measurement files that may be created during the execution of test procedures

Databases   Memory that is to be reserved for databases that might be created for intermediate or end results of test procedures

This is how to configure the HYDROrun memory

Note
Loss of data possible The SD card will be formatted after modifying the memory settings. All contained data (e.g. measuring series) will be lost. • Save this data to a USB stick before you modify the memory settings.

EN

1   Highlight the desired memory: △▽ ENT

2   Select the desired memory size: △▽ ENT

3   Repeat steps 1 and 2 for the other memory types.

4   Confirm the setting with F5 .

5   Confirm the query about whether the SD card is to be formatted, to apply the changed memory settings.

■

Supplied test procedures

These demonstrate the possibilities of the **HYDRO**gen/**HYDRO**run software package from HYDROTECHNIK and how measurement values can be individually displayed.

The following test procedures are available for new deliveries of the measuring instrument and after each time the SD card has been formatted.

Four Displays (English)   Presentation of the measurands p1, p2, T1 and Q1 on four large-scaled display sections.

Values as bargraph (English)   Presentation of the measurands p1, p2, p3 and Q1 as bar diagrams.

Cylinder alignment (English)

Synchronity test of two lifting cylinders of a bulldozer.

This test procedure also tests whether the correct sensors are connected to the instrument. This avoids faulty measurements due to incorrect sensors. A bar diagram shows the cylinder pressures p1 and p2, and the pressure difference.

The test is OK, if both pressure values are 145 bar (± 5 bar) at the final stop and the pressure difference is smaller than 5 bar.

Nine Displays (English)

Presentation of the measurands p1, p2, p3, p4, T1, T2, Q1 and Q2 on nine large-scaled display sections.

Displays + Bargraph (English)

Presentation of the measurands p1 and p2 on two large-scaled display sections and of Q1 as a bargraph.

Valve Test (English)

Serial testing of valves This test checks whether the valves open at a defined pressure.

Pressure is also measured when a flow rate (> 0.2 l/min) is detected. The valve must open at a pressure of 1.5 bar (± 0.2 bar). The test result is stored in a database that can be evaluated in the instrument and transferred to a PC (transfer with **HYDRO***run*).

Arithmetic Test (English)

Graphical presentation of measured and calculated variables with **HYDRO-***gen*/**HYDRO***run*.

Single Value Storing (English)

Single value storing (English) – Storing the measured values p1 and Q1 with key press (storage of individual value). If pressure value exceeds 200 bar, an alarm will be displayed. If pressure falls below 1 bar, the single value storing will be ended with a key press. At the end, a statistic will be shown and then a graphical presentation of the measured values.

Inspect. servo valves (English)

Inspection of servo parts.

The control voltage of the valve, pressure p1 and flow rate are measured. The connected sensors are checked prior to the test run. The user will be informed about errors. The control voltage must be set to 0 V for the test. The control voltage must be increased to 10 V within five seconds. After completing the test, the user can select from several display options of the test results.

CANopen device
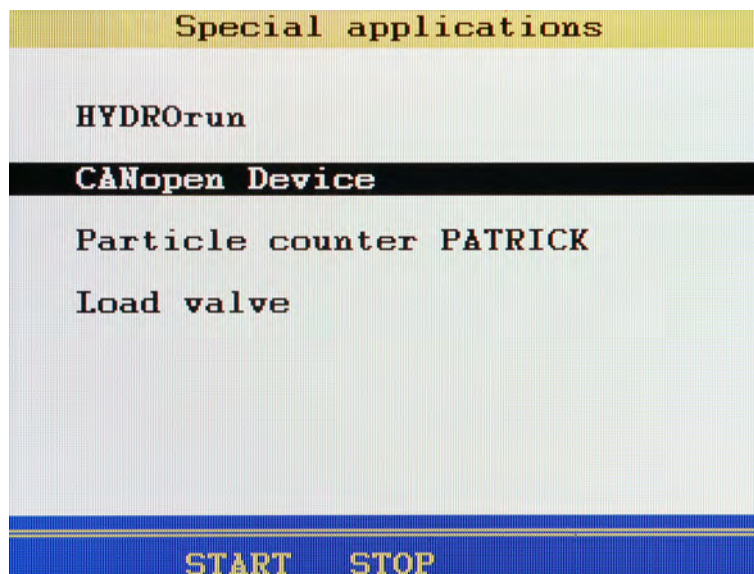
If one or multiple CANopen devices are connected to the MS 5060 Plus, you can use F2 to give the command to start (ID = 0, DLC = 2, data: 0x01 - 0x00), or with F3 the command to stop (ID = 0, DLC = 2, data: 0x80 - 0x00; pre-operational mode).

Information on how to configure the MS 5060 Plus for a CANopen device, see chapter Chapter **CAN configuration** on page 74 and Chapter **Define CAN channel** on page 138.

Patrick the Particle Counter

ℹ Before starting to operate Patrick you should check in the **Device** submenu (see Chapter **CAN configuration** on page 74) whether the CAN bus baud rate is set to the same value like at the particle counter (see type plate). Additionally, the function **PowerCAN** must be set to **ON** in the **Setup** menu (see Chapter **Dialogue Setup (1/2)** on page 82).

```
        Special applications

  HYDROrun

  CANopen Device

  Particle counter PATRICK

  Load valve




CONFIG                              SHOW
```
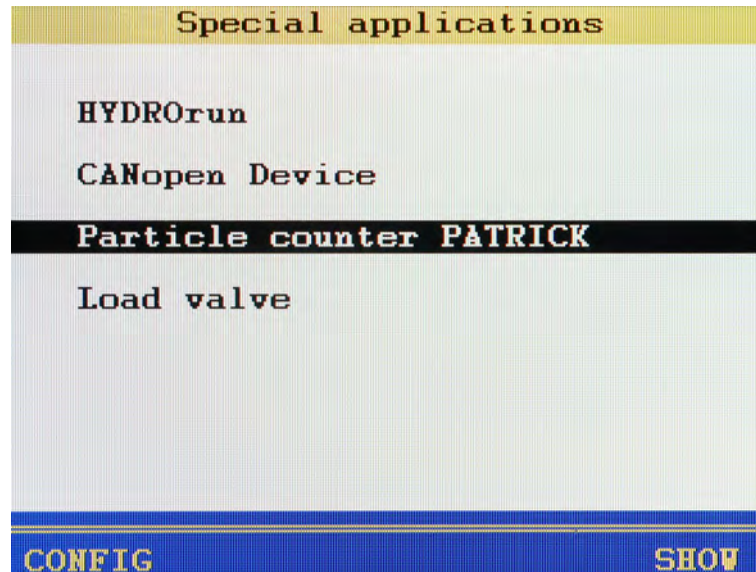
Use the **MultiSystem 5060** *Plus* to configure Patrick the optical particle monitor and read-out its measured values. This is done with two functions and a submenu.

Highlight the **Particle counter PATRICK** entry. Two functions are displayed in the status bar:

F1	**CONFIG**	reprograms channels of the **MultiSystem 5060** *Plus* required to permanently display the measured value of the particle counter;
		an existing configuration of these channels will be overwritten
F5	**SHOW**	opens a dialogue where the measured values and some status information of the particle counter are displayed; the required channels of the **MultiSystem 5060** *Plus* are reprogrammed temporarily, the prior configuration will be restored after leaving the function

Configure the Particle Counter
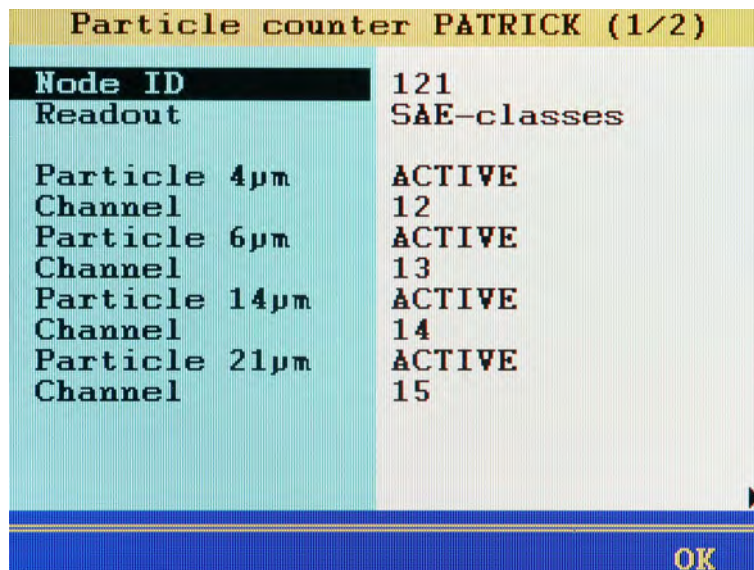
In the **Special applications** menu, highlight the **Particle counter PATRICK** entry and press ⒺⓃⓉ. The first of two configurations is displayed.

Node ID	Enter the ID of the particle counter you want to configure; the ID can bee found on the type plate
Readout	Select whether you would like the purity classes to be displayed according to ISO or SAE
Particle x µm	Activate the size classes that you would like to display
Channel	Assign a channel of the **MultiSystem 5060** *Plus* to each activated size class

Press ◁▷ to display the 2nd configuration page.

```
Particle counter PATRICK (2/2)
Meas. period      60    [s]
Interval time    300    [s]




◄
SEND    READ                        OK
```
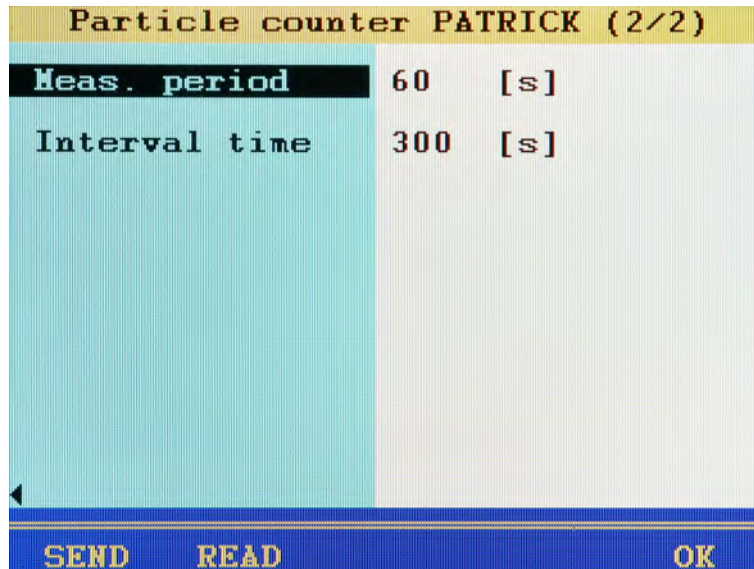
First press `F2` to read the current measuring and interval time from the particle counter:

Meas. period   Duration of a particle counting

Interval time   Time interval between two measurements
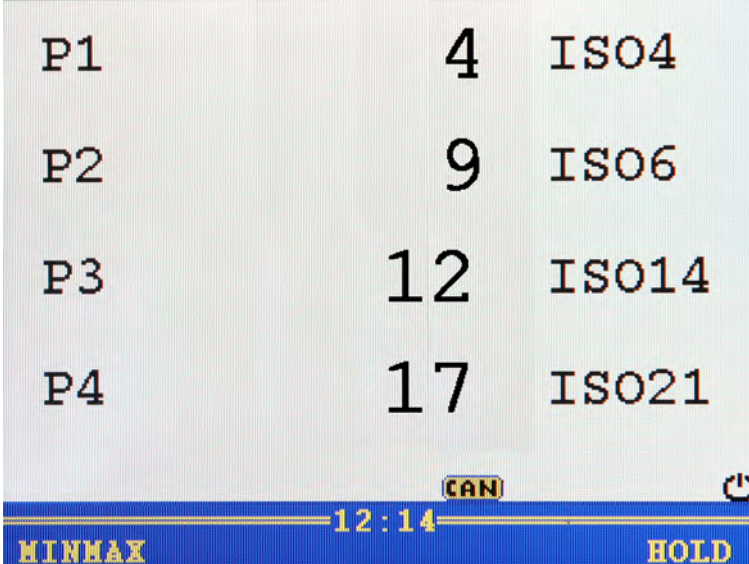
You can modify the values, then press `F1` to transmit the parameters to the particle counter.

Press `F5` to complete the programming.

EN

Measured value window with display of the particle classes

Press [F1] while **Particle counter PATRICK** is highlighted in the **Special applications** menu. This configures the required channels automatically.

