HYDROTECHNIK

ENG

MultiSystem 5070

Universal Portable Measuring System

Operating Instructions

Firmware Version 2.0
Manual Version 2.0
ENG

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Safety

Introduction

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Commissioning

Operation

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Icon reference

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Safety

General safety and warning information

- Never cut, damage or modify the power pack cables or place things on the power pack.
- 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 18),
- Unplug the power cable from the outlet during a thunderstorm.
- Unplug the power cable if you detect smoke or there is an odor, or if the power cable is damaged.
- Ensure sufficient grounding of your system. Inadequate grounding may cause incorrect measurements.

Handling information for the MultiSystem 5070

- 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 instruments which generate electromagnetic fields. Strong magnetic fields may cause malfunctions and influence measurement values.
- Prevent the formation of condensation. If condensation has formed, 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).
- When extending standard measuring cables, use the extension cables provided for this purpose, 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.hydro-technik.com.

Introduction

The information contained in this section is important. If you neglect it, you might lose the right to make guarantee and warranty claims.

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Scope

The manual on hand is valid for measuring instruments named **MultiSystem 5070**. It is intended for the operator of the instrument, that means the person who works with the instrument. This 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. We reserve the right to make technical changes without prior notice. 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 we publish and this manual. Further product features are not guaranteed. We assume no liability for the economy and faultless function if the product is used for a different purpose than the one 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 that do not represent the technical standard, we shall not be responsible for the consequences.

We assume no liability for damage to installations and systems in the surroundings of the product that is 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 damage that results 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 assume no liability for damage that results from the use of accessories and wearing 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 design corresponds to current standards 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 you that we will take immediate measures. The guarantee conditions of HYDROTECHNIK apply; if desired, we will gladly send you these.

Intended use

The measuring instrument **MultiSystem 5070** is a mobile, hand-held instrument for the recording, storage and evaluation of measuring data, collected by sensors connected to the instrument.

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.

Warranty

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 that 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 with sound parts.

Please send the instruments for which you have made a warranty claim postage-paid and with a copy of the invoice or the delivery slip to 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 concerning occupational safety and accident prevention
- have been instructed in the operation of this product
- have read and understood this manual
- are permitted to use and operate this product.

Persons who operate this instrument are obliged to

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

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Authorized personnel

Persons are considered to be authorized if they have a professional education, technical experience, knowledge of the relevant standards 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 5070

MultiSystem 5070 is a practice-oriented, user-friendly hand-held measuring instrument that supports the user in the daily measuring functions. When using sensors with ISDS (intelligent sensor detection), the **MultiSystem 5070** automatically identifies the connected sensors during switch-on and adopts all parameters: Measurement range, physical measurand, unit of measurement, signal output and characteristic curve (linearization). You can also connect sensors without ISDS designation. The entry of the sensor parameters is then done in clear operation menus.

You can connect up to eight sensors and store all measured values. Calculations from the measured values such as difference, sum and performance, as well as the 1st derivation (e.g. speed from path) are available as additional special channels for display and recording. The buffering of extreme values of the minimum and maximum measurands is always active and can be displayed by the corresponding key selection.

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

System requirements for your PC:

- Windows 7/8 (driver required)
  ⇨ www.hydrotechnik.com
- Windows 8.1 or later

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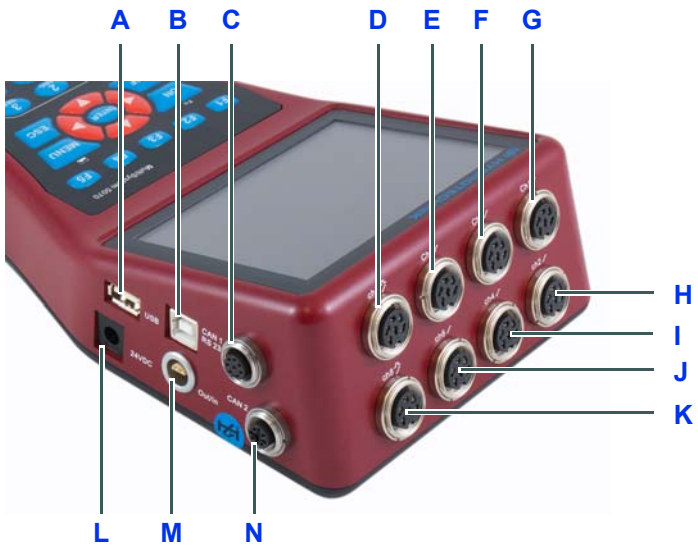
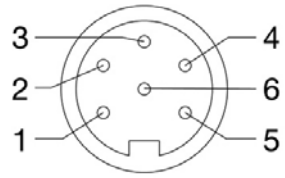
Connections



A	USB – host interface	H	Input Ch2 – analog input
B	USB – device interface	I	Input Ch5 – analog input
C	Combi jack CAN1/RS232	J	Input Ch5 – analog input
D	Input Ch7 – frequency/analog input	K	Input Ch8 – frequency/analog input
E	Input Ch5 – analog input	L	Power supply – power pack
F	Input Ch3 – analog input	M	Digital input and output
G	Input Ch1 – analog input	N	Input CAN2

Characteristics of analog inputs



Number	8 (Ch1 to Ch6)
Signal input	Switchable 0/4 … 20 mA; 0/2 … 10 V; ± 10 V; 0.5 … 4.5 V; 1 … 5 V
Resolution	13-bit analog/digital converter (12-bit + sign)
Measuring rate	Max. 10,000 values per second
Filter function	Input filter 50 kHz (dynamic mode)
IIR filter	Connectable: 5 kHz (standard mode) / 50 Hz (damped mode)
Connector	6 pin device plug
Protection type	IP40

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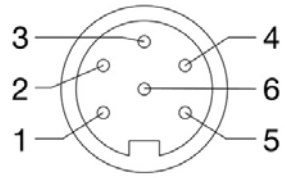
Pin assignment

Pin	Function	R_i	C_i	Limitation	Protection type
1	Signal I [mA]	113 Ω	35 nF	5VDC	Transil diode
2	Ground				
3	Ub[a)]			100 mA	Current limiting
4	Signal U [V]	8.8 kΩ	35 nF	±15 V DC	Transil diode
5	Shield				
6	ISDS				

[a)] Power supply during mains operation 15 V

Characteristics of frequency/analog inputs



Number	2 (Ch7, Ch8) frequency/counter inputs with switchable direction detection or analog inputs
Signal input (Frequency mode)	5 – 30 VDC 0.25 Hz – 20 kHz
Signal input (Analog mode)	Switchable 0/4 … 20 mA; 0/2 … 10 V; ± 10 V; 0.5 … 4.5 V; 1 … 5 V
Resolution (Analog mode)	13-bit analog/digital converter (12-bit + sign)
Measuring rate (Analog mode)	Max. 10,000 values per second
Filter function (Frequency mode)	Adjustable period measurement for averaging
Filter function (Analog mode)	Input filter 50 kHz (dynamic mode)
IIR filter (Analog mode)	Connectable: 5 kHz (standard mode) / 50 Hz (damped mode)
Connector	6 pin device plug
Protection type	IP40

Pin assignment for frequency mode

Pin	Function	R_i	C_i	Limitation	Protection type
1	Signal (f)	100 k	33 nF	15VDC	VDR Transile diode
2	Ground				
3	Ub[a)]			100 mA	PTC
4	Signal direction	100 k	33 nF	15VDC	VDR Transile diode
5	Shield				
6	ISDS				

[a)] Power supply during mains operation 15 V

Pin assignment for analog mode

Pin	Function	R_i	C_i	Limitation	Protection type
1	Signal I [mA]	110 Ω	32 nF	5VDC	Transil diode
2	Ground				
3	Ub[a)]			100 mA	Current limiting
4	Signal U [V]	22 kΩ	32 nF	±15 V DC	Transil diode
5	Shield				
6	ISDS				

a) Power supply during mains operation 15 V

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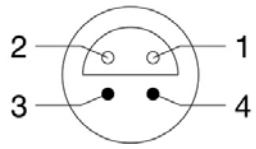
Characteristics of the digital signal input

Note

Possible damage to the instrument!
This input may not be connected directly to inductive loads (e.g. coil of a magnetic valve). Otherwise the instrument may be damaged.

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

Pin assignment



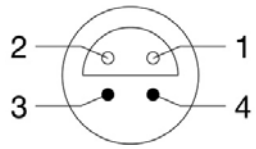
Pin	Function	Limitation	Protection type
3	Signal[a)]	30 VDC	VDR Transile diode
4	Ground		

a) 1 mA constant current

Characteristics digital signal output

Jacks of the digital input/output.

Pin assignment

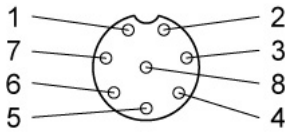


Pin	Function	Limitation	Protection type
1	Ground		
2	Signal	Ub/10 mA	VDR Transile diode

Characteristics of combi jack CAN / RS 232

8-pin M12x1

Pin assignment



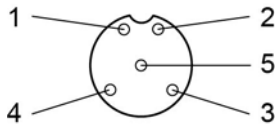
Pin	Function
1	Ground
2	Power supply for MultiXtend or CAN sensors[a)]
3	DTR
4	CAN_H
5	TXD
6	RTS from PC (input)
7	CAN_L
8	RXD

a) ~14.6 to 15 V, max. 800 mA

Characteristics of jack CAN 2

5-pin M12x1

Pin assignment



Pin	Function
1	Screen/casing
2	Power supply for measuring instrument[a)]
3	Ground
4	CAN_H
5	CAN_L

a) The measuring instrument automatically switches on the power supply via the CAN 2 jack. In this case, the measuring instrument is used for data recording only.

Characteristics of USB interface

USB Type A: Host interface

USB Type B: Device interface

Display

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

Various items of information can be displayed as icons in the upper bar of the display:

	Recording bar	Indicates recording in progress
	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, the battery should be charged immediately
 	Power supply	Instrument power supply with external power pack; batteries are charged If the instrument detects problems with the power supply, the icon changes to red.
	Page count	Displays current page and total page count Use ◁ and ▷ to browse display pages

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

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 instrument on	MENU	Open **Home** menu
Fn	Fn function key: Assign favorites and softkeys		Screenshot (using Fn)
◁	Cursor / page to the left	△	Cursor/Highlighting Up
ENTER	Store input		
▽	Cursor/Highlighting Down	▷	Cursor / page to the right
OFF	Switch instrument off	ESC	Cancel input/function without storing

Note: You can use the number keys to select a menu quickly. The number keys correspond to the icon position on the display.

1	Input 1	2 ABC	Input 2 or ABCÄ
3 DEF	Input 3 or DEF	4 GHI	Input 4 or GHI
5 JKL	Input 5 or JKL	6 MNO	Input 6 or MNOÖ
7 PQRS	Input 7 or PQRSß	8 TUV	Input 8 or TUVÜ
9 WXYZ	Input 9 or WXYZ		

0 ␣	Input 0 or space		
-.	Dash, period, special characters[a)]	CLR	In Input mode: Delete individual character (to right of cursor) In the result display: Delete MinMax memory or reset counter (using Fn)

[a)] Use the -. key to enter special characters, 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.

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Technical data

Casing	PC+ABS+20GF plastic
Weight	1,072 g
Protection type	IP40
CE conformity mark	Complies with Directive 2014/30/EU (Electromagnetic Compatibility); Complies with Directive 2014/68/EU (Pressure Equipment Directive) Complies with Directive 2011/65/EU (Restriction of Hazardous Substances)
Internal power supply	Lithium ions, 7.2 V / 6.2 Ah
External Power supply	24 VDC / 2 A
Dimensions	~ 270 x 140 x 69 mm (L x W x H)
Interfaces	USB, USB host, RS232 interface, 2 x CAN
Ambient temperature	-10 °C – 50 °C
Relative humidity	0 – 80% (not condensing)
Storage temperature	-20 °C – 50 °C
Result display	5-digit
Trigger	4 channels as start/stop; with connections AND or OR; time trigger
Scanning rate	Selectable between 100 µsec and 999 min
Measuring rate	Analog input max. 10 kHz Frequency inputs 0.25 Hz … 20 kHz
Measured value memory	4 GB SD card, max. 500 measurement series, max. 24 MB per measurement series (6 million values)
Tolerances	Analog ± 0.10% 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, color)?

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:

- **MultiSystem 5070** measuring instrument
- Plug-in power pack, 230 VAC/24 VDC
- USB data transmission cable
- USB stick

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

Damage to batteries due to excessive discharge
The lithium-ion battery installed in the instrument is only slightly precharged ex works.
If the battery is not fully charged before start-up, there is a risk of excessive discharge, which would severely impair the performance of the battery.
- Charge the battery for 3 hours before you commission the instrument.
- The battery will be charged as soon as the instrument is supplied by a HYDROTECHNIK power pack.

Information about handling instrument batteries

The life cycle of lithium ion cells depends greatly on the conditions of use.

- Avoid a complete discharge, continuous charging and immediate re-charging after every use.
- A red battery symbol will be displayed when the battery is nearly empty. In this case you should maintain a 3 hour charging time.
- In case of longer periods without use you should discharge and charge the batteries monthly.

Display operating instructions

The operating instructions are available as a PDF file on the measuring instrument.

Connect the measuring instrument to a PC.

⇨ See **Connect a PC and transfer data** on page 36.

The measuring instrument is recognized as a removable storage device. You can open the operating instructions directly from the instrument.

The operating instructions are available as a PDF file in the download area of our website:

⇨ www.hydrotechnik.com

Operation

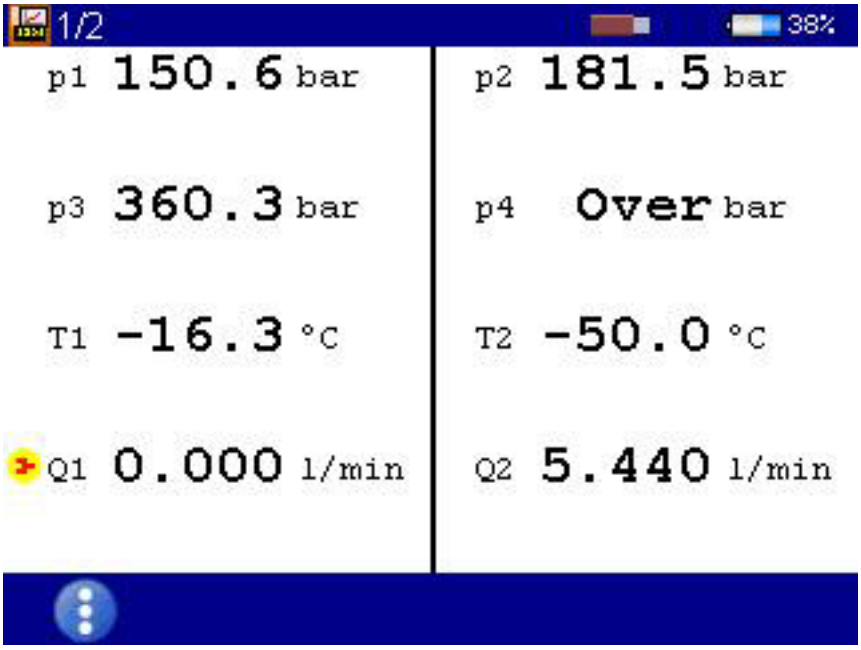
This section will provide you with all information required for the daily use of the measuring instrument. The following operations are explained:

- **Switch the instrument on and off**
- **Select operating language**
- **Connect sensors**
- **Enter sensor parameters**
- **Record measuring data**
- **Connect a PC and transfer data**
- **Delete 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 **HYDRO***com* software 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 30).

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

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

2 Wait for the self-test until the result display or the **Home** menu is displayed.

3 Use instrument.

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

The instrument saves all data and settings before the instrument software is shut down.

If you hold the OFF key down for longer than 5 seconds, the instrument is switched off without saving.

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Operation of the instrument software

After you have switched on the instrument, the **Home** menu or the result display is shown, depending on the setting in the **User profile** menu.

If the result display is shown, press the MENU key to display the **Home** menu.

Menus have up to 3 x 3 icons. Each icon takes you to the next menu level or to a dialog.

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Navigating in the instrument software

Each icon corresponds to a menu or a dialog. There are two ways to select an icon.