Then return to the measured values display:

```
P1              4   ISO4

P2              9   ISO6

P3             12   ISO14

P4             17   ISO21

                     CAN        ⏻
               12:14
MINMAX                         HOLD
```

The current measured values for the four classes are displayed. You can select additional channels to be displayed.

Measured value display with the Presentation function

Press `F5` while **Particle counter PATRICK** is highlighted in the **Special applications** menu. A warning hint is displayed first:
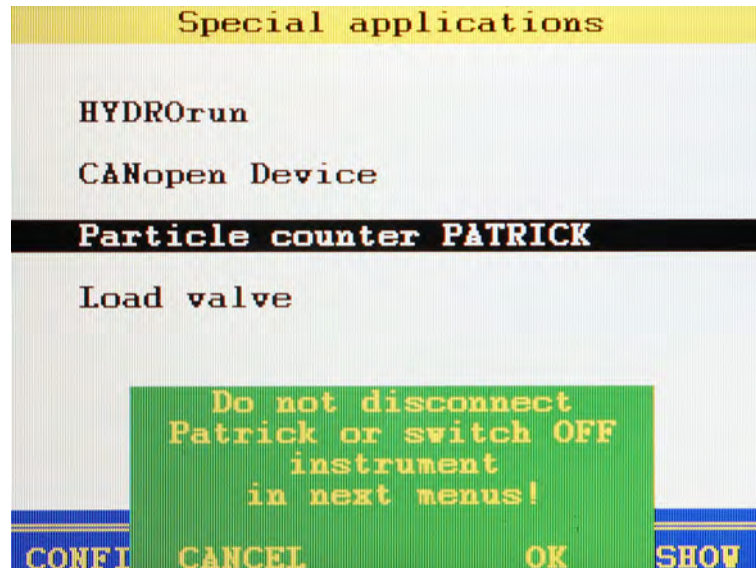
Patrick is switched into Device mode for the **Presentation** function. Patrick automatically switches to standard mode after this function is completed. If the function is not completed properly, Patrick remains in Device mode and adds a value to the history memory every four seconds. This quickly overwrites the existing history data and a long-term documentation can no longer take place.

Press F4 to open the **SHOW** function:
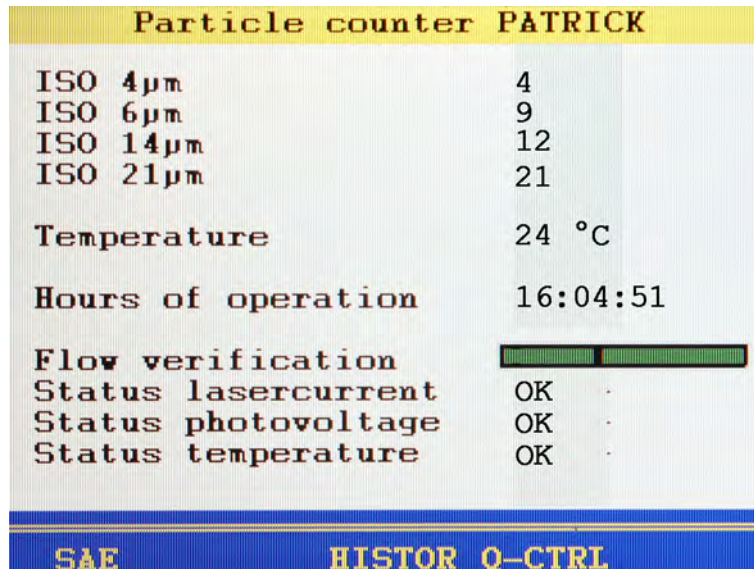
The current measured values of the particle classes are displayed together with several status values of the particle counter. The flow control bargraph turns red when the volume flow rate is outside the allowed limits.

F1	**SAE**	displays the SAE particle classes
F3	**HISTOR**	shows the content of the history memory of the particle counter
F4	**Q-CTRL**	Use this function to request measuring data faster from Patrick to be able to see flow changes earlier in the bargraph

History memory of the particle counter

You can read out and display the data from the history memory of the particle counter:
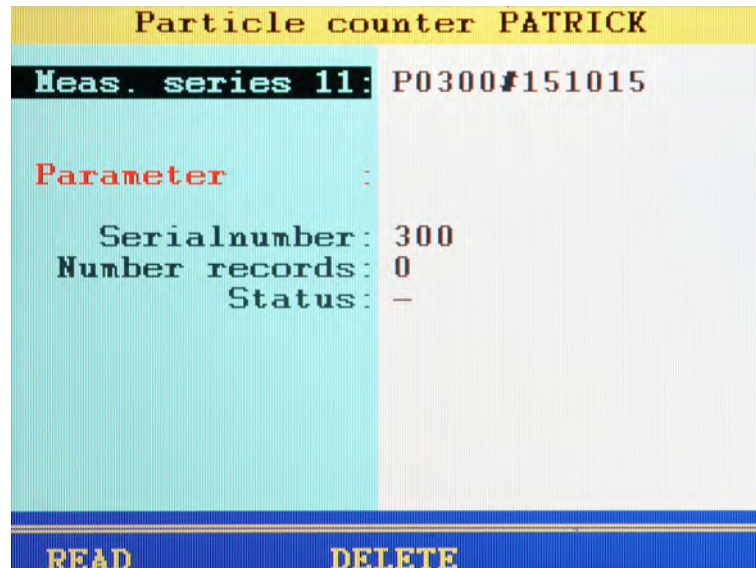
Meas. series xx	Proposed name for the measured value file created with the history data; this can be overwritten
Serialnumber	Display of the serial number of the particle counter
Number of records	Number of data sets in the history memory
Status	Number of transmitted data sets; if > 0 the **SHOW** function is displayed

There are three functions available:

F1	**READ**	reads the data from the history memory
F2	**DELETE**	clears the history memory of the particle counter
F5	**SHOW**	displays the read history data as a table

Display history data

The history data is displayed as a table with five columns. A maximum of eleven data sets are displayed at a time.

The columns show (from left to right):

- Date, time of day
- ISO class 4 µm
- ISO class 6 µm
- ISO class 14 µm
- ISO class 21 µm

F1	**SAE**	shows the particle classes according to SAE
F2	**DETAIL**	shows the data sets between the highlighted ones and the ones in the next line (only available if more data sets than lines)
F3	**RESET**	returns from the detail view

Press **ESC** to close the data table view.

Load valve

Use the **MultiSystem 5060** *Plus* to program and operate the electronically-controlled load valve **HySense QL 326** :

⇨ **Program the load valve** on page 107

⇨ **Operate the load valve** on page 114

Parameter shows the current configuration of the load valve.

Press 🔵 to program the load valve.

ℹ You can only program the load valve if is **INACTIVE**.

⇨ See **Program the load valve** on page 107.

Device / QL-326   **Device** is displayed if no load valve is connected with the measuring instrument.

If a load valve is connected with the measuring instrument, the short name of the load valve will be displayed (example: **QL-326**).

- **INACTIVE**

  The load valve is not active.

  – You can configure the parameters of the load valve

  – You can not operate the load valve.

- **Connected**

  The connection to the load valve is active.

  – You can operate the load valve.

Heartbeat   Indicates whether the measuring instrument is able to communicate with the load valve.

- **???**

  The measuring instrument has not found any load valve to communicate with.

- **ACTIVE**

  The measuring instrument can communicate with the load valve.

  The code in front of **ACTIVE** indicates the state of the communication. Please contact customer service for the code, if necessary.

Software   shows the software version of the load valve.

Program the load valve

> ℹ️ You can only program the load valve if is **INACTIVE**.

➡️ **Here is how to open the load valve dialogue (1/2)**

1 Press 🔵MENU to open the menu.

2 Use △▽ to highlight the **Special applications** entry and press 🔵ENT.

3 Use △▽ to highlight the **Load valve** entry and press 🔵ENT.

4 Use △▽ to highlight the **Parameter** entry and press 🔵ENT.

■

```
Load valve (1/2)
Operation mode    ramp
Mode              SINGLE VAL
Nbr. of cycles    ---
```
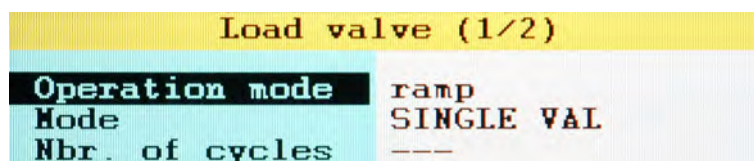
You can define the load valve behaviour in the **Load valve (1/2)** dialogue:

Operation mode Use 🔵ENT to select your desired operating mode:

- **ramp**

  The valve follows the curve of a defined ramp.

  ⇨ See **Program Ramp mode** on page 108.

- **sine**

  The valve follows a sine curve.

  ⇨ See **Program Sine mode** on page 110.

- **Inactive**

  The load valve is switched off.

- **Manual**

  The valve of the load valve is controlled with F3 and F4.

Mode   Use ⓔⓝⓣ to select from the following options:

- **CYCLIC**

  Ramp/Sine is followed repeatedly. The number of repetitions is defined under **Nbr. of cycles**.

- **SINGLE VAL**

  Ramp/Sine is followed exactly one time.

Nbr. of cycles   Enter the number of repetitions for the load (ramp/sine).

For **Mode**, **CYCLIC** must be selected.

➔ **Program Ramp mode**


```
          Load valve (1/2)
Operation mode    ramp
Mode              SINGLE VAL
Nbr. of cycles    ---

Start A            10 %
Ende A             50 %
Duration A         2.00 s
Value B            50 %
Duration B         1.00 s
Start C            50 %
Ende C             10 %
Duration C         2.50 s
Value D            10 %
Duration D         4.00 s            ▶
                                   OK
```

EN
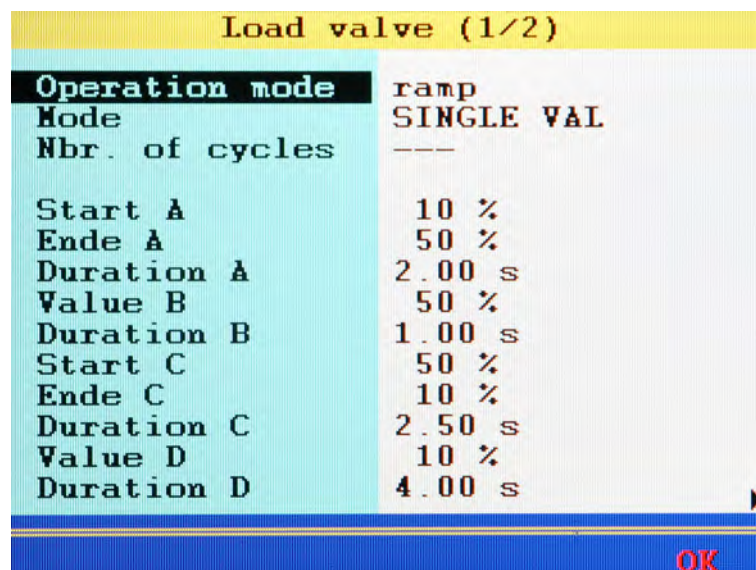
The load valve follows the curve of a ramp that can be defined with four sections. The values shown in the dialogue result in this ramp:
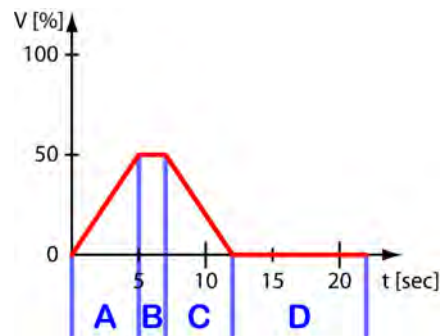
Picture: Values for ramp operation mode

Highlight the setpoints of the ramp, press ᴱᴺᵀ and enter the desired value.

Then press ᴱᴺᵀ.

Start / End   This input corresponds t the Volt value as percentage of the maximum output voltage.

Duration   Time values as a multiple of 10 ms.

➔ **Program Sine mode**

```
         Load valve (1/2)

Operation mode    sine
Mode              SINGLE VAL
Nbr. of cycles    ---

Amplitude         30 %
Offset            40 %
Frequency         0.10 Hz



                              ▶

                            OK
```
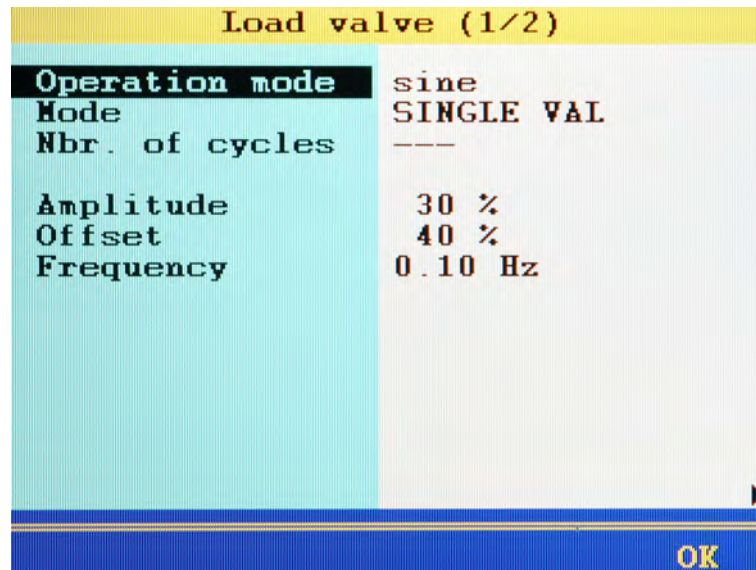
The load valve follows a sine curve that can be defined with three parameters. The values entered in the dialogue result in the shown curve:
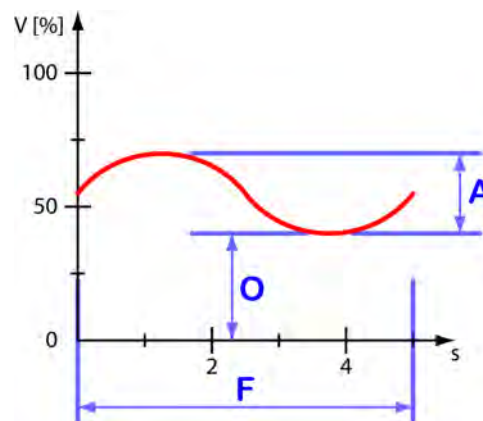
Picture: Values for sine operation mode

A	**Amplitude** of the curve
O	**Offset** between zero and the base line of the curve
F	**Frequency**

Highlight the setpoints of the curve, press 🔵ENT and enter the desired value.
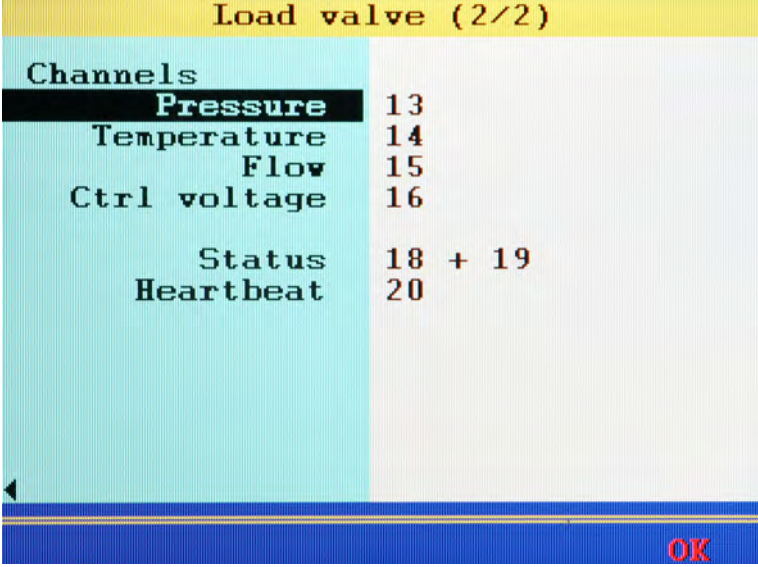
> ℹ️ Make sure that the sum of **Amplitude** and **Offset** is less than 100 %.

Then press 🔵ENT.

Amplitude   This input corresponds t the Volt value as percentage of the maximum output voltage.

Offset   This input corresponds t the Volt value as percentage of the maximum output voltage.

Frequency   Enter frequency as a multiple of 10 mHz.

➔ **Program channels**

Press ◁▷ to display the **Load valve (2/2)** dialogue.

```
            Load valve (2/2)

Channels
          Pressure      13
       Temperature      14
             Flow       15
      Ctrl voltage      16

           Status      18 + 19
        Heartbeat      20

◀
                                    OK
```

Seven channels are required for the operation of the load valve.

- Three channels for the display of the measured values:
    - **Pressure**
    - **Temperature**
    - **Flow**
- One channel for the display of the valve voltage of the load valve.
    - **Ctrl voltage**
- Two channels for the communication between measuring instrument and load valve:
    - **Status**
- One channel for the status query:
    - **Heartbeat**

Highlight the desired channel, press **ENT** and modify the channel assignment.

Then press **ENT**.

➜ **End program**

Press [F5] to end the load valve programming and save your input.

```
                Load valve (1/2)

 Operation mode     ramp
 Mode               CYCLIC
 Nbr. of cycles     3

 Start A            10 %
 Ende A             50 %
 Duration A         2.00 s
 Value B            50 %
 Duration B         1.00 s
 Start C            50 %
 Ende           ┌────────────────────┐
 Durat          │  Set channels for  │
 Value          │     display?       │
 Durat          │                    │
                └────────────────────┘
           YES                NO      OK
```
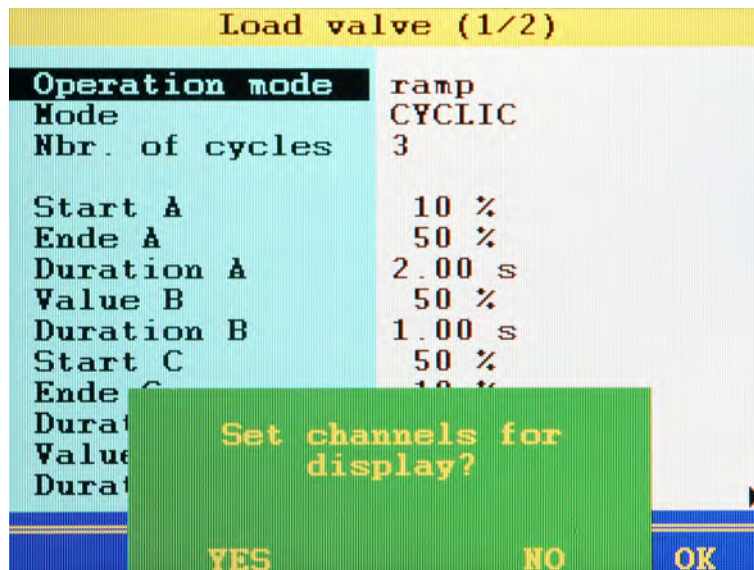
If the channels of the load valve are not displayed in the measured values display, the measuring instrument will offer to insert the channels in the measured value display.

[F2] **YES**   The measured values of the load valve are inserted in the measured values display.

[F4] **NO**   No adaptation of the measured values display is carried out.

If necessary, modify the settings of the measured values display in the **Display** submenu.

⇨ See **Display submenu** on page 58.

Operate the load valve

The following prerequisites must be given to be able to operate the load valve with the measuring instrument:

- The load valve is connected with the measuring instrument and ready for operation.
- The communication between measuring instrument and load valve is functioning. A **Heartbeat** is displayed.

  ⇨ See **Load valve** on page 105.
- The load valve is programmed.

  ⇨ See **Program the load valve** on page 107.

➔ **Activate the load valve**

1 Press MENU to open the menu.

2 Use △▽ to highlight the **Special applications** entry and press ENT.

3 Use △▽ to highlight the entry **QL-326** (device) and press ENT.

```
                    Load  valve

        Parameter            ramp,  SINGLE  V~.
        QL-326               connected

        Heartbeat            0x5  ACTIVE
        Software             1.3a
```
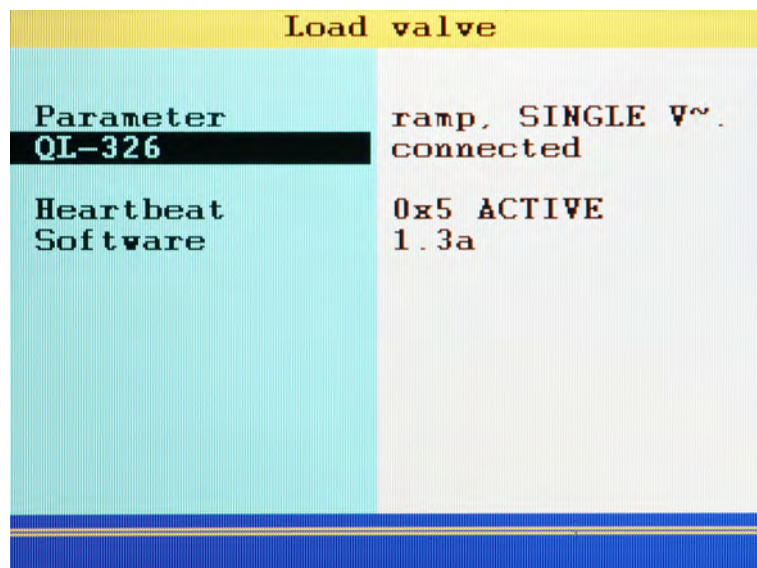
Next to the entry **QL-326**, **connected** will be displayed.

4 Press ESC until the measured values display is shown.

■

Now the function bar at the lower screen edge has two functions. Press △▽ to toggle between the functions:

Picture: Standard function bar

Picture: Function bar during operation mode Ramp or Sine

Picture: Function bar during operation mode Manual

The special function bars have these functions:

F1	**START**	starts the load valve.
		Yellow: The load valve can be started.
		Green: The load valve is started and is taking place. The button has no function:
F2	**STOP**	stops the load valve. Stops the load valve, valve will be opened and the full volume flows through the load valve.
		Yellow: The load valve is started and can be stopped.
		Red: The load valve is not started. The button has no function:
F3		Opens the valve of the load valve.
		(operation mode **Manual** only)
F4		Closes the valve of the load valve.
		(operation mode **Manual** only)
F5	**HOLD**	"freezes" the measured values display.

When you have ended the measurement, you can deactivate the load valve again.
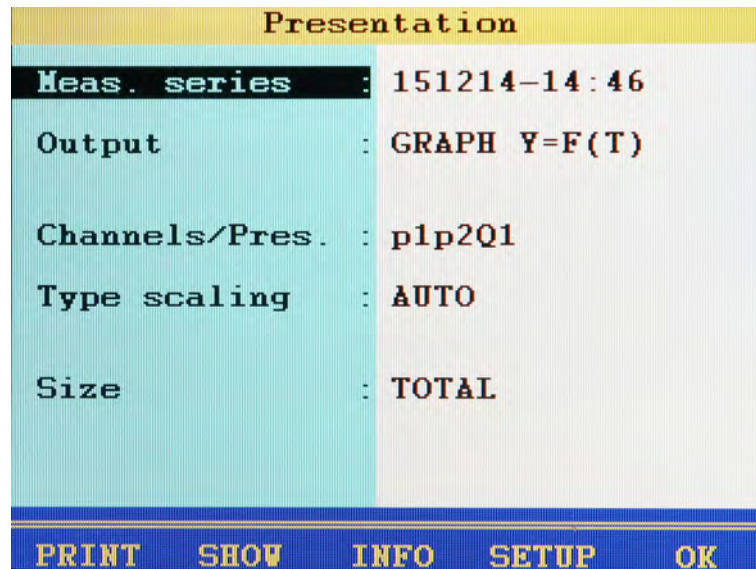
Presentation function

You can process, display and print the stored measured values using the functions of the show menu.

1 Open the **Presentation** submenu: [MENU] [F2]

2 Select measurement: [ENT] [△▽] [ENT]

3 Select output format: [△▽] [ENT] [△▽] [ENT]

⇨ Set additional options, see chapter Chapter **Select channels** on page 118.

4 Present measurement: [F2]

■

➔ **Select measurement:**

1 Open Presentation menu: `MENU` `F2`

2 Select measurement: `ENT` △▽ `ENT`

- You can press `F1` to display the name of the measurement file instead of the recording time.

- Press `F3` while a measurement is highlighted to display information about the measurement.
  Date and time of the measurement, storing time and scanning rate, and possible trigger settings will be displayed.

- Notes, which were entered at the start of the storing, are shown on the second information page. You can edit the notes.