Highlight and ENTER

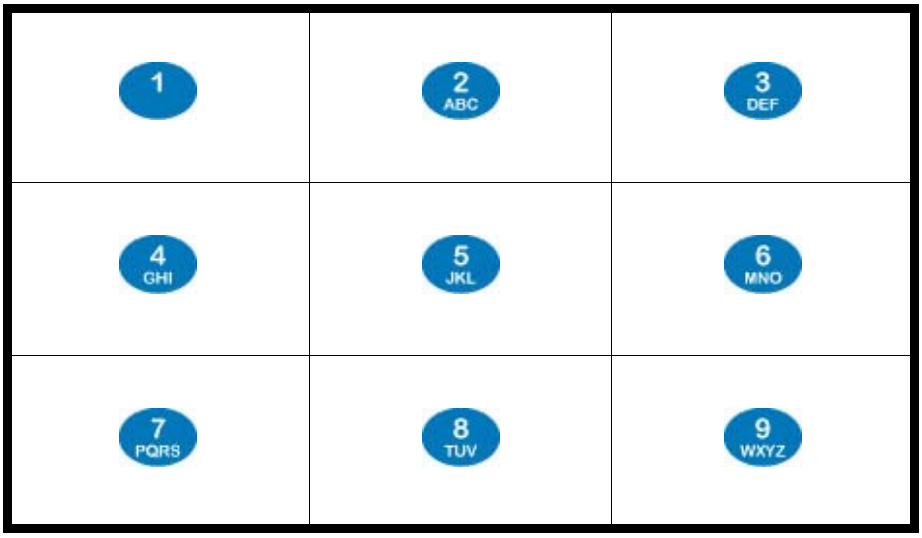
Highlight the desired icon with the △▽◁▷ keys and press the ENTER key.

The selected menu or dialog is displayed.

Number keys

You can use the number keys to select a menu quickly.

The number keys correspond to the icon position in the menus.



When you press a number key, the corresponding menu or dialog opens.

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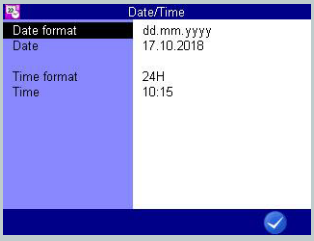
Navigation example Navigate to the **Date/Time** dialog.

Menu/dialog	Action	Highlight and ENTER	Number keys
	Select the **Setting** menu. 	  	
	Select the **Device** menu. 	  	
	Select the **Date/Time** dialog. 	 	
			

Favorites

There are three slots for favorites in the **Home** menu. You can assign a menu or dialog to each of the slots so that you have quick access to frequently used menus or dialogs in the **Home** menu.

➔ **Assign a favorite**

1 Select a favorite in the menu using △▽◁▷

2 Open the favorite selection: ON + ENTER (press simultaneously)

3 Select and confirm menu or dialog: △▽ ENTER

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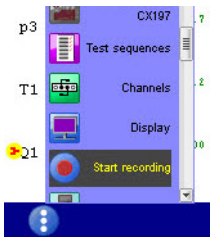
User-defined softkeys

You can use the F2 to F5 keys as user-defined softkeys in the result display.

➔ **Create softkeys**



1 Open the **Home** menu: MENU

2 Open **Result display**: ◁ ▷ △ ▽ ENTER

3 Open the favorite selection for the softkey F2: ON + F2 (press simultaneously)

4 Select the menu or dialog: △ ▽

5 Confirm the selection for the softkey: ENTER

The F2 key in the result display is now a softkey.

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The keys F3, F4 and F5 can also be defined as softkeys in the same way.

Select **Favorite** in the selection dialog in order to delete a user-defined softkey.

Softkeys: Symbols/text

In the **User profile** dialog, select whether softkeys are displayed as symbols or text.

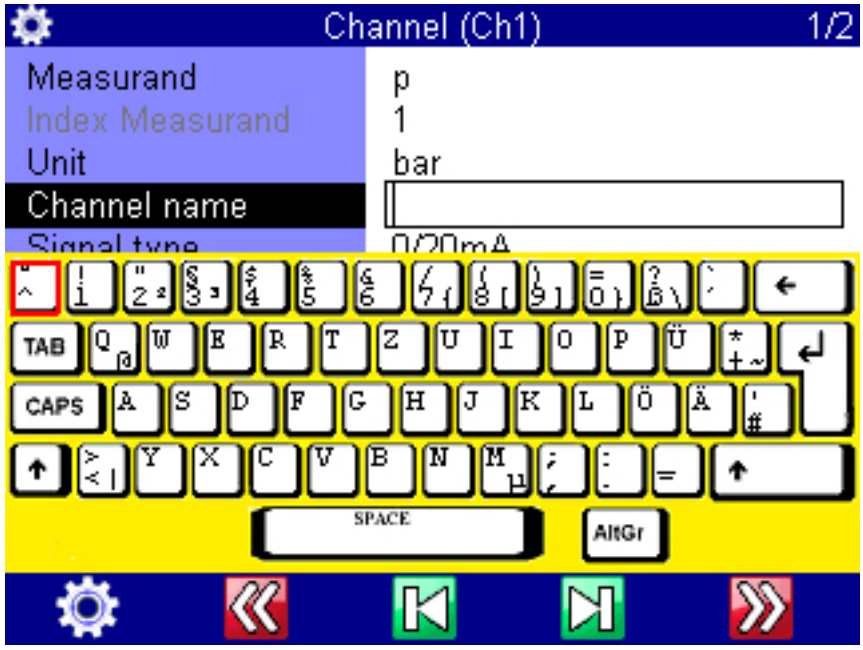
⇨ See **Softkeys** on page 102.

⇨ See **Softkeys: Symbols/text** on page 154.

Virtual keyboard

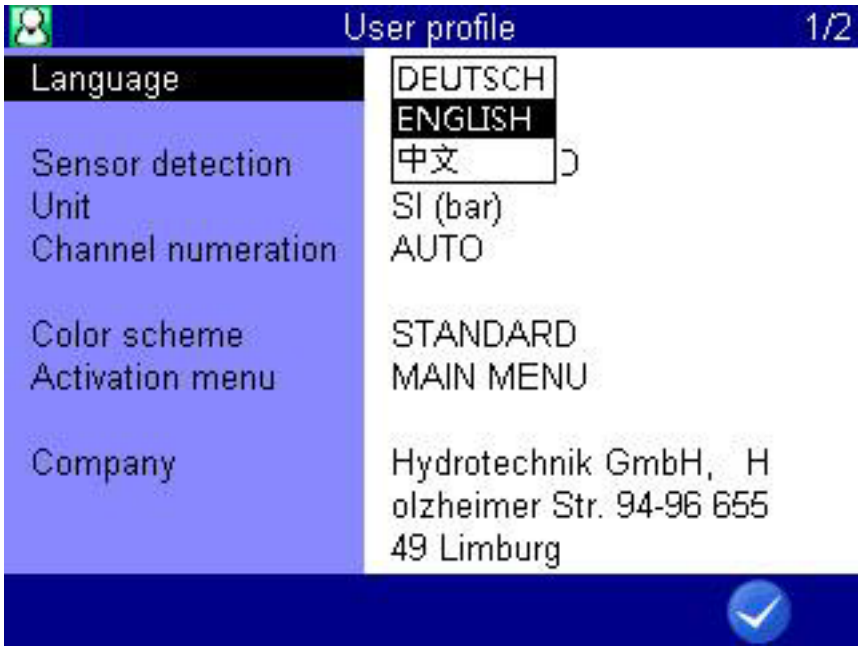
In fields where you can enter text or numbers, you can use MENU to open a virtual keyboard.

Use the ◁▷ △▽ buttons to select a key on the virtual keyboard. The currently selected key is framed in red. Press ENTER to confirm the selection. Press ESC to close the virtual keyboard.



F1		**SETUP/Setting**	Opens the dialog for selecting a country-specific keyboard. The following keyboards are available: • German (QWERTZ) • English (QWERTY) • Norwegian • Russian • Greek
F2		**LEFT**	Moves the cursor one place to the left.
F3		**POS1**	Positions the cursor at the start of the entry.
F4		**END**	Positions the cursor at the end of the entry.
F5		**RIGHT**	Moves the cursor one place to the right.

Select operating language



1 Open the **Home** menu: MENU

2 Open the **Setting** menu: ◁▷ △▽ ENTER

3 Open the **Device** menu: ◁▷ △▽ ENTER

4 Open the **General Settings** menu: ◁▷ △▽ ENTER

5 Select **Language** with △▽ and use ENTER to open a dialog box.

6 Select the language in the dialog box: △▽ ENTER

7 Confirm changes and exit the dialog: F5

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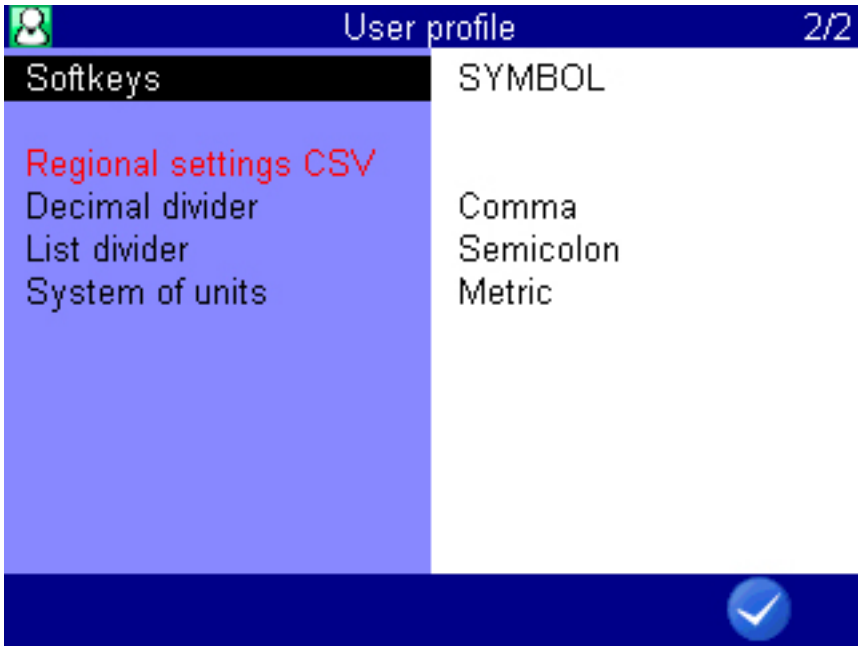
Adjust number format



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You can adjust the format of the numbers stored in the CSV files to the country settings.

1 Open the **Home** menu: MENU

2 Open the **Setting** menu: ◁▷ △▽ ENTER

3 Open the **Device** menu: ◁▷ △▽ ENTER

4 Open the **General Settings** menu: ◁▷ △▽ ENTER

5 Switch to the second page in the **General Settings** menu: ◁▷.

6 Use △▽ to highlight **Decimal separator** and select with ENTER.

7 Use △▽ to highlight **List separator** and select with ENTER.

8 Use △▽ to highlight **System of units** and select with ENTER.

9 Confirm changes and exit the dialog: F5

■

Decimal separator Choose between **Comma** and **Dot**.

List separator Choose between **Semicolon** and **Comma**.

System of units Choose between **Metric** and **US units**.

Adjust the country settings for the CSV files to the settings on your computer.

Set date and time

1 Open the **Home** menu: MENU

2 Open the **Setting** menu: ◁ ▷ △ ▽ ENTER

3 Open the **Device** menu: ◁ ▷ △ ▽ ENTER

4 Open the **Date/Time** dialog: ◁ ▷ △ ▽ ENTER

5 Enter the **Date format**: △ ▽ ENTER △ ▽ ENTER

6 Enter the **Date**: △ ▽ ENTER △ ▽ ENTER

7 Enter the **Time format**: △ ▽ ENTER △ ▽ ENTER

8 Enter the **Time**: △ ▽ ENTER △ ▽ ENTER

9 Confirm changes and exit the dialog: F5

■

Connect sensors

1 Switch the instrument off.

2 Connect the desired sensors to the inputs.

⇨ See Chapter **Connections** on page 11.

3 Switch the instrument on.

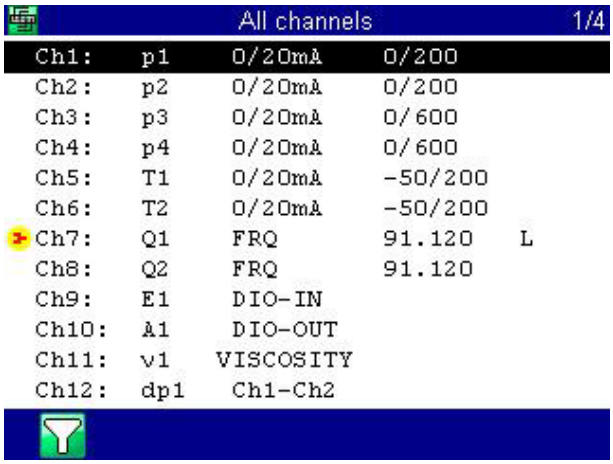
■

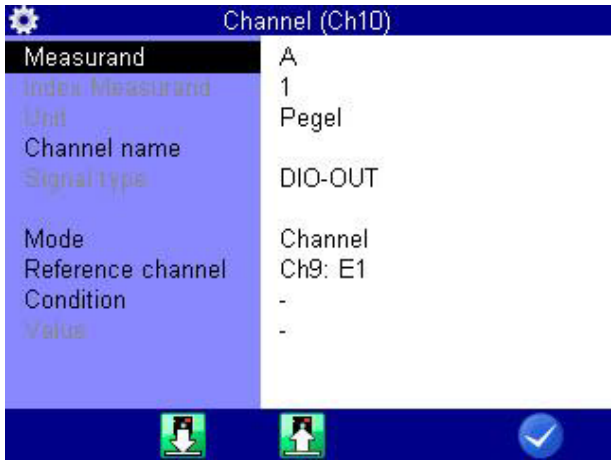
Enter sensor parameters

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.

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.

ENG





1 Open the **Home** menu: MENU

2 Open the **Setting** menu: ◁▷ △▽ ENTER

3 Open **channel** menu: ◁▷ △▽ ENTER

4 Open the **All channels** dialog: ◁▷ △▽ ENTER

5 Highlight channel: △▽

6 Start programming: ENTER

7 Highlight and select a dialog entry: △▽ ENTER

8 Highlight a value: △▽,
or enter a value, e.g. 12.5

9 Confirm value: ENTER

10 Confirm changes and exit the dialog: F5

■

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

Index Measurand 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.

Channel name You can assign an individual name to each channel.

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

On the frequency channels (Ch7-Ch8) you can also choose between **FRQ**, **± FRQ, CNT, ± CNT** and **± CNT (4Q)**.

Measuring range Enter the beginning and end of the measuring range. Press ENTER to confirm both entries (analog sensors only).

Calibration value Enter the factor for the calculation of the measured value from the frequency signal (for frequency sensors only).

Zero point Press ENTER and START F4 to execute the automatic zero point equalization. A possible zero point deviation will be compensated by the software (analog sensors only).

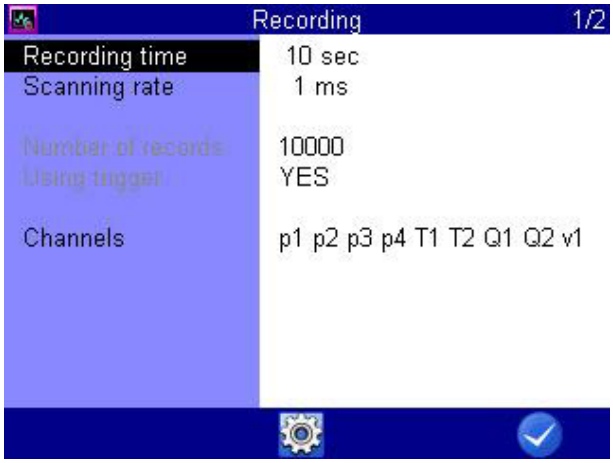
Linearisation If a calibration table is available for the connected sensor, you can enter it here after selecting **YES** at the **Linearization** dialog entry.

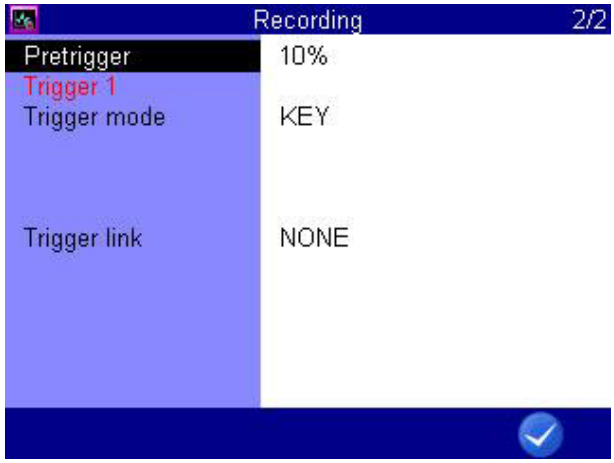
⇨ Please observe the additional information in chapter Chapter **Linearization table** on page 125.

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





ENG

Data are collected in measurement series. These can be configured in the **Recording** dialog.

1 Open the **Home** menu: MENU
2 Open the **Setting** menu: ◁▷ △▽ ENTER
3 Open the **Recording** dialog: ◁▷ △▽ ENTER
4 Make a selection: △▽
5 Confirm selection: ENTER
6 Apply changes: F5
7 Return to result display: ESC

■

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

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

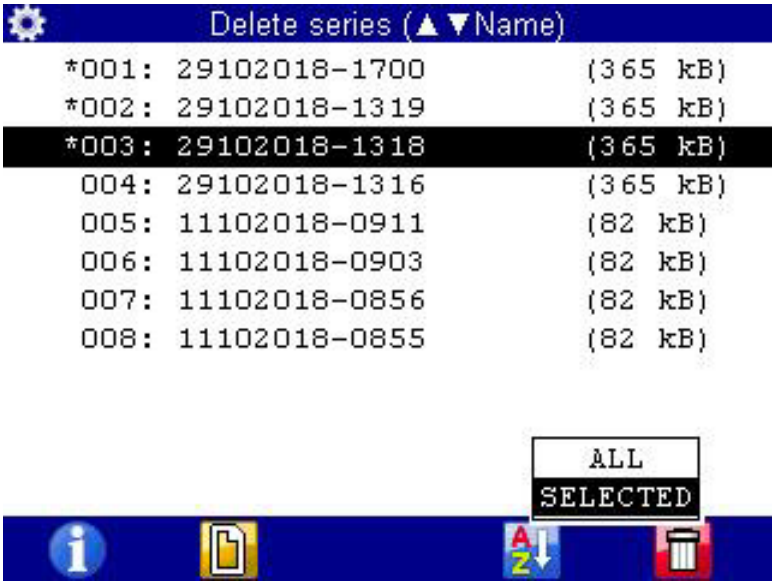
Recording time and scanning rate define how often and how long measurement data is to be stored. Be aware that if you store too much measurement data, the later evaluation and presentation will become more difficult.

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

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 **Trigger function** on page 111 for further information on how to use the trigger function.

Delete measuring data



In the example shown, the measurement series 001, 002 and 003 have already been selected for deletion, an * is displayed to the left of the series.

If you press F2, the names of the measurement files will be displayed; pressing F1 will provide you more information about the highlighted measurement series. Use F4 to sort the measurement data displayed.

1 Open the **Home** menu: MENU

2 Open the **Saved measurements** menu: ◁▷ △▽ ENTER

3 Open the **Delete series** dialog: ◁▷ △▽ ENTER

4 Select one or more measurement series (optional): △▽ ENTER

5 Delete: F5

6 Delete the selected measurement series or all series: △▽ ENTER

7 Confirm deletion with F2 or cancel with F4.

The deletion cannot be undone.

■

The search function is explained here:

⇨ **Search series** on page 67

Display information on selected file

If you have selected a file (e.g. measurement file, configuration file, screenshot, etc.), you can use to display information about the contents of the file. The information that is visible will depend on the file type. For screenshots, a preview of the image is displayed. If a note has been saved in the measurement file you can edit it with F2.

Press ESC to exit the dialog.

Information about a file can be displayed in many dialogs.

ENG

Connect a PC and transfer data

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

The measuring instrument is recognized as a removable storage device. You can open the operating instructions directly from the instrument.

ENG

1 Switch on measuring instrument and PC.

2 Make sure that “Mass storage device” is selected as USB mode and that at least one volume is enabled.

⇨ See **USB (DEVICE)** on page 95.

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

4 Plug the USB cable into an available USB jack on your PC.

System requirements for your PC:

- Windows 7/8 (driver required)
  ⇨ www.hydrotechnik.com
- Windows 8.1 or later

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

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

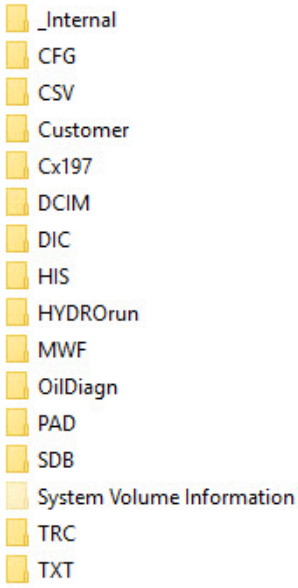
■

The internal memory has two partitions:

- **DATA-VOL**
  This is the general memory for files (measurement series, images, etc.)
- **DOCU volume**
  This is where you will find the operating instructions, data sheets and software for this instrument.

ENG

Directory structure for DATA-VOL partition



A directory structure has been set up on the **DATA-VOL** partition, the general memory for files (measurement series, images, etc.). The files are saved to different folders by file type.
You may not find all of the folders listed here in the directory structure. The folders displayed depend on the instrument version you are using.

_Internal Internal system files for oil condition analysis, e.g. oil database, measuring point database and database for sensor assignment (***.SYS**, ***.ODB** and ***.TDB**).

CFG Stored instrument configurations (***.CFG**).

CSV Converted spreadsheet or database files in CSV format (***.CSV**).

Customer Customer-specific files.

Cx197 HySense CX197 diagnostic files.

DCMI Image files of screenshots in bitmap format (***.BMP**).

DIC Directory for dictionaries (***.DIC**).

HIS History files read from oil condition sensors.

- History file of a Patrick sensor (***.PHIS**)
- History file of a viscosity sensor (***.VHIS**)
- History file of a moisture sensor (***.HHIS**)
- History file of a filling level sensor (***.LHIS**)

HYDROrun Databases created with HYDROrun, e.g. measurement results of test sequences (***.DBF)**.

MWF MWF files for measurement series (***.MWF**).

OilDiagn Measurement results from oil condition sensors.

- Oil condition diagnosis file from Patrick sensor (***.OCDP**)
- Oil condition diagnosis file from CV100 viscosity sensor (***.OCDV**)
- Oil condition diagnosis file from CM100 moisture sensor (***.OCDM**)
- Oil condition diagnosis file from CL1xx filling level sensor (***.OCDL**)
- Oil condition diagnosis file from CW100 contamination sensor (***.OCDW**)

PAD Test sequence files and test sequences (***.PAD**).

SDB Stored sensor settings (***.SDB**).

⇨ **Channels** on page 70

TRC Stored TRACE files (CAN traces) (***.TRC**).

TXT Stored text files (***.TXT**).

ENG

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 (measurement series, sensor and CAN databases, projects, test sequences, databases from test sequences, etc.).

1 Switch device off: OFF

2 Switch device on: ON

3 Wait until the beginning of the initialization is displayed and then press the following keys consecutively: 1 2 ABC 3 DEF

The selection list of the available operating languages will be displayed, from where you may select the desired one. Then the instrument will be reset and restarted.

■

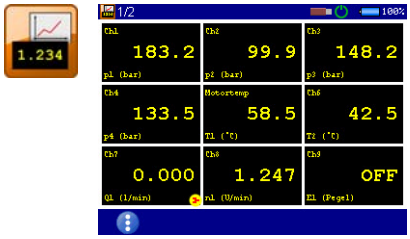
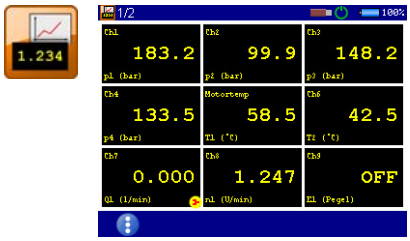
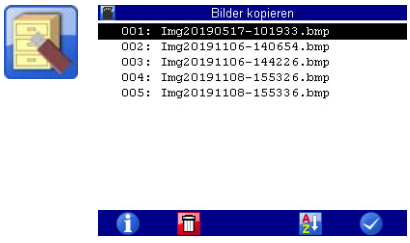
ENG

Operating software

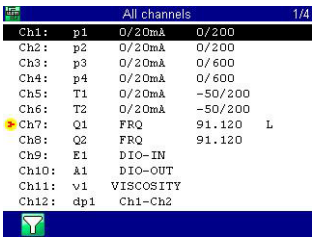
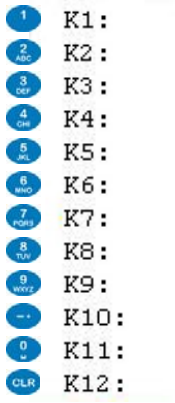
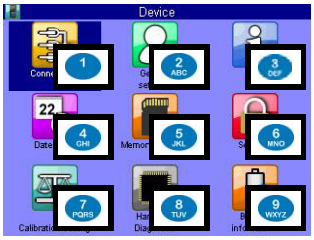
The operating software of the **MultiSystem 5070** will be presented and explained on the following pages.

ENG

Frequently used functions

Function in menu/dialog	Keys to be used	Step-by-step instructions
Reset minimum/maximum value 	CLR	1. Open **Home**: MENU 2. Open **Result display**: ◁ ▷ △ ▽ ENTER 3. Reset minimum/maximum value: CLR
Reset counter(s) 	Fn + CLR (press simultaneously)	1. Open **Home**: MENU 2. Open **Result display**: ◁ ▷ △ ▽ ENTER 3. Reset counter(s): Fn CLR
Display saved screenshot 		1. Open **Home**: MENU 2. Open **Tools**: ◁ ▷ △ ▽ ENTER 3. Open **Flash drive file manager**: ◁ ▷ △ ▽ ENTER 4. Open **File type** selection: △ ▽ ENTER 5. Select **Images (BMP)**: △ ▽ ENTER 6. Open **Selected**: △ ▽ ENTER 7. Select **Screenshot**: △ ▽ 8. Display **Screenshot**: △ ▽ F1

ENG

Function in menu/dialog	Keys to be used	Step-by-step instructions
Quickly select a channel to enter sensor parameters e.g. in:  		1. Open **Home**: MENU 2. Open **Setting**: ◁ ▷ △ ▽ ENTER 3. Open **Channels**: ◁ ▷ △ ▽ ENTER 4. Open one of the following menus: • **All channels** • **Analog channels** • **Frequency channels** • **Digital channels** • **Calculation channels** • **CAN channels** using ◁ ▷ △ ▽ ENTER 5. Select channel by pressing a key in the relevant line: 
Quickly select a function in an icon menu e.g. in:  		Select a function in the icon menu by pressing the relevant key, e.g.: 

Home

MENU opens the **Menu**; you can operate all functions of the **MultiSystem 5070** from here.

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

Available menus

Highlight the desired menu with △▽◁▷ and press ENTER.

Start recording Starts the recording of measurement data; the configurations from the recording menu (channel selection, recording time, scanning rate, etc.) are applied.

Measure (measured values display) Display of current measured values

Configurations Function for managing instrument configurations

Saved measurements Display, present and delete measurement series

Setting Configure channels, display, instrument and recording

Tools Settings for USB stick, special applications and games

Favorites You can save menus or dialogs as favorites here.

⇨ See **Favorites** on page 150.

Start recording

➔ **Start recording**

F5 **OK** Confirms input/saves changes.

Choosing **Start recording** will display a dialog in which the instrument suggests the current time and date as the name of the measurement. The defined recording parameters (channel selection, storage duration, triggers etc.) can be set in the **Recording** menu. Start recording with F5.

Series name Name of the measurement series; press ENTER to overwrite the proposal

File name 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 VAL**
  The current value of each selected channel will be recorded when the key is pressed

If you want to assign a note to the recording, switch to the second page in the **Start recording** dialog.

Note You can enter any free text here. Select **Note**, press ENTER and enter the desired text. Store the note with ENTER.

➔ **Open saved measurements**

⇨ See **Saved measurements** on page 52.

➔ **Use an USB stick**

⇨ See **Flash drive file manager** on page 117.

ENG

Result display

Displays the current measured values. In the **Display** dialog, you can select which channels are displayed here.

There are different result displays:

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

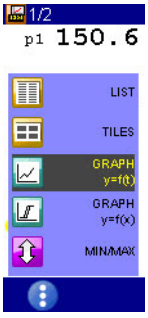
In the **User profile** dialog, you can specify that the result display is displayed after the measuring instrument is switched on.

⇨ See **General Settings** on page 98.

ENG

Change display

Use F1 to open the display selection menu. Choose from the following options:



List view

⇨ **Measured values with their units** on page 46

Tile view

⇨ **Tiles per page** on page 85

Graph view $y=f_{(t)}$

⇨ **Graphic presentation in display menu** on page 133

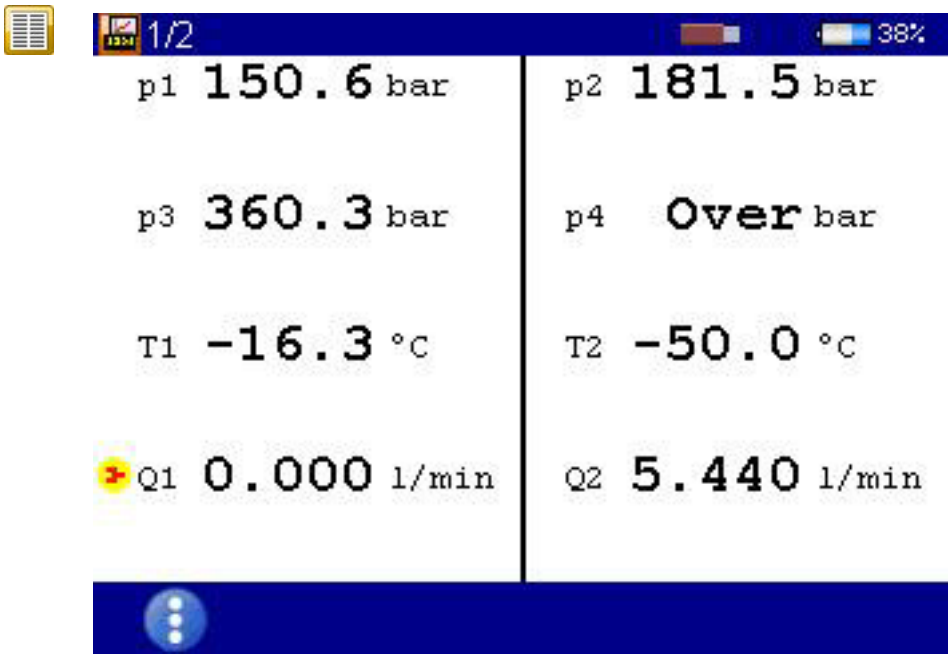
Graph view $y=f_{(x)}$

⇨ **Graphic presentation in display menu** on page 133

MinMax view

⇨ **Measured values with MinMax** on page 47

Measured values with their units



F1

Change display

⇨ **Change display** on page 45

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

ENG

Measured values with MinMax

F1

Change display

⇨ **Change display** on page 45

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

Symbols in the result display

Channel with ISDS sensor

Channel is recorded

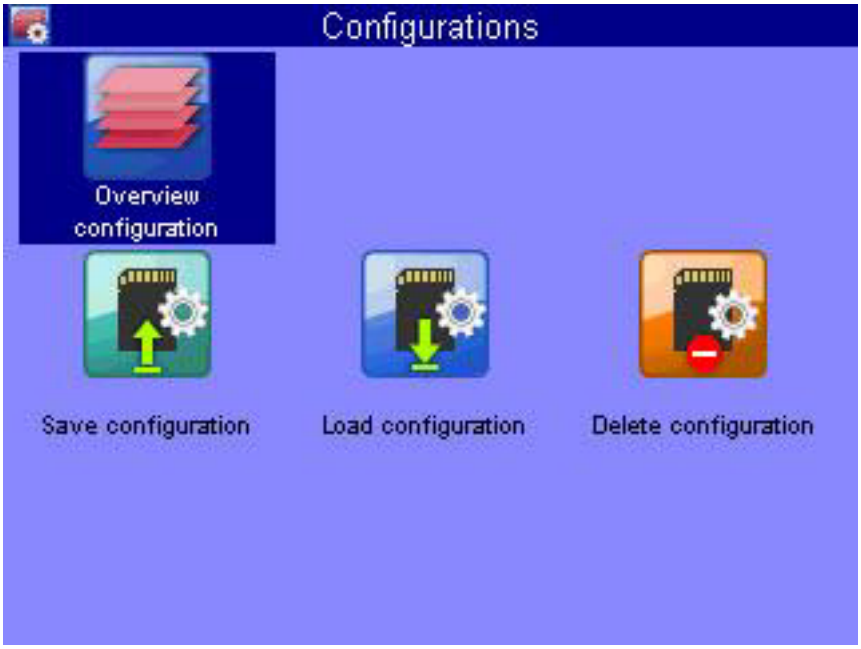
ENG

Error display

The following error messages may appear in the result display if errors occur during measurement:

Error message	Explanation
NoCan	The CAN channel is defined but the CAN bus is not enabled. ⇨ **CAN #1 and CAN #2** on page 91
DIV0	Division by 0 occurs when the measured value is calculated (e.g. using a formula).
-----	• CAN channel: The channel is not receiving any measured values, for example because the CAN timeout has been reached. • 4-20 mA sensor: The cable is broken.