■

➔ **Select output format**

The data of the selected measurement can be presented in four different ways:

- **Table**: Presentation of all measured values of each channel in a table

- **Statistics**: Presentation of the minimum, maximum and average values of each channel

- **Graph**: Two different graphical presentations; one depending on time, the other depending on a selected variable

The graphics are examples for the different types of presentations:

Table

Statistics

Graph

Information about the different display options can be found in the chapters:

⇨ Chapter **Presentation type table** on page 123

⇨ Chapter **Presentation type graph** on page 124

➜ **Select channels**

You can select, which channels of a series are to be presented and assign colours and symbols.

EN

Symbols   Select whether symbols are to be used for the presentation of the channels

Colors   Select whether colours are to be used for the presentation of the channels

Channels   These functions are available when one of these two lines is highlighted (only when the option is set to **YES**):

	HELP	shows helpful information about this dialogue
F1		
F2	**LOAD**	loads the settings for symbols and colours from the display menu
F5	**OK**	saves the settings and closes the dialogue

Highlight one of the displayed channels to modify symbols and colours for it.

You can use one of two methods:

- Press one of the F-keys, select a setting and press `ENT`
- Press `ENT` repeatedly to step through the options, select the settings and the press `ENT`

These functions are available when one of the channels is highlighted:

	SELECT	allows you to select/deselect the channel
F2		
F3	**SYMBOL**	opens the list for selecting a symbol
F4	**COLOR**	opens the list for selecting a colour
F5	**OK**	saves the settings and closes the dialogue

⟶ **Define scaling**
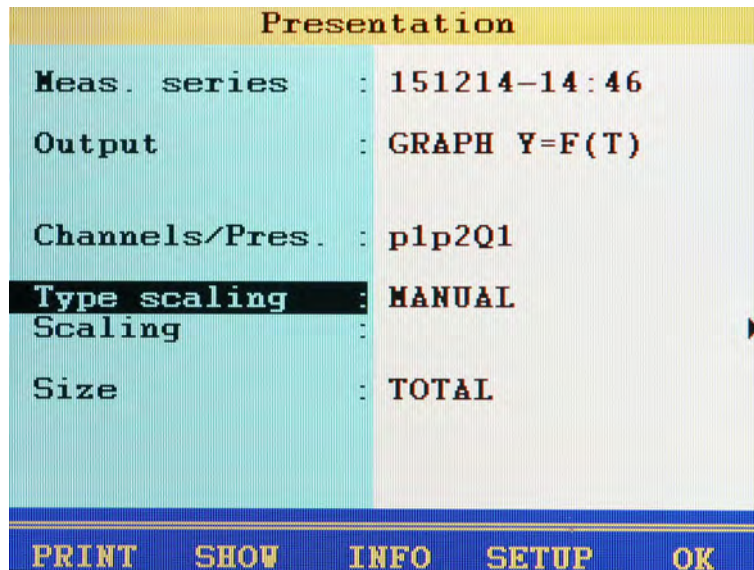
By default, the entire measuring range of a variable is used as scaling.

However, if you want to limit the presentation to a certain part of the measuring range, you can enable the manual scaling:

1 Select **Type scaling**: △▽ Ⓔⁿᵀ

2 Select **MANUAL**: △▽ Ⓔⁿᵀ

3 Select **Scaling**: △▽ Ⓔⁿᵀ

■

➔ **Enter minimum and maximum values**

```
Scaling presentation (1/1)

Channel              Min        Max
p1 (bar)          : 0.00000   200.000
p2 (bar)          : 40.0000   100.000
Q1 (l/min)        : 0.00000   300.000




          LOAD   AUTO   AUTO-S   OK
```

You can set the minimal and maximal values of the measured values to be presented here.

- For **p1** and **Q1** the complete measuring range (0 – 200 bar, resp. 0 – 300 l/min) is to be displayed.

- For **p2** only the measurement values which lie between 40 and 100 bar are to be displayed.

You may use the function keys to ease the manual scaling:

F2	**LOAD**	loads the measuring ranges of the channels and shows them as scaling
F3	**AUTO**	checks the measured values of all channels and shows the actual measuring ranges rounded as scaling
F4	**AUTO-S**	checks the measured values of the highlighted variable and shows the actual measuring range as scaling
F5	**OK**	saves the settings and closes the dialogue

This is how to change the scaling of a variable:

1   Select variable: △▽ ENT

2   Enter minimal value and ENT.

3   Enter maximum value and ENT.

4   Save scaling and close: F5

■

➔ **Define size**

```
                    Presentation
 Meas. series    : 151214-14:46

 Output          : GRAPH Y=F(T)


 Channels/Pres.  : p1p2Q1

 Type scaling    : AUTO


 Size            : CLIPPING
 From            : 2.500    [sec]
 To              : 5.000

 PRINT    SHOW    INFO   SETUP    OK
```
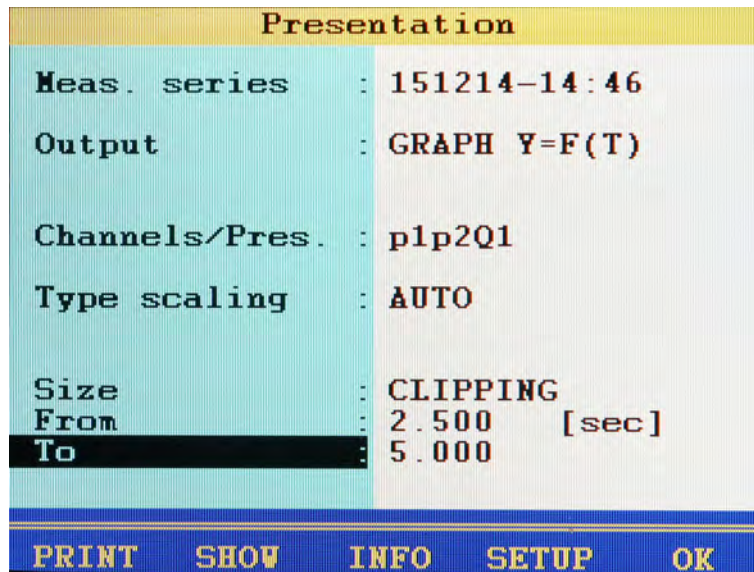
By default, measurements are presented completely. But you may limit the range of presented values by entering a start and end time. In the example shown, only the range between 2.5 and 5.0 seconds is be shown.

This is how to adapt the range of presentation:

1 Select **Size**: △▽ ENT

2 Select **CLIPPING**: △▽ ENT

3 Enter the **From** time: △▽ ENT Value ENT

4 Enter the **To** time: △▽ ENT Value ENT

■

Presentation type table


```
[sec]        p1        p2        Q1
  0.0       0.0       0.0     0.000
  5.0     200.1       0.0     0.000
 10.0       0.0     200.0     0.000
 15.0       0.0       0.0     0.000
 20.0       0.0      90.1    75.872
 25.0       0.0     200.0    75.874
 30.0       0.0       0.0    75.868
 35.0       0.0       0.0    75.869
 40.0       0.0       0.0     0.000
 45.0       0.0       0.0     0.000
 50.0       0.0       0.0     0.000
        151214-14:46
PRINT  DETAIL
```

Independently of the recording time, a table will always contain eleven lines:

• Start and end value

• Nine intermediate values

You can zoom into the table to display intermediate values between two displayed values:

1   Press [F2].

2   Use △▽ to highlight the lines below which you would like to display the intermediate values.

3   Press [ENT].

The highlighted value becomes the start and the next the end value, between that nine intermediate values are displayed; if not enough values are contained in the measuring series to display nine values between the start and end value, the next ten measuring values will be displayed after the start value.

4   You can now repeat these steps to show more detailed values, or press [F3] to undo the zooming step-by-step.

■

Presentation type graph

EN
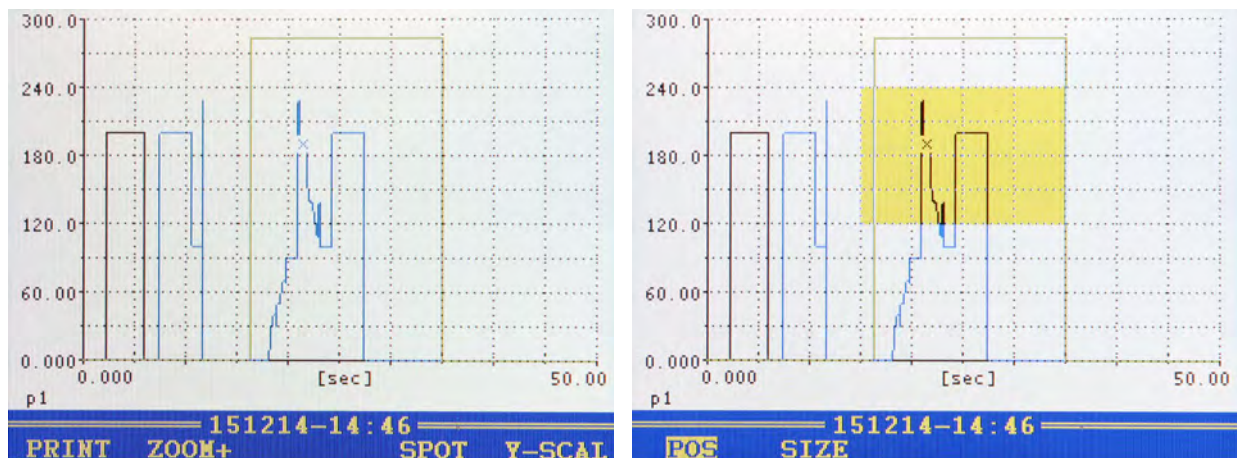
The selected channels are displayed with the assigned symbols and colours.

You can use the zoom function to enlarge certain areas of the graph. You have the following options:

F1	**PRINT**	Print graph
F2	**ZOOM+**	Zoom into the graph
F3		Zoom out in steps
F4	**SPOT**	Use spot function (see **Spot function** on page 126)
F5	**Y-SCAL**	Toggle the channel for which the scaling is displayed at the y-axis (see **Meaning of the scaling locations** on page 125)

1   Enable zoom function: `F2`

A yellow rectangle indicates the area that will be enlarged.

You can move and scale the rectangle:

2   Move rectangle: `F1` ◁▷ △▽

3   Scale rectangle: `F2` ◁▷ △▽

4   Display yellow area (apply zooming): `ENT`

You can use the zoom function repeatedly to show the desired area of the graph in an optimised way.

5   End graph presentation: `ESC`

■

Meaning of the scaling locations

The upper right graphic shows the presentation with **GLOSS** scaling location, that means the scaling of the displayed channels is shown beneath the graph beside the channels. This gives more room for the graph.

The **Y-AXIS** scaling location (see upper left graphic) shows the scaling of *one* channel on the y axis.

Press `F5` to toggle between the scaling of all displayed channels. The channel whose scaling is currently displayed is shown beneath the y axis.

The scaling location can be changed in the setup of the presentation menu (see Chapter **Dialogue Setup for Presentation** on page 127).

EN
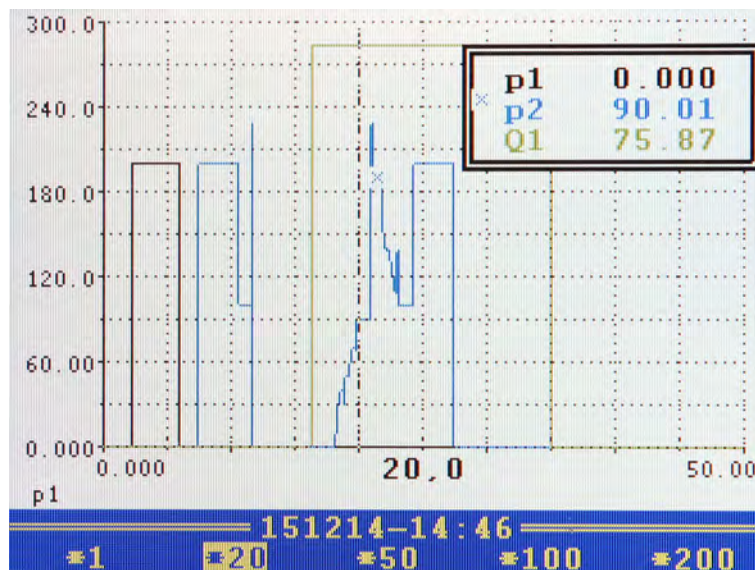
Spot function

You can use the spot function to display measured values of a certain time position within the graph:

1 Activate spot function: `F4`

2 Choose move factor: `F1` `F2` `F3` `F4` `F5`

3 Move spot line: ◁▷

Press the `MENU` key during the spot function to select different move factors.