Configurations



In the **Configurations** menu, you can view all settings for the measuring instrument and name and save the settings record. You can save as many configurations as you wish and then load or delete them.

Save a new configuration

1 Select the **Save configuration** dialog: ◁▷ △▽ ENTER

2 Enter a **File name** and ENTER.

Use F2 to toggle between capital and small letters.

3 Enter a **Description** and ENTER.

Use F2 to toggle between capital and small letters.

4 Save configuration and exit dialog: F5.

■

Load a saved configuration

1 Select the **Load configuration** dialog: ◁ ▷ △ ▽ ENTER
2 Select a **File name**: ENTER.
3 In the dialog box, make a selection from the list of configurations: △ ▽ ENTER
4 Load configuration and exit dialog: ✓ F5.

■

Delete a saved configuration

1 Select the **Delete configurations** dialog: ◁ ▷ △ ▽ ENTER
2 Select a **File name**: ENTER.
3 In the dialog box, make a selection from the list of configurations: △ ▽.
4 Delete: ✓ F5.
5 Choose between **ALL** and **SELECTED**: ENTER.
6 Press **YES** to confirm deletion and exit the dialog: F2

■

Transfer configuration to another measuring instrument with USB stick

1 Save the configuration in the **Save configurations** dialog on the instrument.

⇨ See **Save a new configuration** on page 49

2 Copy the configuration from the instrument onto a USB stick.

⇨ See **Saving to a USB stick** on page 117.

3 Insert the USB stick into the measuring instrument to which you want to transfer the configuration.

4 Copy the configuration from the USB stick onto the instrument.

⇨ See **Loading files from the USB stick** on page 120.

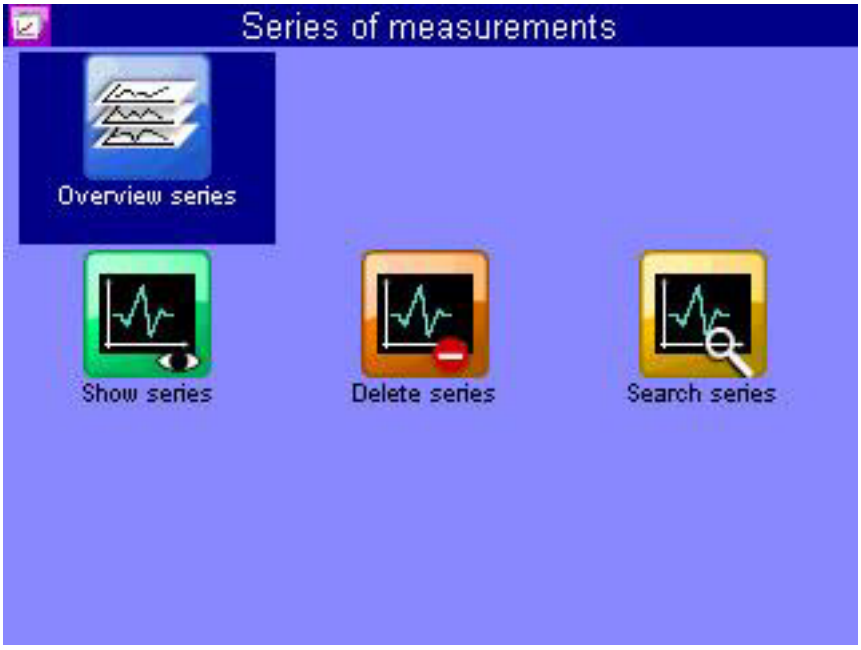
5 Open the **Load configuration** dialog on the target instrument and load the desired configuration.

⇨ See **Load a saved configuration** on page 50

■

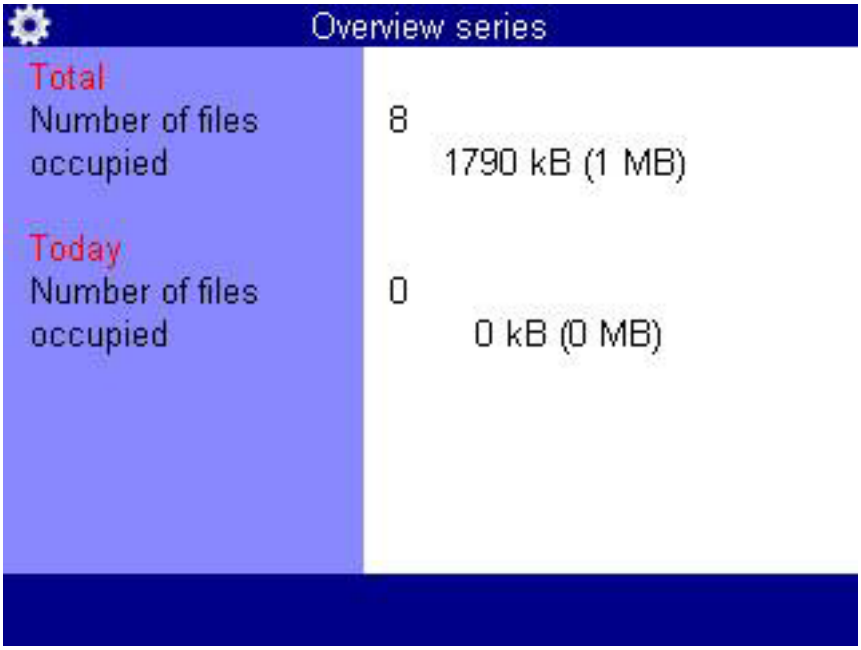
ENG

Saved measurements



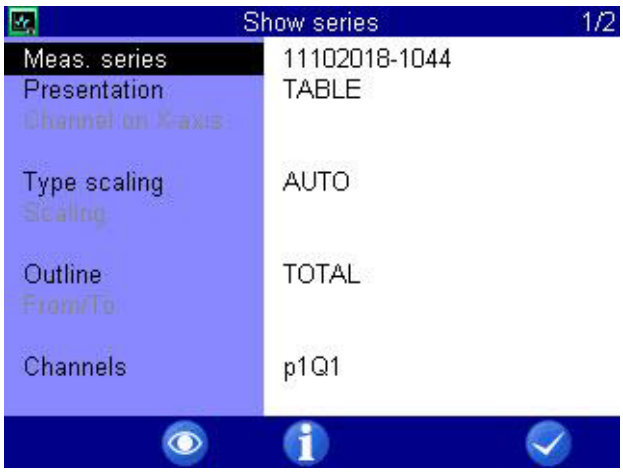
In this menu you can process, display, delete, search for and configure the presentation of recorded measurement series.

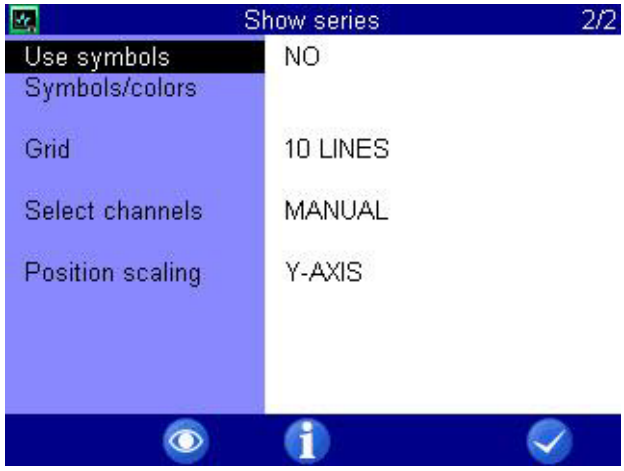
Series overview



ENG

Show series





F2 

DISPLAY Displays the selected measurement.

F3 

INFO Displays information about the selected object.

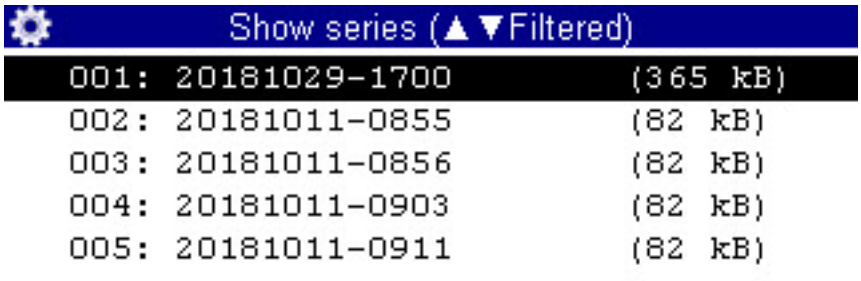
⇨ **Display information on selected file** on page 35

F5 

OK Confirms input/saves changes.

In the Show series dialog, select a measurement series and specify the presentation mode. Then press F2 to display the measurement series.

Series



F1 

INFO Displays information about the selected object.

⇨ **Display information on selected file** on page 35

F2 

FILE Converts the display to file name.

F2 

NAME Converts the display to series name.

F4 

SORT Sorts the displayed list/table.

➔ **Select the measurement series**

1 Open the **Show series** dialog: ◁▷ △▽ ENTER

2 Open the **Show series (▲▼name)** dialog: △▽ ENTER

- You can press F2 to display the name of the measurement file instead of the recording time.
- You can press F4 to sort the measurement series.

3 Select the measurement series: △▽ ENTER

- Press F1 while a measurement is highlighted to display information about the measurement series.
  Date and time of the measurement, recording time and scanning rate, and possible trigger settings will be displayed.
  Notes which were entered at the start of the recording are shown on the third information page. You can edit the notes.

■

ENG

Presentation

The data of the selected measurement series 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 graphic presentations
  - Time-dependent presentation
  - Variable-dependent presentation

The graphics represent examples of the different types of presentations:

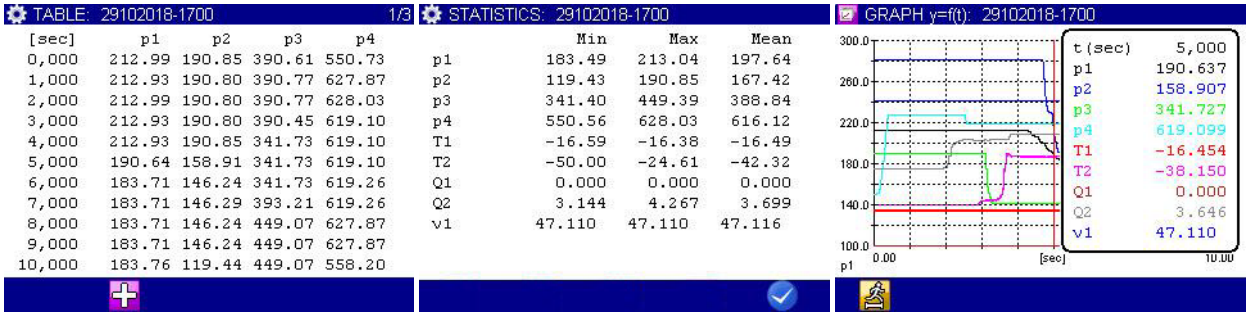


Table Statistics Graph

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

⇨ Chapter **Presentation type “Table”** on page 61

⇨ Chapter **Presentation type “Graph”** on page 62

Channel on x axis

If you have selected the **GRAPH y=f (x)** presentation mode, you can select the channel for the y axis. The first channel of the measurement is preset.

ENG

Type scaling

F2 

DISPLAY Displays the selected measurement.

F3 

INFO Displays information about the selected object.

⇨ **Display information on selected file** on page 35

F5 

OK Confirms input/saves changes.

By default, the entire measuring range of a measurand is used as scaling.

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

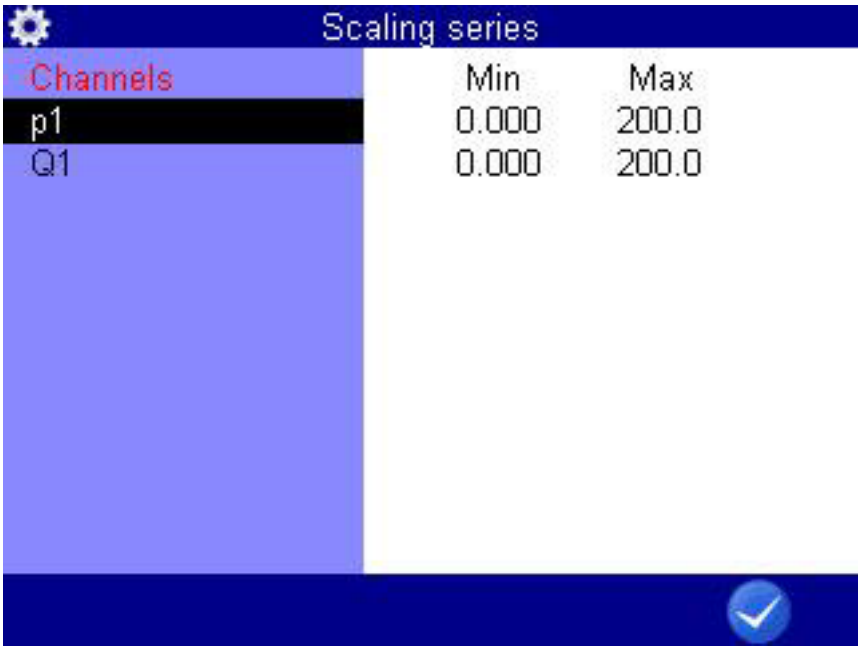
1 Select **Type scaling**: △▽.

2 Select **MANUAL** or **AUTO**: ENTER.

■

ENG

Scaling



F5 

OK Confirms input/saves changes.

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.

➔ **To change the scaling of a measurand**

1 Select variable: △▽ ENTER

2 Enter minimal value and ENTER.

3 Enter maximum value and ENTER.

4 Save scaling and exit the dialog: F5

■

ENG

Outline

F2 

DISPLAY Displays the selected measurement.

F3 

INFO Displays information about the selected object.

⇨ **Display information on selected file** on page 35

F5 

OK Confirms input/saves changes.

By default, measurement series 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 0.0 and 10.0 seconds is be shown.

This is how to adapt the range of presentation:

1 Select **Outline**: △▽.

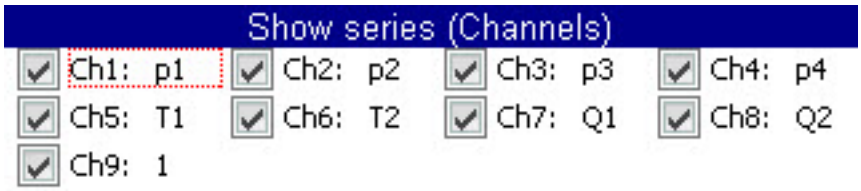
2 Select **CLIPPING**: ENTER

3 Enter time **From/To** and press ENTER to confirm values, from, to and time value.

■

ENG

Channels



F3 

ALL Selects all entries.
Removes all selections.

F5 

OK Confirms input/saves changes.

Opens the **Show series (Channels)** dialog. Select the channels to be presented.

All channels marked with an ☑ check mark are presented.

Select a channel and use ENTER to change highlighting.

Press F3 to select or deselect all channels.

ENG

Use symbols

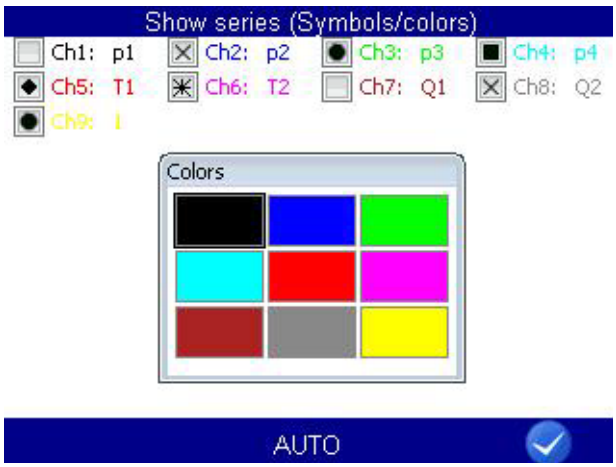
Select whether symbols are to be used for the presentation of the channels.

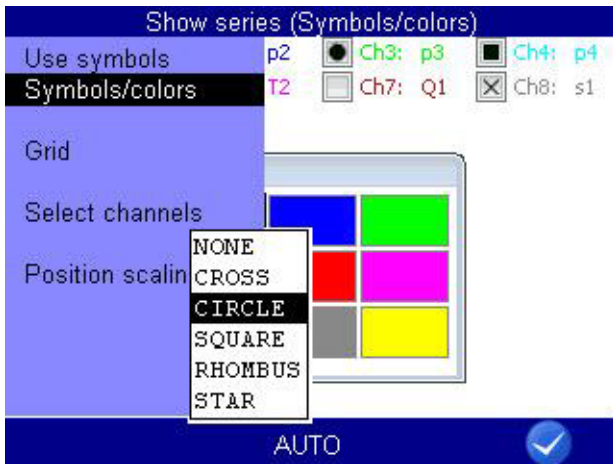
1 Open the **Use symbols** dialog entry: △▽ ENTER

2 Select **YES** or **NO**: △▽ ENTER

■

Symbols/colors Select the symbols and colors that are to be used for the presentation of individual channels.





F3 **AUTO** Automatically assigns symbols and colors.

F5 **OK** Confirms input/saves changes.

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

1 Select a channel: ◁▷ △▽ ENTER

2 Select the color for the channel: ◁ ▷ △ ▽ ENTER

3 Select a symbol for the channel: △ ▽ ENTER

Symbols/colors Opens the dialog for selecting symbols and colors.

Grid Number of the displayed lines in the grid of the diagram (**small grid**, **5 lines**, **10 lines**, **zero lines**).

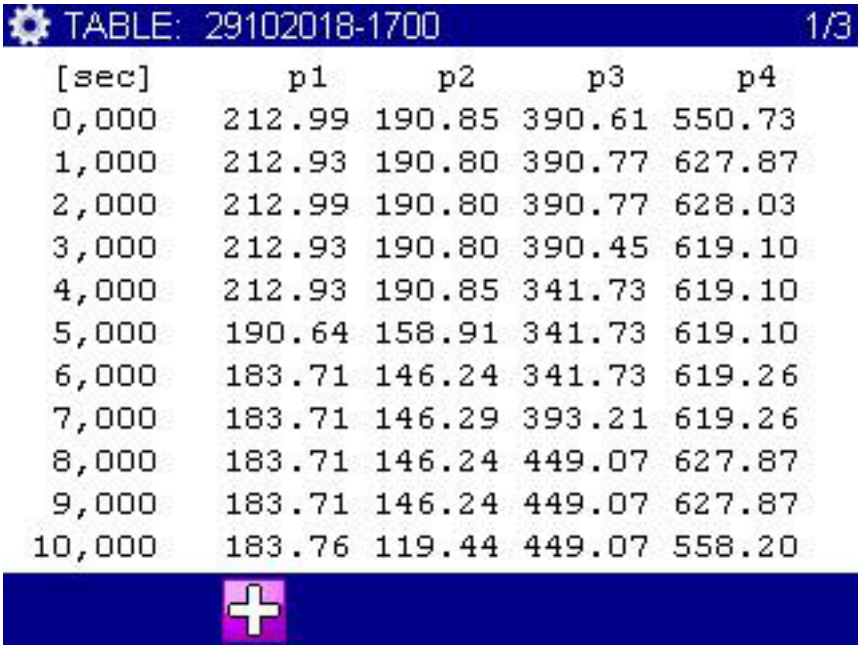
Select channels Choose from the following options:

- **AUTO**: For presentation of a different measurement series, all channels of this measurement will be selected automatically for the presentation
- **MANUAL**: When presenting other measurement series, 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.

Presentation type “Table”



F2 **DETAIL** Presentation type “Table”: Zooms into the table.

F3 **RESET** Presentation type “Table”: Zooms out of the table.

- 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.

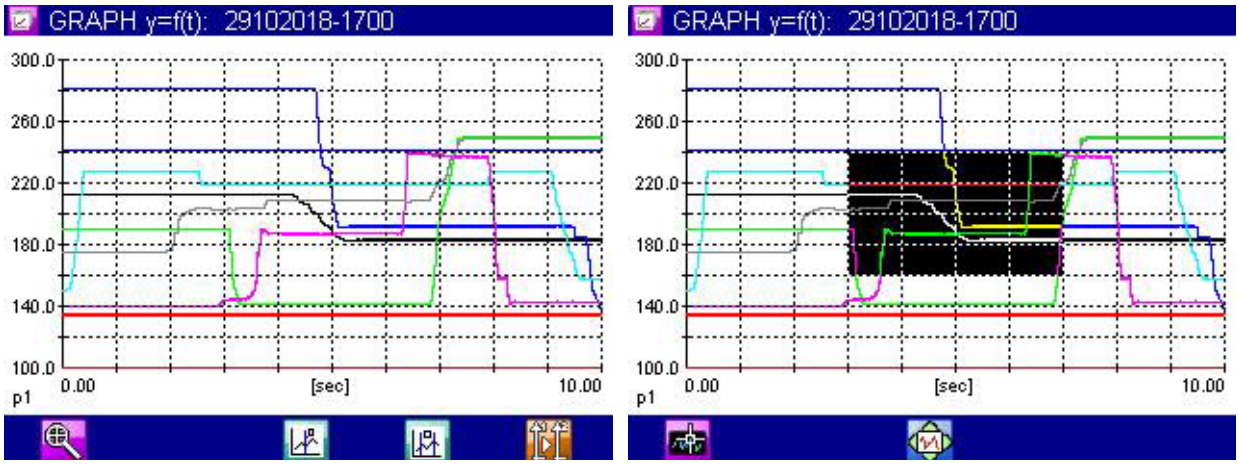
3 Press ENTER.

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 measurement series to display nine values between the start and end value, the next 10 measured 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”



F1		**ZOOM+**	Activates the zoom function.
F2		**ZOOM-**	Resets the last zoom.
F1		**POS**	Positions the zoom section.

F3		**SIZE**	Changes the zoom section.
F3		**SPOT**	Enables the spot function. ⇨ **Spot function** on page 64
F4		**D-SPOT**	Enables the delta-spot function. ⇨ **Delta spot function** on page 65
F5		**Y-SCAL**	Toggles the channel for which the scaling is displayed at the y-axis. For measurement series with two or more channels only.
F1		**Increment**	Changes the step width in the spot and delta-spot functions.

The selected channels are displayed with the assigned symbols and colors.

➔ **To use the zoom function**

1 Enable zoom function: F1

An inverted area indicates the area that will be enlarged.

You can move and scale the inverted area.

2 Move the inverted area: F1 ◁▷ △▽

3 Scale the inverted area: F3 ◁▷ △▽

4 Display the inverted area (apply zooming): ENTER

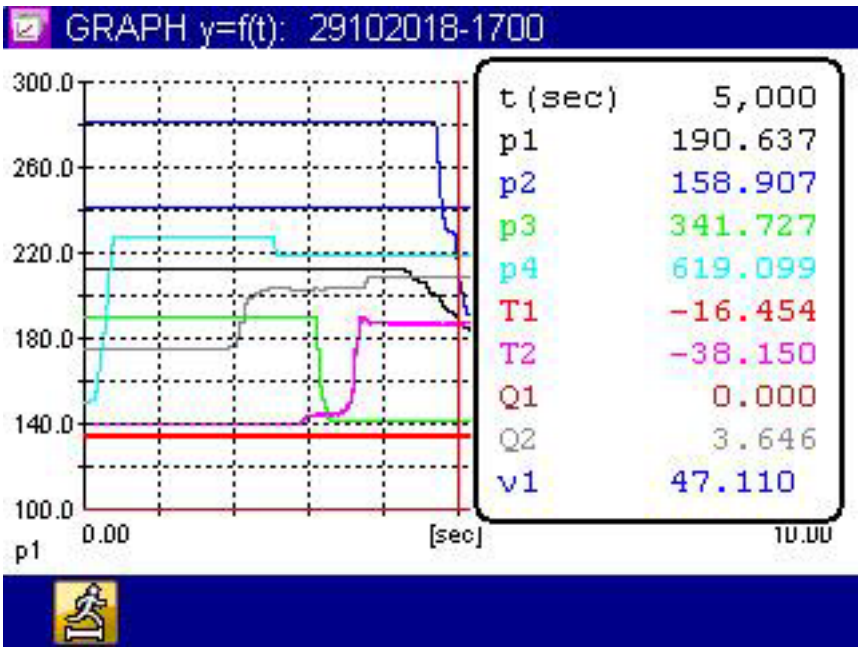
You can use the zoom function repeatedly to show the desired area of the graph in an optimized way.

5 End graph presentation: ESC

■

ENG

Spot function



F1 

Increment Changes the step width in the spot and delta-spot functions.

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 △▽ ENTER

3 Move spot line: ◁▷

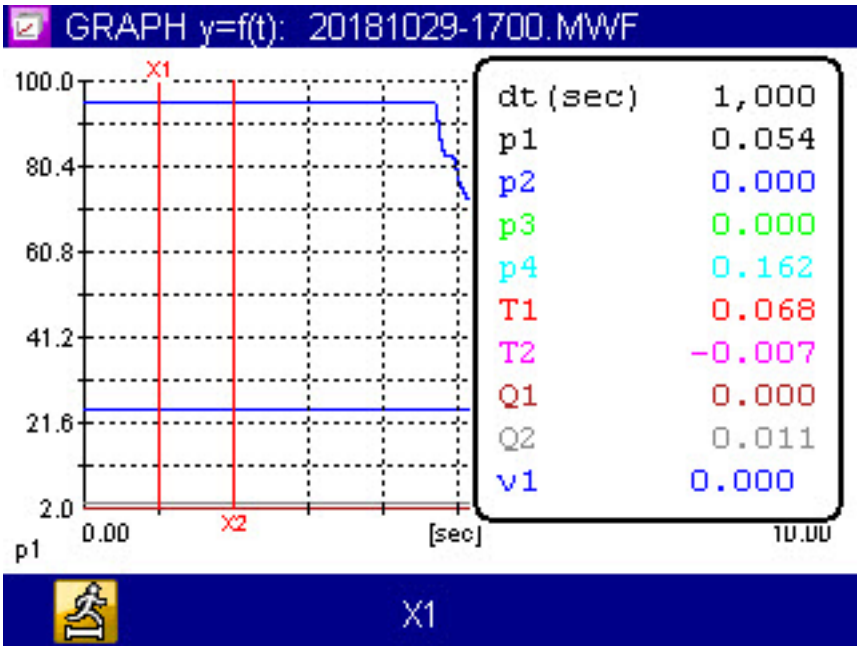
4 Read measured values.

5 End spot function: ESC

■

ENG

Delta spot function



F1 

Increment Changes the step width in the spot and delta-spot functions.

F3

X1
X2
X1+X2

Changes the spot line that is moved with the ◁▷ keys.

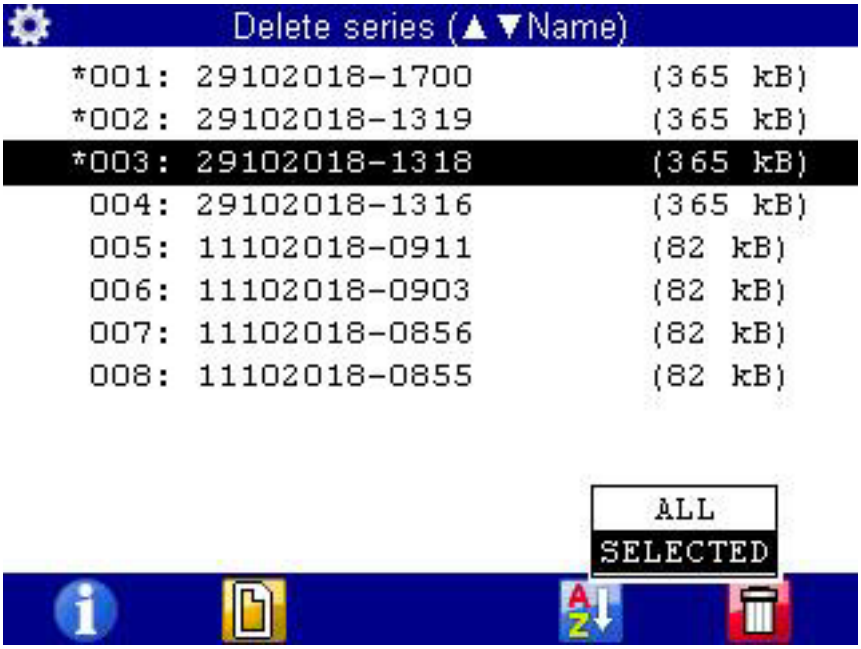
For the delta-spot function, two spot lines are displayed.

The differences between each channel's measured values marked by the two spot lines on the curve are displayed on the right.

Use F1 to select the move factor and F3 to choose whether the left (**X1**), the right (**X2**) or both (**X1+X2**) spot lines are to be moved.

ENG

Delete series



F1		**INFO**	Displays information about the selected object. ⇨ **Display information on selected file** on page 35
F2		**FILE**	Converts the display to file name.
F2		**NAME**	Converts the display to series name.
F4		**SORT**	Sorts the displayed list/table.
F5		**DELETE**	Enables the delete function.

Use the functions of this dialog to delete stored measurement series.

In the graphic, the measurement series **001**, **002** and **003** are selected for deletion. The measurement series **003** is highlighted. Press F1 to display information on it.

1 Open the **Delete series** dialog: ◁▷ △▽ ENTER

2 Select one or more measurement series (optional): △▽ ENTER

3 Delete: F5

4 Delete the selected measurement series or all series: △▽ ENTER

5 Confirm deletion with F2 or cancel with F4.

The deletion cannot be undone.

■

Search series

F1		**SEARCH**	Starts the search.
F3		**RESET**	Resets the search result.
F5		**OK**	Confirms input/saves changes.

Use the functions of this dialog to search for recorded measurement series.

1 Open the **Search series** dialog: ◁▷ △▽ ENTER

2 Highlight and select the **Search term** dialog entry: △▽ ENTER

3 Enter a search term, e.g. 1720 ENTER

4 Run the search and close the dialog: F1 F5

5 Open the **Show series** dialog: ◁▷ △▽ ENTER

6 Open the **Show series (▲▼name)** dialog: △▽ ENTER

The measurement series returned by the search function are shown in blue.

7 Sort measurement series by search result: F4 △▽ ENTER

Select **Filtered**. The measurement series returned by the search function are displayed at the top of the list.

8 Select the measurement series: △▽ ENTER

■

ENG

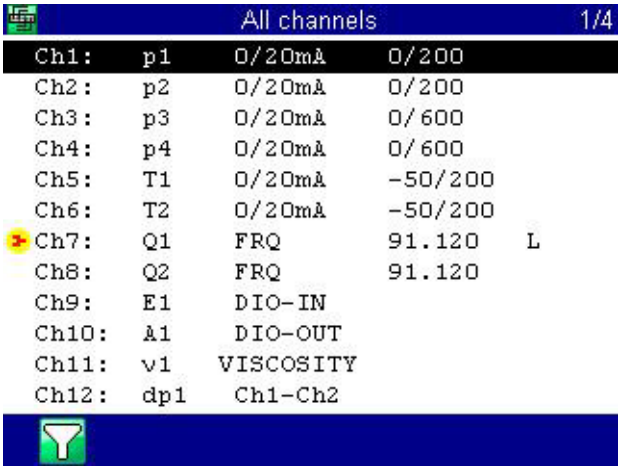
Setting

In the **Setting** menu, settings can be applied for channels, display, instrument and recording.

ENG

ENG

Channels



FILTER

Opens the **Overview Filter** dialog.

⇨ **Overview Filter** on page 80

There are 42 channels available:

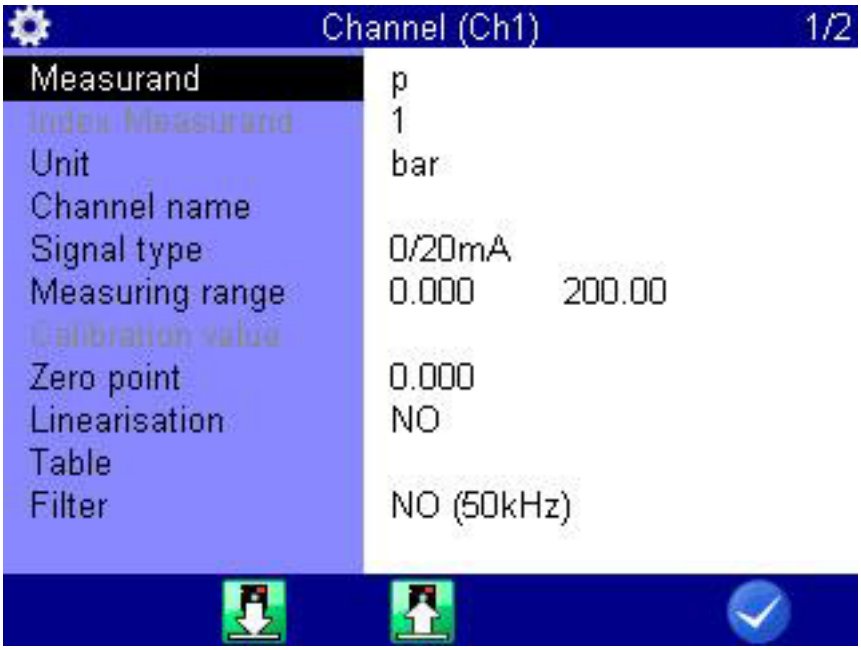
- **Ch1** ... **Ch8**
  Measuring channels; sensor connectors at the rearside of the device
- **Ch9**
  Trigger input
- **Ch10**
  Trigger output
- **Ch11** ... **K42**
  Special channels for calculations or recording CAN signals.