4 Read measured values.

5 End spot function: `ESC`

■

Delta spot function

If you press the [MENU] key while the graphic is displayed, two new function key assignments will be displayed:

[F4]   Use delta-spot function

[F5]   Print screen

EN

For the delta-spot function, two spot lines are displayed.

For scaling location **Y-AXIS**, the differences between the measured values marked by the spot lines are displayed in a rectangle in the upper right corner.

For scaling location **GLOSS**, the distance between the spot lines is displayed as a bold number between the spot lines at the x-axis.

Like in the spot function, you can now choose move factors with the keys [F1] [F2] [F3] and select with [F4] whether the left (x1), right (x2) or both spot lines are to be moved.

Dialogue Setup for Presentation
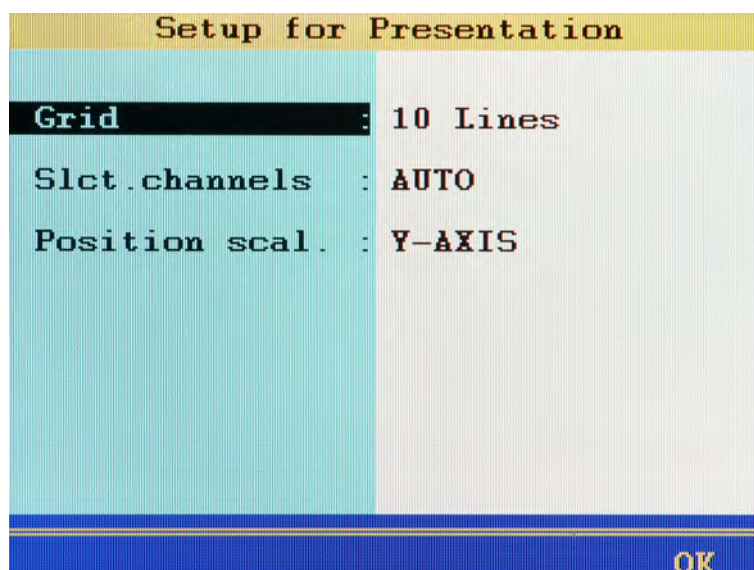
You can modify the basic structure of the graphic presentation in the **Setup** submenu.

1   Open the **Setup** submenu: `F4`

2   Highlight function: △▽ `ENT`

3   Select setting: △▽ `ENT`

4   Exit the **Setup** submenu: `F5`

∎

Grid   Number of the displayed lines in the grid of the diagram (**no Grid**, **5 Lines**, **10 Lines**, **Zero Lines**).

Channel selection   Choose from the following options:

- **AUTO**: For presentation of a different measurement, all channels of this measurement will be selected automatically for the presentation

- **MANUAL**: When presenting other measurements, the last channel selected remains, if possible

Position scaling   defines how the scaling of the channels is displayed.

- For **GLOSS**, the scaling is displayed beneath the graph.

- For **Y-AXIS**, only the scaling one channel is shown on the y axis. There is remaining space for the graphic.

Press `F5` to browse the scaling of the channels shown.
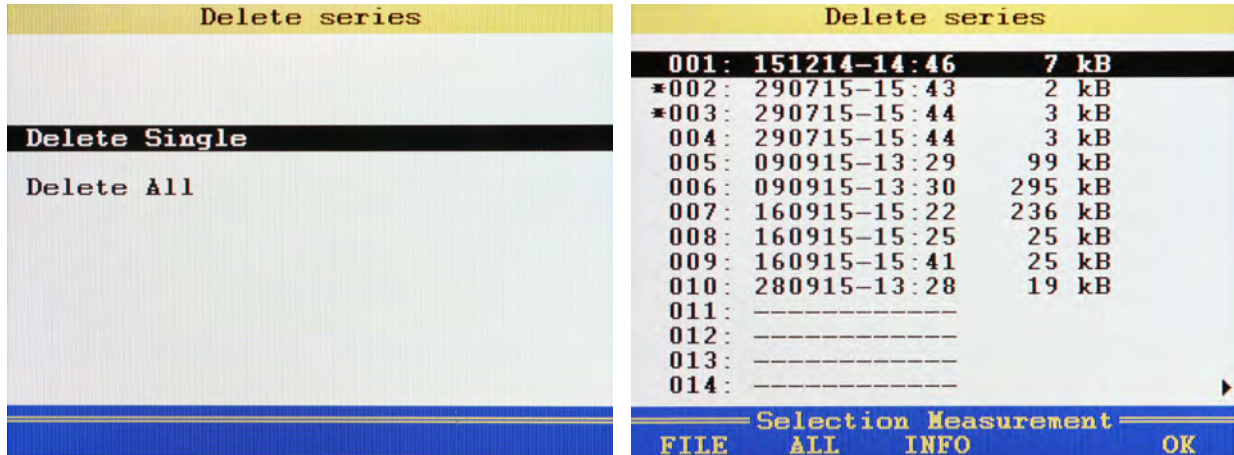
Delete series function

Use the functions of this menu to delete stored measurements.

In the graphic, the measurement series **002** and **003** are selected for deletion. The measurement series **001** is highlighted. Press F3 to display information on it.

1 Open delete menu: MENU F3

2 Select **Delete Single** or **Delete All**: △▽ ENT

For **Delete All**, continue with step 6.

3 For **Delete Single**, select desired measurement: △▽ ENT

A * will be displayed next to the measurement.

Press F3 to display information on the currently highlighted measurement.

4 Repeat step 3 until all desired series of measurements are selected.

5 Start deletion: F5

6 Confirm deletion with F2 or cancel with F4 .

The deletion cannot be undone.

■

USB stick menu function

With the functions of the USB stick menu you can move files between the stick and the measurement system, and display information on the USB stick.

```
              Menu USBStick

  Mode          :  Save

  Data type     :  Meas. series (MWF)

  Selected      :  2 (14836 Bytes)

  Default name  :  5060#


  HELP                        INFO   START
```
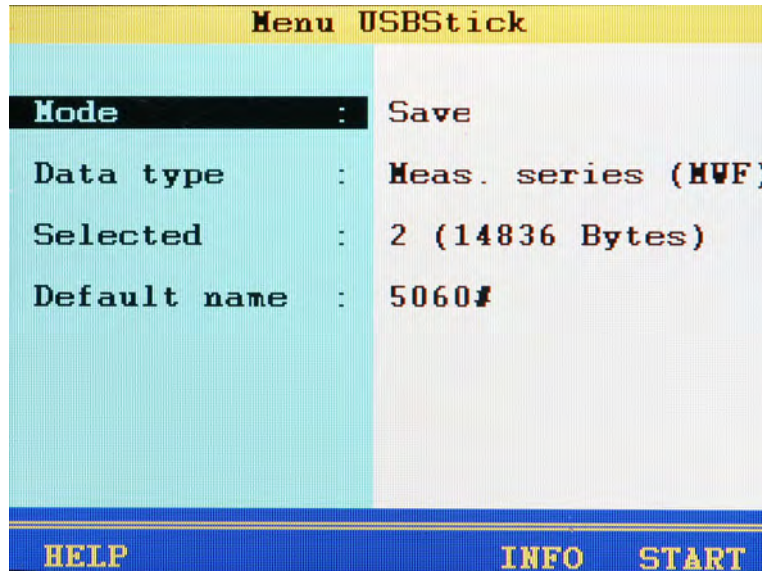
> ⓘ **Menu is not displayed all the time**
> The USB stick menu will only be displayed if a USB stick is plugged and detected.
> Please observe the requirements for the USB stick as described in chapter Chapter **How to use the USB stick** on page 149.

➔ **Saving to the USB stick**

To transfer files from the SD card of the measuring instrument onto a USB stick, proceed as follows:

1 Open the USB stick menu: `MENU` `F4`

2 Select **Save** mode: `ENT`

3 Select **Data type**: `△▽` `ENT` `△▽` `ENT`

- Measurements (mwf files)
- Project data (prj files)
- Sensor databases (sdb files)
- CAN parameter databases (cdb files)

4 Select files.

   ⇨ See **Select files** on page 131.

5 Define default name.

   ⇨ See **Define default name** on page 132.

6 Start copying: `F5`

∎

➔   **Select files**

```
              Menu USBStick
*001:  151214-14:46      7 kB
 002:  290715-15:43      2 kB
 003:  290715-15:44      3 kB
 004:  290715-15:44      3 kB
 005:  090915-13:29     99 kB
*006:  090915-13:30    295 kB
 007:  160915-15:22    236 kB
 008:  160915-15:25     25 kB
 009:  160915-15:41     25 kB
 010:  280915-13:28     19 kB
 011:  -------------
 012:  -------------
 013:  -------------
 014:  -------------              ▶
          Selection Measurement
  FILE     ALL     INFO        OK
```

There are three functions available making file selection easier:

F1	**FILE**	Shows the names of the files
F2	**ALL**	Selects all files
F3	**INFO**	Displays additional information on the selected file

1   Highlight **Select** in the USB stick menu: △▽

2   Open the **Select** submenu: ENT

3   Select desired file(s): △▽ ENT

Selected files are marked with a * to the left next to the line (here the files **001** and **006**).

4   End selection: F5

■

➜   **Define default name**

When copying files to the USB stick, only the 8.3 name convention is support-
ed. All files will therefore be renamed. Here you may define a prefix for the new
file names. Since the name may only have eight characters, you should leave
enough space for a consecutive numbering of the files.

1   Highlight **Default name** in the USB stick menu: △▽

2   Start definition: ⓔⓝⓣ

3   Enter desired prefix; you may use all alphanumeric characters.

4   Confirm prefix: ⓔⓝⓣ

■

EN

➔ **Load files from the USB stick**
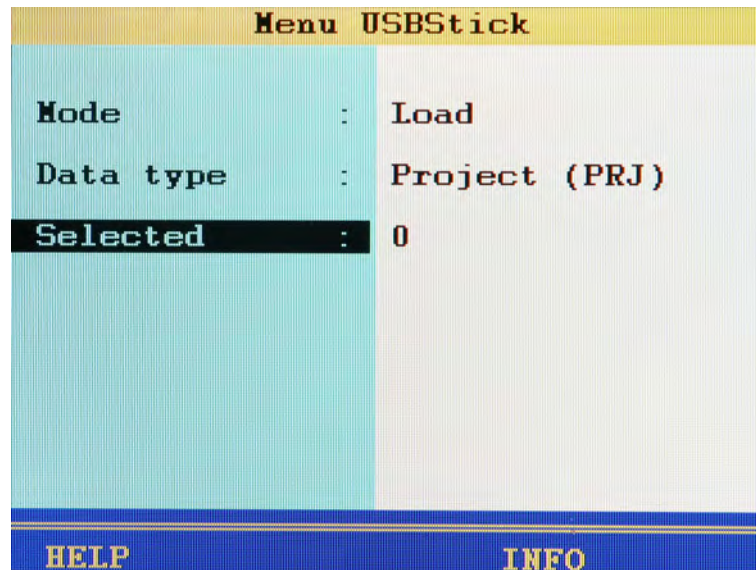
To transfer files from the USB stick to the measuring instrument, proceed as follows:

1 Open the USB stick menu: [MENU] [F4]

2 Select mode **Load**: [ENT]

3 Select **Data type**: [△▽] [ENT] [△▽] [ENT]

- Measurements (mwf files)
- Project data (prj files)
- Sensor databases (sdb files)
- CAN parameter databases (cdb files)

4 Select files.

⇨ See **Select files** on page 134.

5 Start copying: [F5]

■

➔ **Select files**

```
D:\*.PRJ [DATA]                        1/1

 ─┬ 5060#001.PRJ  28.09.15 11:44 10.24kB
  ├ TEST02.PRJ    29.09.15 12:48 10.24kB
 *├ 5060#005.PRJ  28.09.15 11:44 10.24kB
  ├ 5060#006.PRJ  28.09.15 11:44 10.24kB
  ├ 5060#002.PRJ  28.09.15 11:44 10.24kB
  ├ 5060#003.PRJ  28.09.15 11:44 10.24kB




  10 of 61 k  in 1 of 6 files marked
              DELETE   COPY
```
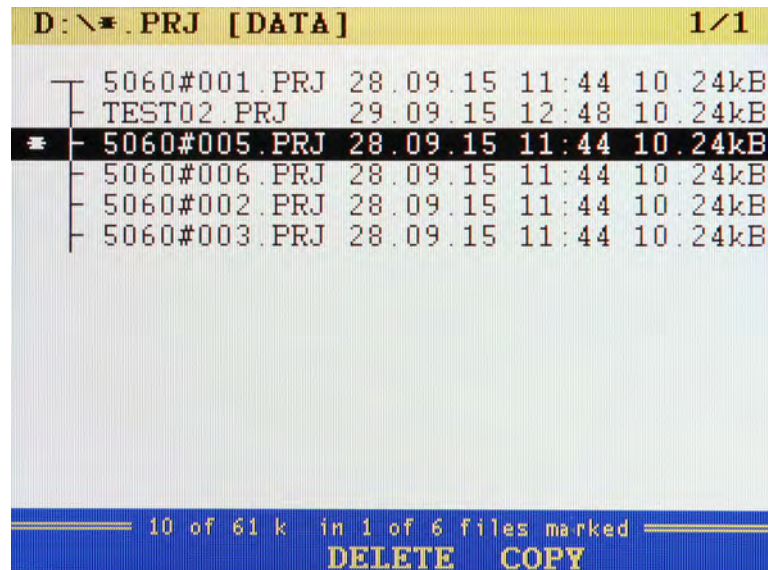
There are two functions available during the file selection:

F3	**DELETE**	Deletes the marked file(s) from the USB stick
F4	**COPY**	Copies the marked file(s) from the USB stick to the SC card of the instrument

1 Highlight **Select** in the USB stick menu: △▽

2 Open the **Select** submenu: ENT

3 Select desired file(s): △▽ ENT

   Selected files are marked with a * left next to the line.

4 End selection: F5

■

Ⅼⅰ **Display information about the USB stick**

```
                  Menu USBStick

  Memory size       :  3632.184  kB

  Free memory       :  3631.692  kB

  ** Root directory **
  Number of files  :  12
  MWF- files        :   3  (397 kB)
  PRJ- files        :   6  (61  kB)
  SDB- files        :   0  (0   kB)
  CDB- files        :   0  (0   kB)
  BIN- files        :   0  (0   kB)
  PAD- files        :   0  (0   kB)
  other files       :   3  (34  kB)
```

ℹ **Waiting time up to four minutes**
If information is to be displayed on the USB stick, the memory capacity of the stick is tested. This can take up to four minutes depending on the capacity of the USB stick.

You can display information on the detected USB stick by pressing `F4` while the USB stick menu is displayed. Then the memory capacity of the stick is tested, which may take up to four minutes. A screen will subsequently appear, as can be seen in the example graphic.

Here you can see the size of the total and available memory as well as a list of files contained on the stick that are interesting for the **MultiSystem 5060** *Plus*. Press `ESC` to leave the submenu.

Special functions

Special functions of the instrument, which have been referred to in the previous sections, are explained here.

Linearisation table

The linearisation table can be utilized to compensate for sensor inaccuracies. By calibrating a sensor, you will obtain this table, which can be entered into the measuring instrument. Five different linearisation tables, each with ten values are available for each measuring channel.

1 Select the option **YES** at the **Linearisation** menu option. `ENT`.

2 Highlight **Table**: `ENT`.

3 Either highlight a stored table, or an empty line if you want to enter a new table: `ENT`.

4 Highlight the entry **ID.- Number**: `ENT`.

5 Enter a name for the new table: `ENT`.

6 Highlight **Ref.-Point 1**: `ENT`.

7 Enter the first set value: `ENT`.

8 Enter the first actual value: `ENT`.

9 Repeat steps 7 and 8 for all required lines of the table.

10 Complete the entry of set and actual values: `ESC`.

11 Confirm the table: `F5`.

The new table is selected as active.

■

Define CAN channel

Note
The CAN bus must be activated in the device menu to enable the use of a CAN channel. See chapter Chapter CAN configuration on page 74

Channel 13

```
Calculation      : CAN
Variable         : p
Index Variable   : 5
Unit             : bar
Name             :
CAN- Parameter   :
    Specification : Can 2.0A
    Identifier    : 417 (1A1H)
    Format        : BINARY (BIT)
    Timeout       : 4
    Meas.range    : 0.0000
                    400.00

LOAD    SAVE              OK
```

CAN- Menu (1/2)

```
Specification : Can 2.0A
Timeout       : 4   (sec)
Identifier    : 1A1(H) (417d)
Format        : BINARY (BIT)
Bit- Offset   : 0
Number Bits   : 16
Byte order    : Little Endian
Filter        : NO
Command (0)   : 0          (0H)
Index (1-2)   : 0          (0H)
Calculation   : REF.-LIST
CAN-Value     : 0          20000
Meas-Value    : 0.00000    400.000
Type of Value : unsigned            ▶

HELP    LOAD    SAVE              OK
```

After you have set a calculation channel to **CAN**, you can enter variable and unit freely. Then you have to define the CAN parameters. Please have the documentation of the CAN sensor or the **MultiXtend**available; all required information can be found here.

1 Highlight **CAN- parameters**: ᴱᴺᵀ .

2 Select the CAN specification: ᴱᴺᵀ .

3 Enter the timeout: ᴱᴺᵀ .

4 Enter the identifier as a decimal number.

The corresponding value is displayed in hexadecimal numbers and the corresponding decimal value stands in brackets – ᴱᴺᵀ .

5 Select the data format: ᴱᴺᵀ .
Further input options are displayed depending on the selected format.

After entering all CAN parameters you can assign a name and store them:

1 F3 .

2 ᴱᴺᵀ – enter a name, use F2 to toggle between the entry of capital and small letters – ᴱᴺᵀ .

3 F5 – store entered name.

CAN original format

When entering the CAN specifications you may select the **ORIGINAL** format. Then, the CAN data will not be interpreted by the measuring instrument, but saved digitally in the measurement file. During the subsequent data evaluation with **HYDRO***com* 6, these data can be interpreted.

This allows the recording of so called "Multichannels". These are channels containing data from several sources, e.g. switch positions (max. 64 switches in one channel) or different sensor signals.

If you want to record CAN original data, you will only have to define the number of Offset-Bits (bits at the beginning of a CAN message that shall be left out) and Data-Bits (bits after the offset that shall be recorded).

Display of Multichannel data

If you include a Multichannel into the measuring display, no measured values but a hexadecimal number in blue digits will be shown. In a max. 5-digit hex number, up to 20 sub-channels can be displayed. If the channel contains more sub-channels, the last four hex digits will be displayed together with a ~ in front of them.

Use of Multichannels

Many machine states (pump on, blinker off, rear light on, motor on, …) are encoded in a CAN message with a single bit. By default, a separate measuring channel of the instrument must be used for each status / status bit. With the Multichannel function, all status bits can be collected with one single channel, you may later use **HYDRO***com* 6 to separate this into the single status information. You may also use **HYDRO***com* 6 to combine single bits of a Multichannel to one measured value. This allows to collect several measured values using one channel of the MS 5060 Plus. Due to the HEX format, a readable display of these measured values in the instrument is not possible.

Examples
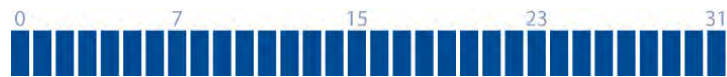
Here you save all 32 bits of a Multichannel.

Format:	ORIGINAL
Bit offset:	0
Data bits:	32
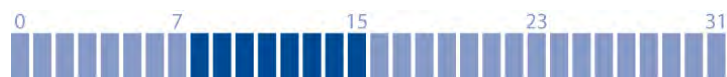
Here, you save data bits 8 to 15.

Format:	ORIGINAL
Bit offset:	8
Data bits:	8
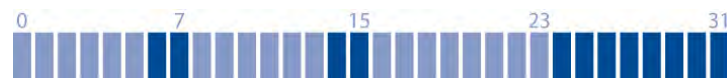
Here you save the data bits 6 to 31. If you do not want to save the "uninteresting" bits 8 to 13 and 16 to 23, you will have to assign the Multichannel to three special channels and define different settings:

- 1. Channel: Bit offset 6, data bits 2;
- 2. Channel: Bit offset 14, data bits 2;
- 3. Channel: Bit offset 24, data bits 8

Format:	ORIGINAL
Bit offset:	6
Data bits:	26
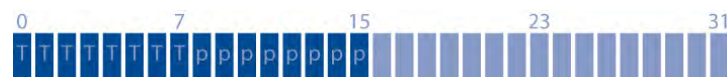
Here the measured values of a temperature (bits 0 to 7) and a pressure sensor (bits 8 to 15) are coming on one Multichannel. With the shown specifications, you record the measured values of both channels, but they cannot be displayed at the measuring instrument. The decoding will be done later using **HYDRO***com* 6.

You need two special channels to display the measured values with the **MultiSystem 5060** *Plus*.

- On the first one, you define for the temperature sensor: **Format** = **BINARY**, bit offset = 0, data bits = 8.

- For the pressure sensor, you require a different special channel and define here: **Format** = **BINARY**, bit offset = 8, data bits = 8

Format:	ORIGINAL
Bit offset:	0
Data bits:	16

Graphic presentation in display menu

After configuring the graphic presentation in the display menu (see Chapter **Display submenu** on page 58) in the measured values display, the measured values will then look like this, for example:
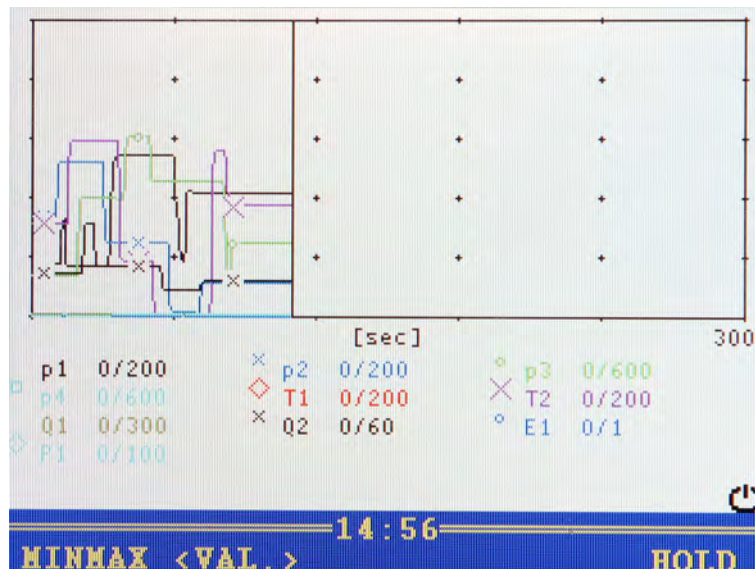
- Channel p1 is displayed as blue line with circles
- Channel T1 is displayed as red line with squares
- The current measured values are displayed beneath the graph
- The vertical black line in the centre of the graph indicates the current measuring position

You can use the following functions:

F1	**MINMAX**	switches to the graphical presentation of MinMax values
F2	**<VAL.>**	displays scaling information instead of measured values
F5	**HOLD**	stops the actualisation of the measured values ("freezes" the display)

Couple several instruments

You can couple several **MultiSystem 5060** *Plus* measuring instruments and increase the number of available input channels with nearly no limitations. But please be aware that the parameters scanning rate, storage time and pretrigger must be programmed identically at all coupled measuring instruments.

Connecting a measuring instrument electrically

Note
Malfunctions possible! Only use the connection cables available from HYDROTECHNIK to connect the instruments. Otherwise there is the risk of malfunctions.

A   Digital input/output

Couple two instruments   Use the connection cable TKZ 8824-F2-00.50 and connect the digital input/output jacks.

Couple several instruments   Use the connection cable for external trigger TKZ 8824-D8-04.00 and couple the instruments serial or parallel:

EN

Serial coupling

- Connect the external trigger signal to pins 3+4 [IN] of the Master instrument.
- Connect the pins 1+2 [OUT] of the Master instrument with pins 3+4 [IN] of the first Slave instrument.
- Connect the pins 1+2 [OUT] of the first Slave instrument with pins 3+4 [IN] of the second Slave instrument.
- Couple all instruments in this manner.

Restrictions of the serial coupling

You will see synchronisation delays with the serial coupling:

- max. 1 ms between Master and Slave 1
- max. 1 ms between Slave 1 and Slave 2
- max. 2 ms between Master and Slave 2
- max. 4 ms between Master and Slave 4

If you operate the coupled instruments in the "dynamic mode" (see section on page Chapter **Set hardware filter** on page 75) (hardware filter switched off), all channels can be scanned with up to 10 kHz. Then the synchronisation delay between two devices is reduced to 0.1 ms.