Press △▽ to highlight a channel.

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

➔ **Configure measurement channels (Ch1 ... Ch8)**

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



F2  **LOAD** Loads sensor parameters from the database.

F3  **SAVE** Stores the current sensor parameters in the database.

F5  **OK** Confirms input/saves changes.

You may configure several properties for each measurement channel:

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

Index Measurand If Channel numeration is set to MANUAL in the **General settings** menu (see **General Settings** on page 98), you may enter the index number of the channel here.

If numeration is set to AUTO, this dialog entry cannot be changed.

Unit Select the unit of measurement.

Channel name

You may enter an individual name for each channel.

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

⇨ See **Tiles per page** on page 85.

Signal type

Sensor-specific

The correct signal type is given on the type plate of the sensor or in its documentation.

For frequency channels Ch7-Ch8, signal type **±CNT(4Q)** runs a precise measurement of all 4 quadrants, not only the rising edges.

ENG

Measuring range

Enter the measuring range for the connected sensor.

Calibration value

Enter the factor for the calculation of the measured value from the frequency signal (for frequency sensors only).

Zero point

Manual zero point alignment of the sensor (see **Do zero point equalization** on page 73)

Linearisation

If available, you may enter or select a linearization table for the connected sensor. This may increase measuring accuracy.

⇨ You can find more information in Chapter **Linearization table** on page 125.

Filter

- Choose from three digital filters:
- **NONE**

  No filter applied; peak pressure measurements up to 10 kHz on channels Ch1 to Ch8
- **STANDARD**

  A 5 kHz filter is applied to channels Ch1 and Ch8.
- **DAMPED**

  A 50 Hz filter is applied to Ch1 to Ch8; peak pressures are suppressed; this is ideal for static measurements or slow processes.

Gate Time

Frequency inputs are equalized by the gate time. The longer the gate time, the slower the measured values will change, since a new value is only recorded after a delay. In the meantime, the measured values remain constant. The result is a signal smoothing.

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.

➔ **Do zero point equalization**

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

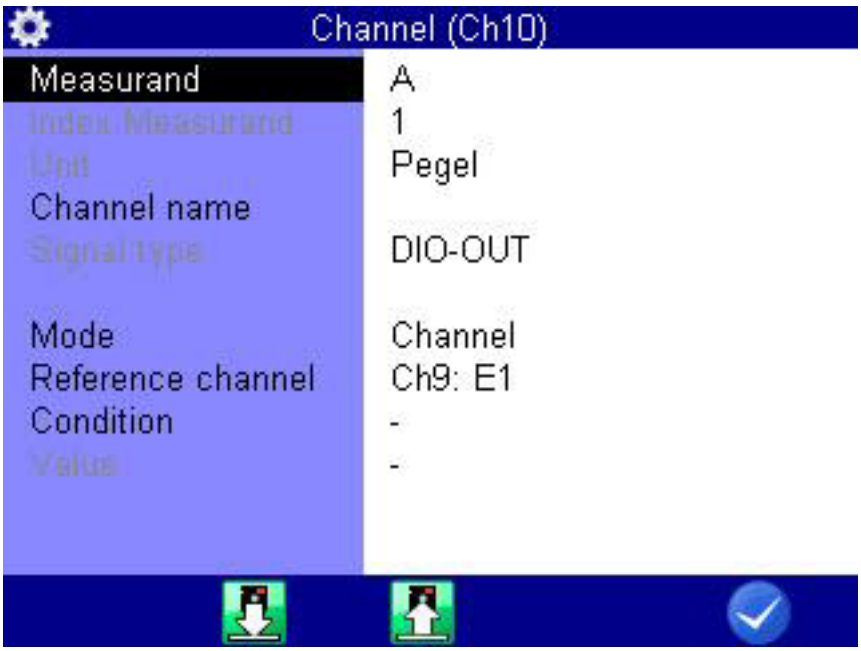
Press F4 to start the zero point alignment. This process is carried out fully automatically; the determined value will be displayed after a few seconds.

➔ **Configure digital signal input (Ch9)**

You can only assign one channel name to the digital signal input. Please observe the technical data (**Technical data** on page 18) for permitted input signals.

ENG

➔ **Configure digital signal output (Ch10)**



F2  **LOAD** Loads sensor parameters from the database.

F3  **SAVE** Stores the current sensor parameters in the database.

F5  **OK** Confirms input/saves changes.

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

You are able to define up to 5 parameters here.

Measurand Shows the internal measurand of the output.

Channel name You can assign an arbitrary name here.

Mode 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 synchronized:
  – 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

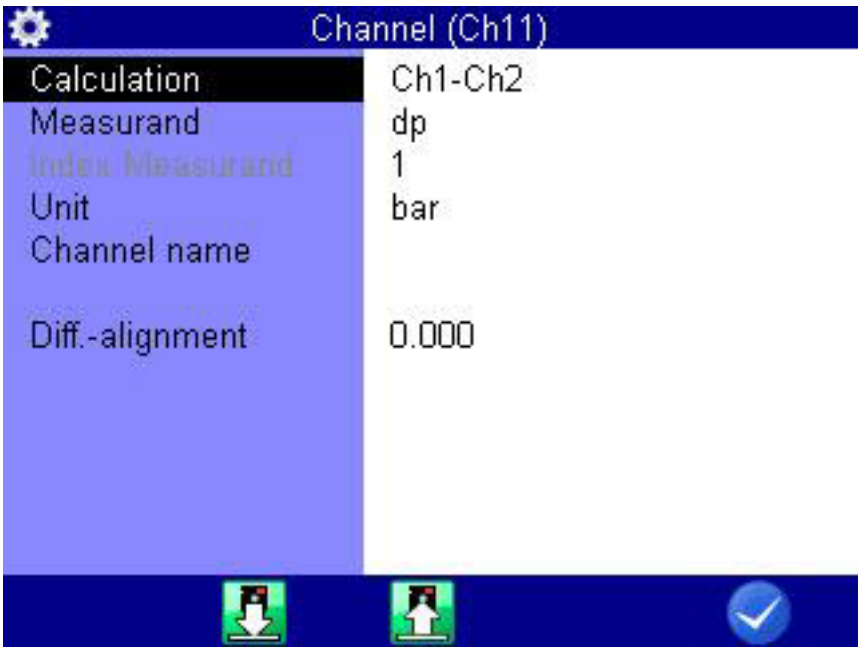
Reference channel Select the channel to be used as reference channel.

Condition For trigger input **OFF**/**ON**

For measurement channels **GREATER THAN**/**LESS THAN**

Value For measurement channels, e.g. 200

➔ **Configure special channels (Ch11 ... Ch42)**



F2  **LOAD** Loads sensor parameters from the database.

F3  **SAVE** Stores the current sensor parameters in the database.

F5  **OK** Confirms input/saves changes.

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.

Calculation Choose between the different occupations of the channel (see further below)

⇨ See **Possible assignments of the special channels** on page 76.

Measurand Is entered automatically when using pre-programmed formulas and cannot be edited;

For individual formulas and assignment with CAN you may define the measurand that is provided on this channel here.

Index Measurand If Channel numeration is set to MANUAL in the **General settings** menu (see **General Settings** on page 98), you may enter the index number of the channel here.

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

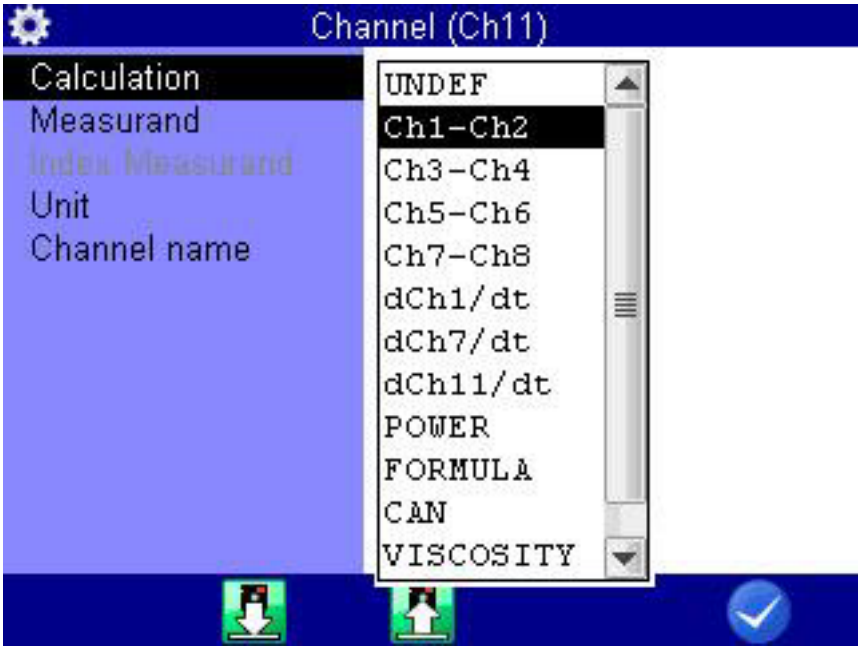
Define the unit for channels with individual formulas and assignment with CAN.

Channel name You can assign an arbitrary name here.

Align. Diff This function automatically determines the measured value difference between the selected channels and uses 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 76)

➔ **Possible assignments of the special channels**



F2 **LOAD** Loads sensor parameters from the database.

F3 **SAVE** Stores the current sensor parameters in the database.

F5 **OK** Confirms input/saves changes.

UNDEF Channel is not in use

Ch1-Ch2 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 **Ch3-Ch4**, **Ch5-Ch6** and **Ch7-Ch8**

dCh1/dt Forms the first derivative of the measured values from channel 1;

Analogously, the derivation of the channels Ch7 (**dCh7/dt**) and Ch11 (**dCh11/dt**) is also possible

POWER Uses the formula *Ch1 x Ch7 / 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

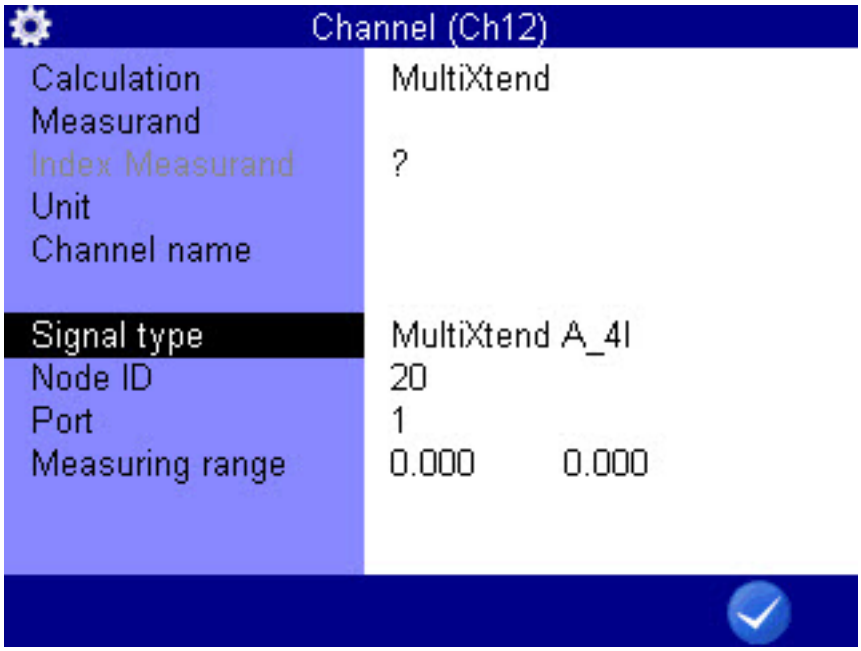
⇨ See **Calculations with formulas** on page 78.

CAN Observe the information in chapter **Define CAN channel** on page 127

Viscosity For viscosity calculation

⇨ See **Viscosity-compensated volume flow rate measurement** on page 142.

➔ **Set up the MultiXtend**



F5 **OK** Confirms input/saves changes.

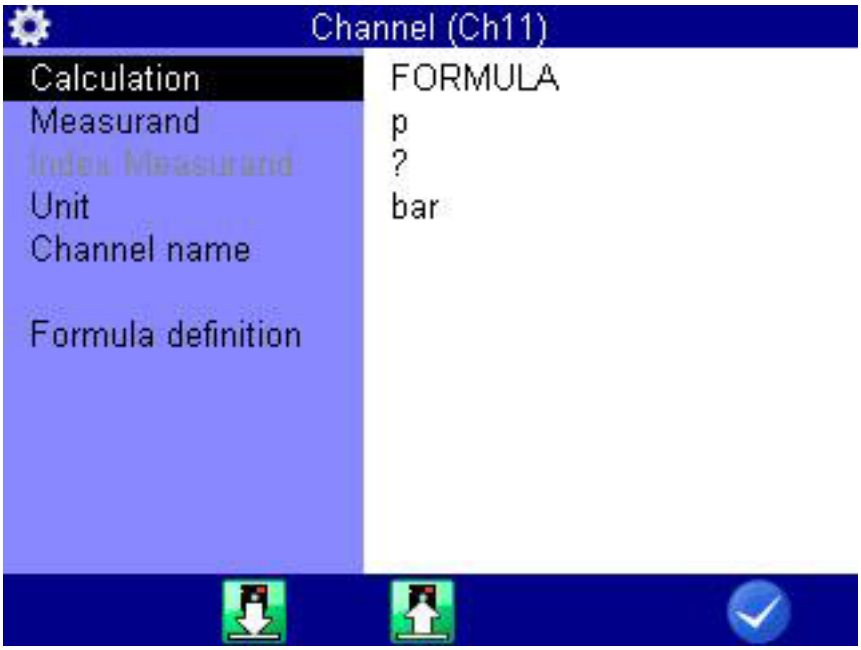
1 Select the **Calculation** dialog entry: △▽ ENTER
2 Select the **MultiXtend** entry: △▽ ENTER
3 Select the **Signal type** dialog entry: △▽ ENTER
4 Select the MultiXtend model: △▽ ENTER
5 For the multi-channel MultiXtend model, select the **Port** dialog entry: △▽ ENTER
6 Select the port corresponding to the desired channel: △▽ ENTER
7 Confirm changes and exit the dialog: F5

8 Repeat the setup for each desired channel on your MultiXtend instrument.

■

⇨ See **Connecting MultiXtend A and T** on page 138.

➔ **Calculations with formulas**



F2		**LOAD**	Loads sensor parameters from the database.
F3		**SAVE**	Stores the current sensor parameters in the database.
F5		**OK**	Confirms input/saves changes.

You may perform any 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 *Ch13/600*(Ch1-Ch5)*

Values from special channels can only be used if the ordinal number of the used channel is lower.
Possible formula on channel 14: *Ch12+Ch1*, impossible formula on Ch14: *Ch15+Ch1*.

Press the 5 JKL key once to enter a **Ch** (= 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 ENTER. The measuring system does not check the entered formula for plausibility.