Parallel coupling
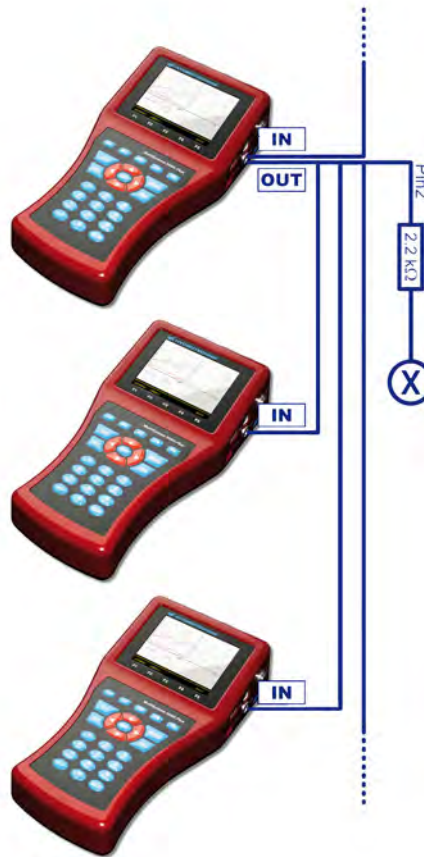
- Connect the external trigger signal to pins 3+4 [IN] of the Master instrument.
- Connect the pins 1+2 [OUT] of the Master instrument with pins 3+4 [IN] of all Slave instruments
- Connect pin 2 of the Master instrument via a 2.2 kOhm resistor with pin 3 of a free measuring channel [X]

⊞ HYDROTECHNIK

Restrictions of the parallel coupling   The parallel coupling may only be used for the maximum of 10 instruments (1 Master + 9 Slaves). You will see small synchronisation delays of max. 1 ms between all instruments.

Use of the MultiXtend Trigger

For the coupling of more than two instruments we recommend the use of the MultiXtend Trigger (TKZ 316A-00-00.50). This simplifies the coupling and allows the use of the standard connection cables (TKZ 8824-F2-00.50).

Programming instruments

Programming Master instrument

1   Program the memory channels as desired.

2   Program scanning rate, storage time and pretrigger as desired.

3   Program the storage start by a trigger (absolutely required, trigger type can be chosen freely).

4   Program the trigger output **ACTIVE** and set it to **SP_TRIG** (forwarding of the trigger signal to the Slaves).

■

EN

Programming Slave instruments

1   Program the memory channels as desired.

2   Program scanning rate, storage time and pretrigger in the same way as the Master instrument.

3   Program the storage start by a trigger. For **Trigger 1**, program the trigger input **E1** to **ON**.

4   Program the trigger output **AKTIV** and set it to **SP_TRIG** (forwarding of the trigger signal to the next Slave). This is required for serial coupling, only.

■

Start recording

Activate the recording at each instrument normally. Please be aware of:

*   The trigger incident may not happen at the Master instrument, before all Slave instruments have been activated

*   There must be sufficient time between the activation of the storage and the happening of the trigger incident to allow all instruments to store the set pretrigger; otherwise the measuring data cannot be synchronised

    Example: the pretrigger is 10 sec (20 % pretrigger at a storage time of 50 sec) and the trigger incident happens 5 sec after the storage activation at the last instrument; this results in a different number of measured values at the coupled instruments

*   The storage may not be stopped at any of the coupled instruments, otherwise a synchronisation becomes impossible

*   Avoid cyclic storage due to a possible triggering ahead of the desired time

Transfer and evaluate measured values

Transfer the measured values from all instruments to a PC. Use the **Combine** function of the **HYDRO***com* software to combine the measurements.

How to use the USB stick

The USB stick can be used to exchange data and to do a firmware update without using a PC and the software **HYDRO***boot*. There are some restrictions for the use of the USB stick:

• USB sticks may only have one partition

• USB sticks must be formatted in the FAT file format

• Bootable USB sticks are not supported (no indication "U3smart" on the stick)

• Only the root directory is supported on the USB stick; subdirectories are not recognized, data cannot be read or written there

• The file names must comply with the 8.3 name convention, longer file names will be shortened automatically

EN

Firmware update using the USB Stick

Note
Loss of data possible! Back up all data from the SD card before starting the update. Do not switch off the instrument and do not unplug the USB stick while the new firmware version is being loaded. Otherwise there could be malfunctions and loss of data.

You can use the USB stick to perform firmware updates quickly and easily.

1 Copy the new firmware version onto the USB stick. The file must be located on the top file system level, not in a directory.

2 Switch on the **MultiSystem 5060** *Plus* and wait until the measured values display appears.

3 Plug the USB stick into the USB connector.

4 Open the device menu.

5 Open the setup menu with `F2`.

6 Highlight the function **USB stick** and press `ENT`.

7 The message *Read directory* will be displayed and after a short time, the data contained on the stick are displayed.

8 Highlight the file *61_00.BIN*' and press `ENT`.

9 Confirm the update with `F5` (**OK**).

10 The new firmware version will be loaded and takes about 3 minutes.

11 After loading the firmware, the message *Update Firmware* will be displayed.

12 Confirm the update with `F2` (**YES**).

13 The update will be executed, then the instrument will be switched off automatically.

14 Unplug the USB stick.

15 Switch the device on. The current firmware version number and the selection list of the available operation languages are displayed.

16 Confirm the operation language with ⒠. Then the message *The software has been updated! Execute RESET?* will be displayed. Press ⒡ to perform the reset.

17 Wait until the initialization has been executed completely.

Now you can use your **MultiSystem 5060** *Plus* with the new firmware version.

■

EN

Connect MultiXtend A and T

You can use the MultiXtend A and T to connect additional analogue sensors or thermocouples to the **MultiSystem 5060** *Plus*. Their signals are digitalised by the MultiXtend and transmitted to the CAN input of the measuring instrument. The presentation, storage and evaluation of the measuring data is then done in the instrument.

The following steps are required to use the MS 5060 Plus:

• Activate CAN bus

• Program CAN channels

• Activate MultiXtend power supply

• Start the MultiXtend

Activate CAN bus


```
                    Device (1/3)
Language        :   ENGLISH

Date            :   13.10.2015
Time            :   15:19

ISDS            :   YES
Unit            :   SI

Can             :   ACTIVE
Baudrate        :   125 kBit/s

HW-Filter (AD)  :   STANDARD          ▶
SW- Filter      :                     ▶

                                      ▶

        SETUP   INFO             OK
```
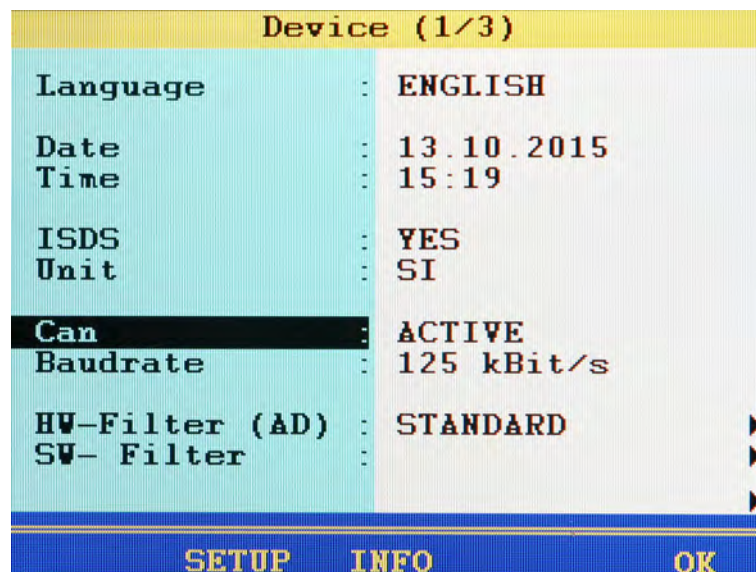
At first you will have to activate the CAN bus in the **Device** submenu:

Note
Malfunctions possible! Make sure that the MultiXtend is set to the desired baud rate. Observe item 3 of the short operating instructions.

1   Open **Device** submenu: `MENU` `△▽` `ENT`

2   Select function: `△▽`

3   Set function to **ACTIVE**: `ENT`

4   Switch to select the **Baudrate**: `△▽` `ENT`

5   Select desired baud rate: `△▽` `ENT`

6   Confirm changes and leave function: `F5`

■

Program CAN channels

Observe the information in chapter Chapter **Define CAN channel** on page 138.

In the following example we show an assignment of a MultiXtend A with three sensors:

- Pressure sensor 0 – 600 bar at input 1
- Pressure sensor 0 – 200 bar at input 2
- Temperature sensor 0 – 60 °C at input 3

Program three input channels on the **MultiSystem 5060** *Plus*:

Measuring channel 13

Calculation	CAN
Variable	p
Unit	bar
Specification	CAN 2.0A
Timeout (sec)	1 (recommended)
Identifier	Enter the sum of 384 plus the address programmed at the MultiXtend (see item 2. of the short operating instructions); e.g. address 064 results in identifier (384 + 64 =) 448
Format	Binary (byte)
Offset	0 (since the sensor is connected to input 1)
Number bytes	2
Order	Little Endian
CAN value	0 / 20,000 (for sensor 0 to 20 mA; 4,000 / 20,000 for sensor 4 to 20 mA)
Measurement value	0.000 / 600.0 (sensor measuring range)
Type of Value	Unsigned

Meas.Channel 14

Calculation	CAN
Variable	p
Unit	bar
Specification	CAN 2.0A
Timeout (sec)	1 (recommended)
Identifier	Enter the sum of 384 plus the address programmed at the MultiXtend (see item 2. of the short operating instructions); e.g. address 064 results in identifier (384 + 64 =) 448
Format	Binary (byte)
Offset	2 (since the sensor is connected to input 2)
Number bytes	2
Order	Little Endian
CAN value	0 / 20,000 (for sensor 0 to 20 mA; 4,000 / 20,000 for sensor 4 to 20 mA)
Measurement value	0.000 / 200.0 (sensor measuring range)
Type of Value	Unsigned

Meas.Channel 15

Calculation	CAN
Variable	t
Unit	°C
Specification	CAN 2.0A
Timeout (sec)	1 (recommended)
Identifier	Enter the sum of 384 plus the address programmed at the MultiXtend (see item 2. of the short operating instructions); e.g. address 064 results in identifier (384 + 64 =) 448
Format	Binary (byte)
Offset	4 (since the sensor is connected to input 3)
Number bytes	2
Order	Little Endian
CAN value	0 / 20,000 (for sensor 0 to 20 mA; 4,000 / 20,000 for sensor 4 to 20 mA)
Measurement value	0.000 / 60.00 (sensor measuring range)
Type of Value	Unsigned

Activate MultiXtend power supply

The **MultiXtend** can either be supplied by its own power pack, or by the MS 5060 Plus. If the instrument shall supply the required power, this function must be activated:

1 Open the **Device** menu.

2 Open the submenu **Setup**: F2

3 Highlight the function **Power CAN**.

4 Press ENT to set the function **Power CAN** to **ON**.

5 Press F5 to confirm the changes and leave the setup menu.

∎

Start the MultiXtend

After activating the power supply, the **MultiXtend** must be started. Otherwise it cannot send signals.

Note
After a loss of supply power or the measuring instrument has been switched off, the MultiXtend must be started again.

1 Open the menu **Special applications**.

2 Press F2 **START**.

∎

Connection of external measuring devices

You can connect external measuring devices (e.g. Multimeters) to the RS232 interface of the **MultiSystem 5060** *Plus* and assign the measuring signals to a special channel. The measuring devices must support the output data format "Voltcraft" or "Metex".

EN

Configuration in the channel menu
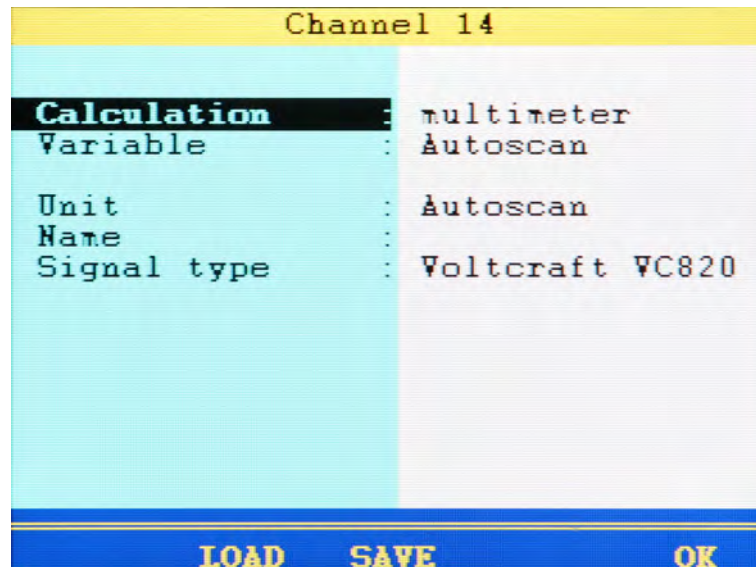
You can assign the output signal of the external device to any special channel. Open the parameters of the desired channel in the channel menu (see Chapter **Configure special channels (C11 ... 24)** on page 53) and set the parameter **Calculation** to **multimeter**.

Then you will have to select the output signal type of the device (**Voltcraft VC 820**, **Metex**, or **Voltcraft VC 9x0**) and assign a name to the channel. Press ⬚F5 to save the channel settings. Then you may use this channel for display, recording and calculations as any other channel.

Note
In certain circumstances, a "Send" command must be given to the connected multimeter in order to initiate the communication. Please observe the operating instructions of the multimeter.

Viscosity-compensated volume flow rate measuring

```
                    ┐ Channel 7

  Measurand       : Q[l/min]
  Index Variable  : 1
  Name            :
  Viscos.balance  : INACTIVE


  Linearisation   : YES
  Table           : 25 øC                    ▶




  ══ Works number: 2005000541 ══
    HELP    LOAD    SAVE              OK
```
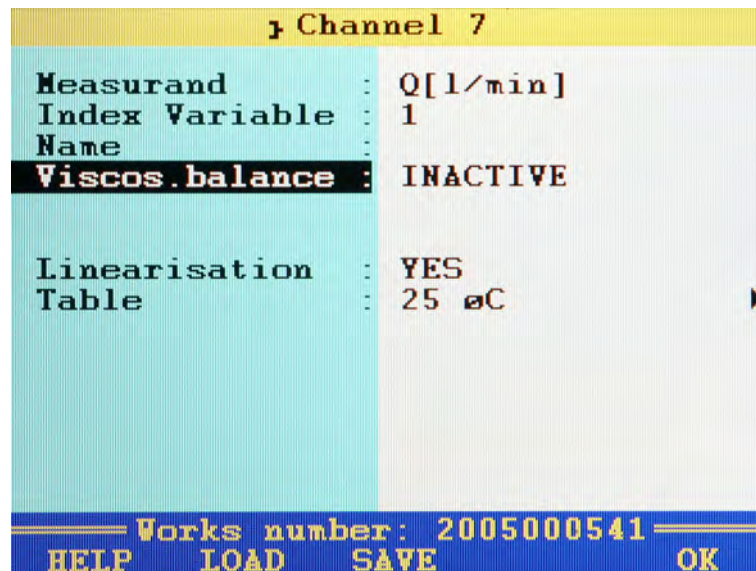
The oil viscosity depends on its temperature. To account for these variations during the measurement of the volume flow, three channels must be correspondingly programmed:

- One measuring channel for temperature (if the viscosity of the oil is not known)
- One measuring channel for the viscosity-compensated volume flow rate measurement
- One virtual channel for the calculation of the viscosity (if the viscosity is to be displayed and/or recorded)

Sensor   For the viscosity-compensated measurement of the volume flow, you will required a suitable turbine volume flow sensor with ISDS function (example: **HySense QT 100**). Use the integrated test point for the temperature measurement.

🛈   The menus and functions described here are only available when a suitable turbine volume flow sensor is connected to the measuring instrument.

Temperature measurement

Program one measuring channel for temperature measurement. You can find additional information under Chapter **Configure measuring channels (C1 ... C8)** on page 49.

Volume flow rate measurement

Open the menu of the measuring channel that you want to use for volume flow rate measurement. Highlight the entry **Viscos.balance** and press ENT to switch it to **ACTIVE**.

Further options will be displayed:

```
                    ⌐ Channel 7
Measurand         :  Q[l/min]
Index Variable    :  1
Name              :
Viscos.balance    :  ACTIVE
Temp.detection    :  NO


Parameter oil
act.viscosity     :     0.00  mm2/s




═════ Works number: 2005000541 ═════
 HELP     LOAD     SAVE              OK
```
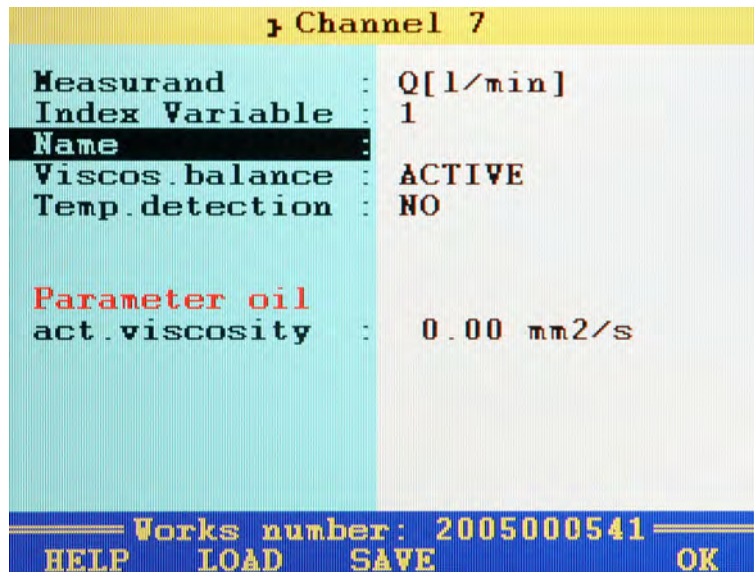
If the **Viscos.balance** option is activated and highlighted, the current compensation values (example) will be shown:

```
Value A:  282.960000
Value B:  -0.589999
Value C:  -0.609999
Value D:   0.330001
Value E:  -0.100000
Value G:  22.070001
```

You can switch temperature measurement ON and OFF in the next line. If disabled, the current viscosity cannot be calculated and the entered oil viscosity value will be used.

Highlight the line **Temp. detection** and press (ENT) to switch it on.
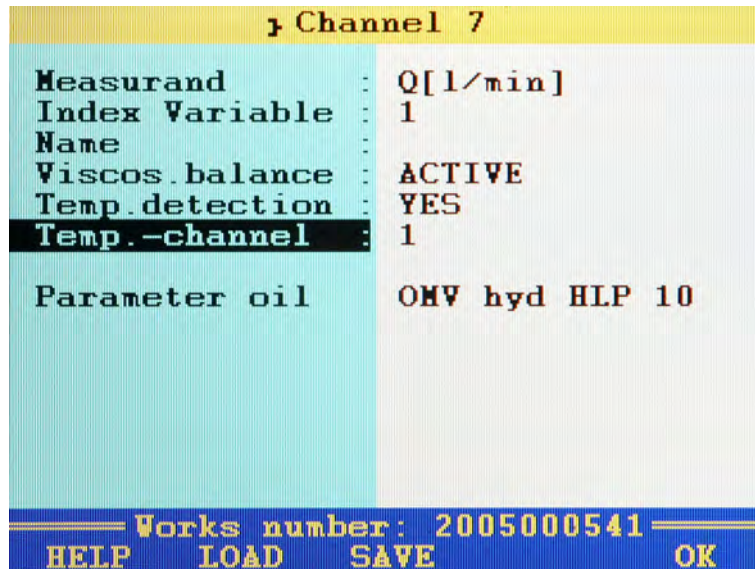
Highlight the next line, press (ENT) and select the measuring channel, where the oil temperature is measured.

Then highlight the item **Parameter oil** and press (ENT) to select or program the oil being used.

Selection of the oil in use

```
                    Oil-Database

 Name              : OMV hyd HLP 10

 Parameter oil     :
 Viscosity/40°C    : 10.00  mm2/s
 Viskosity/100°C:    2.80   mm2/s
 Density/15°C      : 0.860  g/ml
 Pour point        : -45    °C




        EDIT    DELETE              OK
```

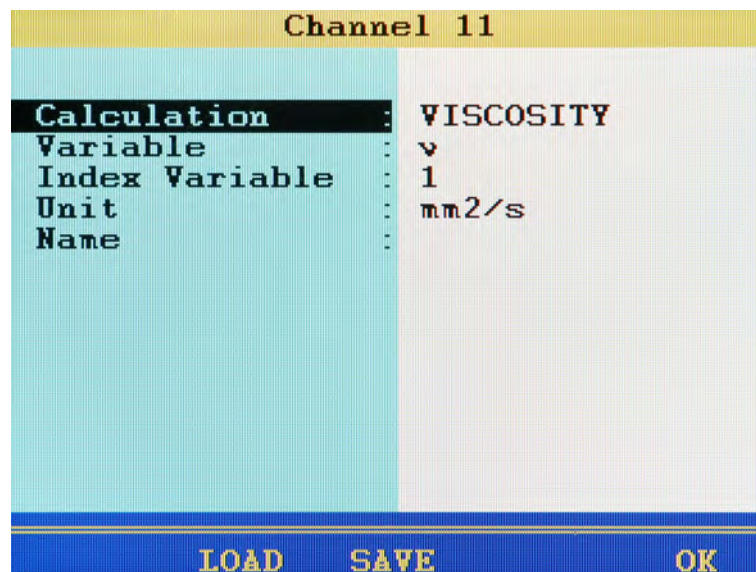The database already contains several oil sorts. Highlight the item **Name**, press `ENT` and select the desired oil.

To write a new oil to the database, select an empty entry (-) from the oil database. Press `F2`, highlight the parameters and enter the values. Then press `F2` to save the new oil.

Press `F3` to delete the currently displayed oil from the database.

Virtual channel for viscosity calculation

```
                    Channel 11

   Calculation      :  VISCOSITY
   Variable         :  v
   Index Variable   :  1
   Unit             :  mm2/s
   Name             :



             LOAD   SAVE            OK
```

If desired, you can program a virtual channel (see Chapter **Configure special channels (C11 ... 24)** on page 53) with the calculation **VISCOSITY** and enter the required parameters.

The result of the calculation will be used at the channel for volume flow rate measurement to compensate the viscosity changes dependent on the temperature. You may also display and record this channel.

Cleaning and maintenance

Cleaning

EN

⚠ **Caution**
Damage to the instrument is possible!   Switch the instrument off and disconnect from the power supply BEFORE starting to clean. This prevents the risk of a short-circuit, and thereby possible damage to the device.

⚠ **Caution**
Damage to the instrument is possible!   Do NOT use any aggressive cleaning materials, solvents, cleaning solvents or similar chemicals when cleaning the device. This prevents the risk of damage to the casing and/or dulling the display.

• If the casing becomes dirty, wipe it with soft, slightly damp cloth.

• Any stubborn dirt can be removed with a mild household cleaning product.

Maintenance

This device is maintenance-free. However, it is still essential to have it recalibrated regularly. If the device is in continuous use, we recommend recalibrating it every 2 years.

HYDROTECHNIK maintains a capable calibration laboratory.
Please contact us:

HYDROTECHNIK GmbH

Holzheimer Straße 94
D-65549 Limburg an der Lahn

Tel.: +49 6431 4004 0
Fax: +49 6431 45308

email: info@hydrotechnik.com
Internet: www.hydrotechnik.com

EN

Repair

If repair is needed, please contact our customer service department. Please have the following information ready when you contact us. If you are returning the equipment, please also attach the following information:

- Company, department, contact person
- Address, telephone and fax number, email address
- Faulty part (equipment, sensor, cable, power pack)
- PC used (CPU, operating system, RAM, HDD)
- **HYDRO**com software version
- Service menu print out, setting **DETAIL**
- Description of fault (please leave the settings on your equipment exactly as they appeared at the time of the fault/error; and please briefly describe the use of equipment, the connection of the sensors, the equipment set-up such as storage parameters, triggers, how many measurements were recorded, printer type, etc.)

Manufacturer address and customer service

Please contact the HYDROTECHNIK customer service department:

HYDROTECHNIK GmbH

Holzheimer Straße 94
D-65549 Limburg an der Lahn

Tel.: +49 6431 4004 0
Fax: +49 6431 45308

email: info@hydrotechnik.com
Internet: www.hydrotechnik.com

HYDROTECHNIK