Example of a consumption measurement in [l/min]

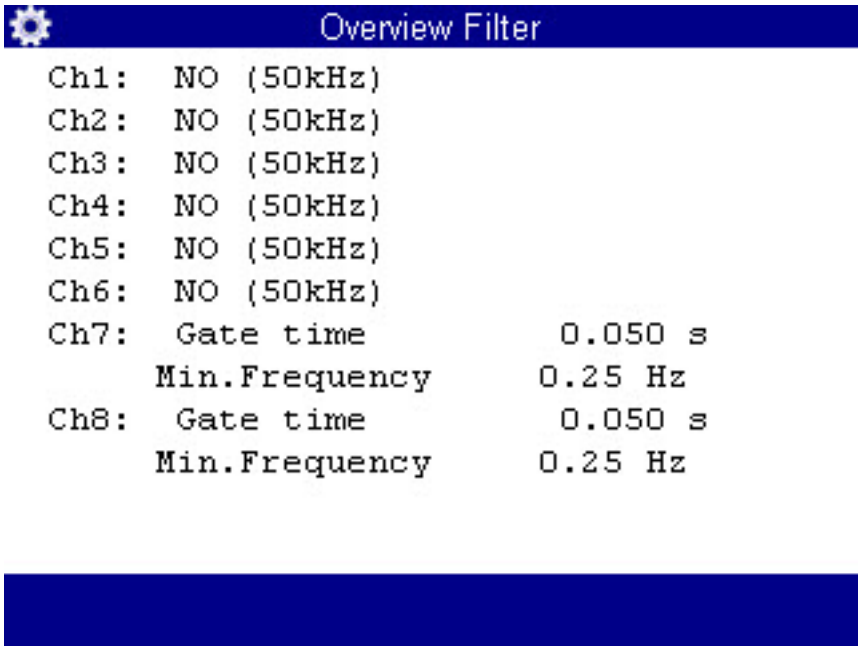
Some measurement channels are required for this example. They are printed in **bold** letters:

- **Channel 7**: Measurement of volume V1 in liters (l)
- **Channel 8**: Measurement of volume V2 in liters (l)
- Channel 11: Calculation *Ch7 - Ch8 = dV1* in liters (l)
- Channel 12: Calculation *dCh11/dt = Q1* in liters per second (l/s)
- Channel 13: Calculation *Ch12 * 60 = Q2* in liters per minute (l/min)

ENG

ENG

Overview Filter



Press the F1 key in the **All channels** dialog to display a summary of all filters.

You can execute several special measurements by applying filters.

Filter Choose from three digital filters:

- NONE
  No filter applied; peak pressure measurements up to 10 kHz on channels Ch1 and Ch8 possible
- **STANDARD**
  A 5 kHz filter is applied to channels Ch1 and Ch8
- **DAMPED**
  A 50 Hz filter is applied to Ch1 to Ch8; peak pressures are suppressed; this is ideal for static measurements or slow processes.

ENG

Channel extension

F1		**SCAN**	Scans the CAN bus for messages.
F2		**CREATE**	Compiles a list of the supported channel extension boxes.
F2		**Setting**	Opens the dialog for settings of the highlighted measurement channel.
F3		**LEFT**	Switches to next column to the left.
F4		**RIGHT**	Switches to next column to the right.
F4		**Port**	Opens the selection between **CAN #1** or **CAN #2**
F5		**OK**	Confirms input/saves changes.

You can use the **Channel extension** dialog to select and configure a channel extension. Use the F4 button to select which CAN bus, **CAN #1** or **CAN #2**, should be used to search for connected instruments.

➔ **Select channel extension**

If you press the F1 key, the system automatically searches for a channel extension box. Press the F2 key to perform manual selection. This allows you to select manually from the list of channel extension boxes found.

Once you have selected a channel extension box, a dialog opens in which you can configure the box's ports.

Selection The selected channel extension box is displayed here. You can use ENTER △▽ ENTER to select a different channel extension box.

Node ID The **Node ID** of the selected channel extension box is displayed in decimal and hexadecimal numbers.

Port The four possible inputs for the selected channel extension box are displayed. Additional data on the port is shown in a dedicated column under each port number. The active port is highlighted in green.

Signal type Displays the **signal type** of the relevant port.

Unit Displays the **unit** of the relevant port.

Reference channel The reference channel for each port is displayed. When a Firmware Version 2.0 channel extension box is selected, the free (as yet unused) measurement channels are automatically assigned to the ports as reference channels. If all measurement channels are already assigned, a "?" appears and you can select and overwrite an assigned measurement channel manually.
You can change the configuration for each of the four measurement channels. Use F4 to switch to the next column to the right and F3 to switch to the next column to the left to highlight a measurement channel. The active measurement channel is highlighted in green. Use F2 to open the dialog with the settings of the highlighted measurement channel in order to change the configuration.

⇨ **Configure special channels (Ch11 ... Ch42)** on page 75

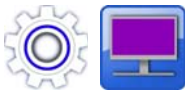
Channel name Displays the measurand set for each reference channel.

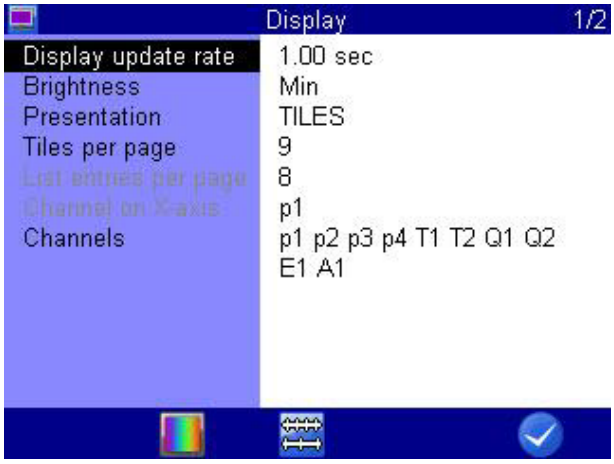
Unit Displays the **unit** set for the measurand in the reference channel.

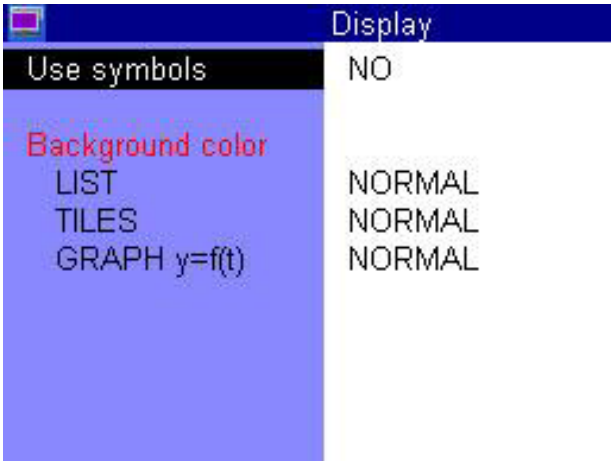
Measuring range from/ to The measuring range **from** and **to** set for the corresponding reference channel is displayed here.

ENG

Display







F2		**COL/SYM**	Opens the **Display (Symbols/colors)** dialog.
F3		**SCAL**	Opens the **Scaling display** dialog.
F5		**OK**	Confirms input/saves changes.

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

Display update rate The display defines the refresh rate of the result display

Select one of the five possible values

Brightness Specifies the brightness value of the display

Select a value from **0%** to **100%**

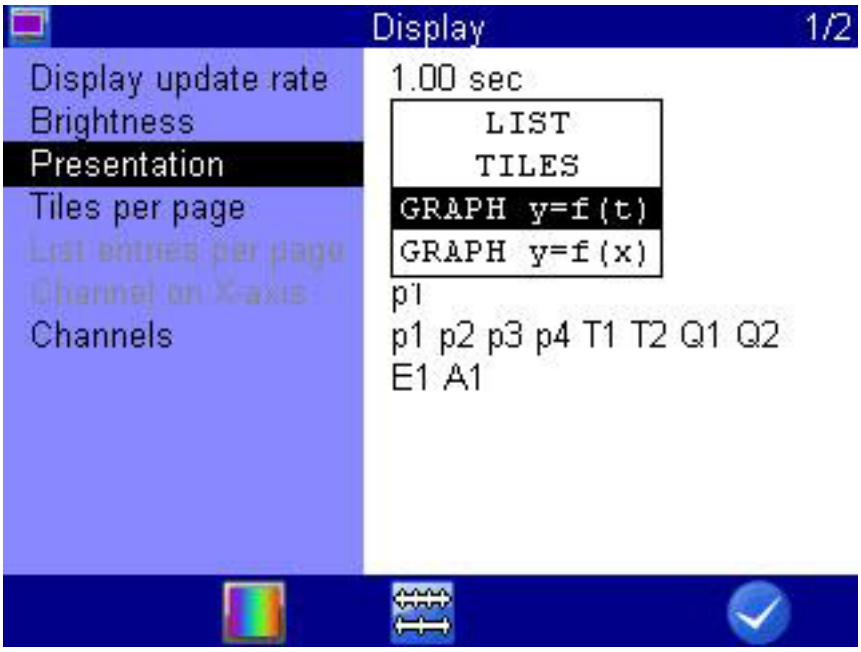
Presentation You can choose between the following options here:

- **LIST**
- **TILES**

You have two possibilities for configuring the graphical presentation:

- **GRAPHIC y = f(t)**
  Presentation of the channels as a function of time
- **GRAPHIC y = f(x)**
  Presentation of the channels as a function of an arbitrary channel

ENG



F2  **COL/SYM** Opens the **Display (Symbols/colors)** dialog.

F3  **SCAL** Opens the **Scaling display** dialog.

F5  **OK** Confirms input/saves changes.

ENG

Tiles per page

Here you have three possibilities for the tile presentation:

- **4**
  Shows 4 tiles in the result display.
- **9**
  Shows 9 tiles in the result display.
- **12**
  Shows 12 tiles in the result display.

F1 

Change display

⇨ **Change display** on page 45

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** menu.

⇨ See **Configure measurement channels (Ch1 ... Ch8)** on page 71.

If there are more channels selected for display than there are tiles shown, the following will be displayed at the top left: (current page/total pages).

Switch to the next page of tiles with ◁▷.

List entries per page

Under List presentation you can choose to display **1**, **2**, **4**, **6**, **8** or **16** list entries per page.

Channel on x axis Select the channel on which the function for the graphical presentation is to be based.

Channels Opens the **Display (channels)** dialog. Select the channels to be displayed in the result display.

All channels marked with an ☑ check mark are displayed.

Select a channel and use ENTER to change highlighting.

Press F3 to select or deselect all channels.

Use symbols Choose whether the individual channels should also be marked with symbols in Graphic presentation.

Background color Choose whether the colors should be presented as **NORMAL** or **INVERTED** (reversed).

COL/SYM You can assign symbols and colors to the channels here.

⇨ See **Display (Symbols/colors) dialog** on page 87.

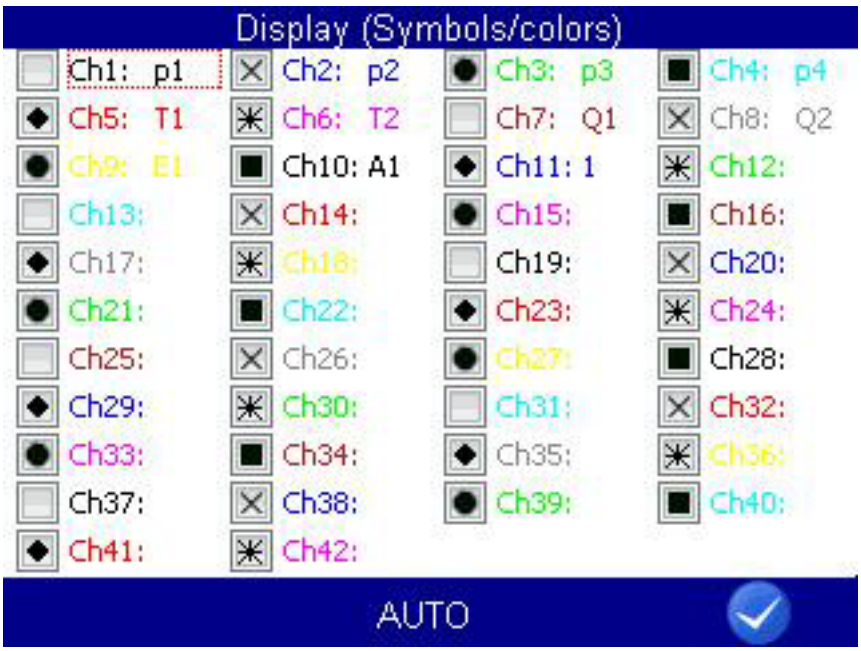
SCAL. Select the measurement range of the channel which is to be displayed in the graphical presentation.

⇨ See **Display scaling dialog** on page 88.

ENG

ENG

Display (Symbols/colors) dialog



F3

F5

AUTO	Automatically assigns symbols and colors.
OK	Confirms input/saves changes.

First, make a selection from the **Use symbols** dialog entry in the **Display** dialog:

- **YES**: Symbols and colors are used
- **NO**: Only colors are used

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

Open the **COL/SYM** dialog on the lower display bar using F2.

Press F3 **AUTO** to assign the standard settings to all channels. If a channel is highlighted, you can use ENTER to open and assign the selection lists for symbols and colors.

1 Highlight a channel – ENTER.

2 Select a color – ENTER.

(only for activated symbols)

3 Select a symbol – ENTER.

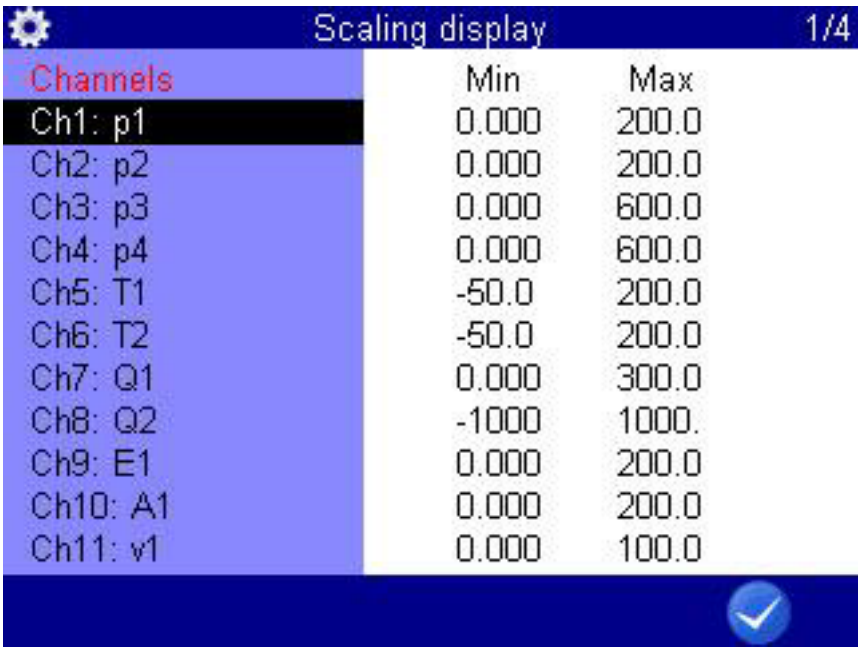
4 Repeat steps 1 to 3 for all desired channels.

5 Confirm changes and exit the dialog: F5

■

ENG

Display scaling dialog



F5 

OK Confirms input/saves changes.

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

⇨ See **Configure measurement channels (Ch1 ... Ch8)** on page 71.

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

In the **Display** dialog, use F3 to open the **Scaling display** dialog to adjust the display of the measuring range of the individual channels.

1 △▽ ENTER : press to select the desired channel.

2 Enter lower limit of display range – ENTER.

3 Enter upper limit of display range – ENTER.

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

5 Confirm changes and exit the dialog: F5

■

Device

Configuration of the instrument is done via the **Device** menu.

Connections Settings for CAN, COM, LAN/WLAN and, Bluetooth connections and the internal USB memory

General settings Settings for the language, sensors, (menu) color scheme, menu display when switching the instrument on, individual company details and softkey display, operating language

Info Information about the software and hardware of the measuring instrument

Date/Time Setting of date and time

Memory medium Information about the configuration and partitioning the internal SD card

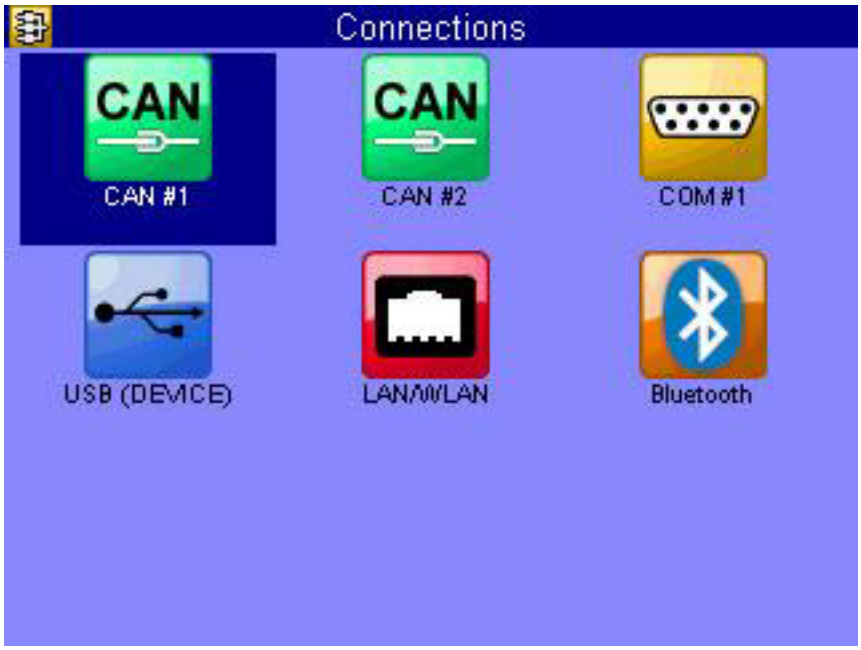
Security Setting of access rights for menus

Calibration Specifying the calibration interval

Hardware Diagnostic Expanded settings for diagnosis of hardware (for service personnel)

Battery information Information and current state of battery

Connections



ENG

CAN #1 and CAN #2

F5 **OK** Confirms input/saves changes.

Interface Enable/disable CAN bus

Power supply Use this function to switch the power supply of connected CAN sensors ON and OFF. Highlight the dialog entry with △▽ and press ENTER to toggle between **ON** and **OFF**.

Baud rate Set transmission speed for CAN data

➔ **CAN configuration**

You can define a calculation channel as CAN channel (see Chapter **Define CAN channel** on page 127). To enable this, you have to activate the CAN bus here and set the data transmission rate.

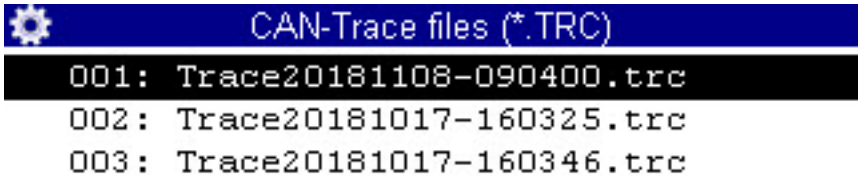
1 Select **CAN #1** or **CAN #2** in the **Connections** menu: ◁▷ △▽ ENTER
2 Select the bus termination: △▽ ENTER △▽ ENTER
3 Toggle to input the baud rate: △▽ ENTER
4 Select the desired baud rate: △▽ ENTER
5 Confirm changes and exit the dialog: F5

■

Start CANopen Here you can trigger the start command into the CAN bus that requests the connected sensors and adaptor boxes to send data. Choose between **AUTO** and **MANUAL**. Start the request with the F3 key.

TRACE The trace function records the CAN messages. Start and stop the recording with the F4 key.

Load an existing recording with the ENTER key.



F1 

INFO Displays information about the selected object.

⇨ **Display information on selected file** on page 35

F2 

FILE Converts the display to file name.

F2 

NAME Converts the display to series name.

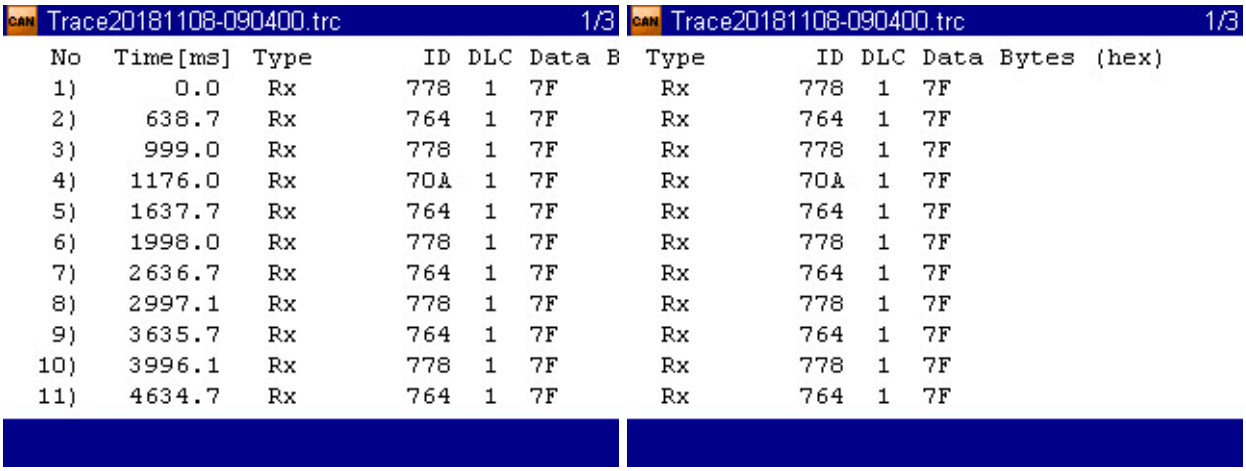
F5 

SORT Sorts the displayed list/table.

ENG

The number of messages for the loaded recording is displayed in the Messages dialog entry.

Open a loaded recording with the F2 key.



Trace20181108-090400.trc 1/3

No	Time[ms]	Type	ID	DLC	Data B
1)	0.0	Rx	778	1	7F
2)	638.7	Rx	764	1	7F
3)	999.0	Rx	778	1	7F
4)	1176.0	Rx	70A	1	7F
5)	1637.7	Rx	764	1	7F
6)	1998.0	Rx	778	1	7F
7)	2636.7	Rx	764	1	7F
8)	2997.1	Rx	778	1	7F
9)	3635.7	Rx	764	1	7F
10)	3996.1	Rx	778	1	7F
11)	4634.7	Rx	764	1	7F

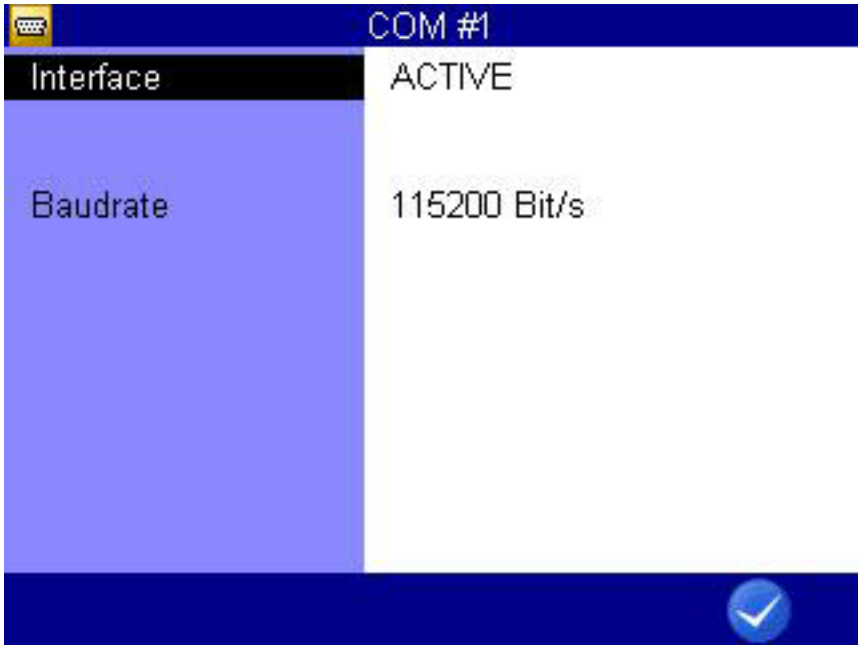
Trace20181108-090400.trc 1/3

Type	ID	DLC	Data Bytes (hex)
Rx	778	1	7F
Rx	764	1	7F
Rx	778	1	7F
Rx	70A	1	7F
Rx	764	1	7F
Rx	778	1	7F
Rx	764	1	7F
Rx	778	1	7F
Rx	764	1	7F
Rx	778	1	7F
Rx	764	1	7F

Use the ◁▷ keys to see the front or back of a trace line. You can use the △▽ keys to browse.

ENG

COM #1



F5 

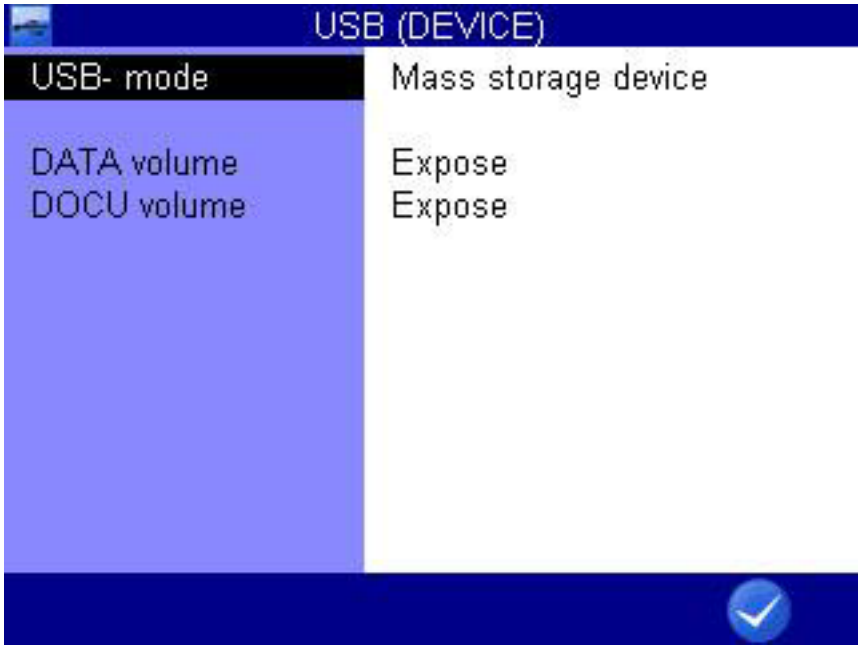
OK Confirms input/saves changes.

Interface Enable/disable COM bus

Baud rate Set transmission speed for COM data

ENG

USB (DEVICE)



F5 

OK Confirms input/saves changes.

USB mode

Choose from the following options:

- **USB device**: The measuring instrument is only enabled for communication with the PC. Drives are not enabled for the PC.
  Example: using the HYDROlink software.
- **Mass storage device**: The measuring instrument is enabled for communication with the PC and at least one drive is enabled for the PC. Drives can be enabled for the PC. The default drive to be enabled is the DOCU-VOL drive.

  If you want to transfer measuring data to the PC without additional software, enable the DATA-VOL drive.

⇨ See **Connect a PC and transfer data** on page 36.

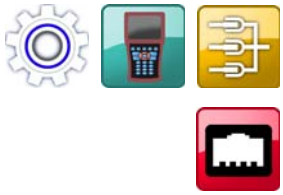
DATA volume
DOCU volume

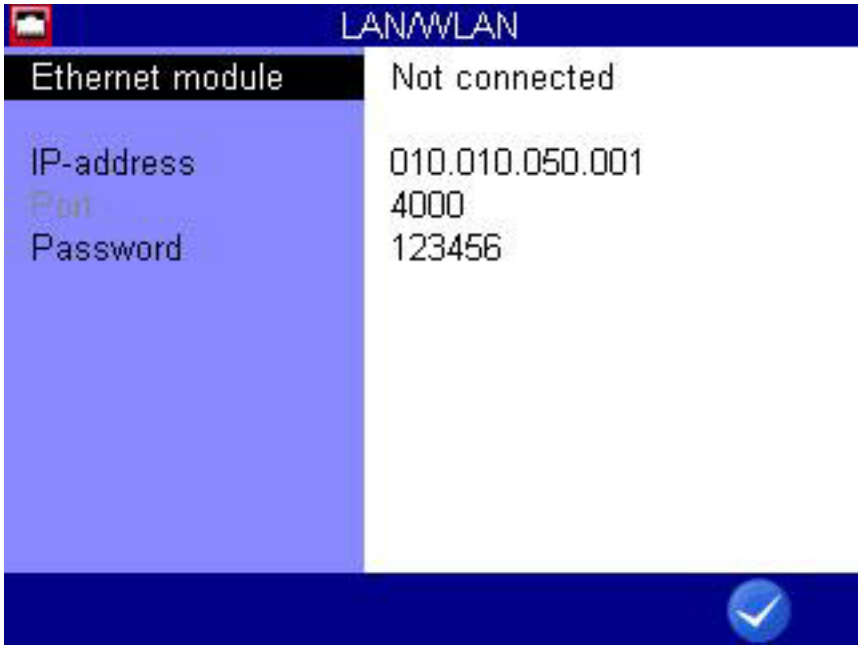
Can only be selected if **USB mode** is set to **Mass storage device**. Choose from the following options:

- **Bind**: The volume is bound to the measuring instrument and cannot be addressed as an external drive by the PC.
- **Expose**: The volume is visible on the PC as an external drive.

Enable the **DATA-VOL** in order to transfer files directly from the measuring instrument to a PC. You can use any file browser for this.

LAN/WLAN





F5 

OK Confirms input/saves changes.

Ethernet module For the connection of the Ethernet module, **Not connected**, **MultiXtend/LAN** and **USB/WLAN** can be selected.

IP Enter the IP address that **MultiSystem 5070** 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

➔ **Set up Ethernet functionality**

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

These options can be set:

1 Select the Ethernet options: △▽ ENTER

2 Select the desired option: △▽ ENTER

3 Select the desired setting or enter the required information.

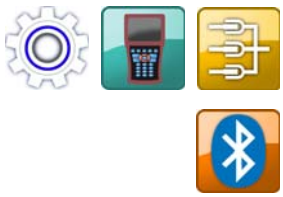
4 Confirm the setting/entry: ENTER

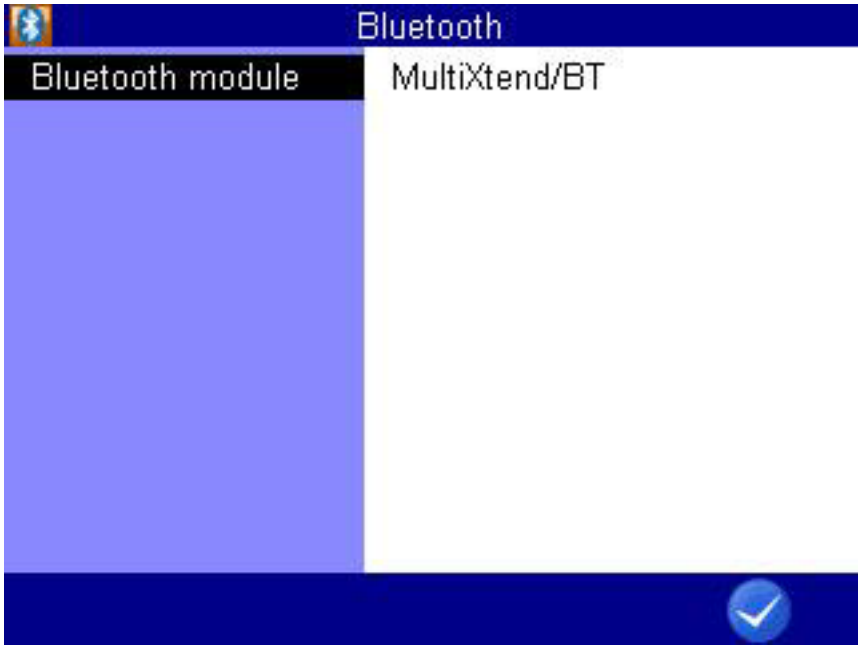
5 Confirm changes and exit the dialog: F5

■

ENG

Bluetooth





F5 

OK Confirms input/saves changes.

Select a **Bluetooth module**.

General Settings

F5 

OK Confirms input/saves changes.

Language You can choose from the following languages:

- German
- English
- French
- Italian
- Spanish
- Dutch
- Danish
- Bulgarian
- Czech
- Croatian
- Hungarian
- Polish
- Romanian
- Russian
- Greek
- Turkish
- Chinese
- Korean

More languages may be available depending on the firmware version that is installed on your **MultiSystem 5070**. Additional languages may be provided with a firmware update.

➔ **Select operating language**

1 Select **Language** on the **User profile** dialog with ENTER.

2 Select language: △▽ ENTER

3 Confirm changes and exit the dialog: F5

■

Sensor detection Adjust the instrument's sensor detection.

➔ **ISDS configuration**

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

1 Open the **Sensor detection** dialog entry: △▽ ENTER

2 Activate sensor detection with **YES**: △▽ ENTER

■

Unit Select the unit system

- **SI (bar)**
  The measuring instrument uses the units of the SI system. However, for pressure, the unit bar is used.
- **US**
  The measuring instrument uses the units that are common in the USA (e.g. psi, °F).
- **SI (MPa)**
  The measuring instrument uses only the units of the SI system. Pressure will be displayed in MPa.

➔ **Selecting a unit**

1 Open the **Unit** dialog entry: △▽ ENTER

2 Select desired unit: △▽ ENTER

3 Confirm changes and exit the dialog: F5

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

■

Channel numeration Select between automatic and manual channel numbering.

➔ **Channel numeration function**

As a standard, the MS 5070 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 channel numeration from **AUTO** to **MANUAL**, you can assign fixed index numbers to the channels (see Chapter **Configure measurement channels (Ch1 ... Ch8)** on page 71). These will be kept 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 dialog entry with △▽ and press ENTER to toggle between **AUTO** and **MANUAL**.

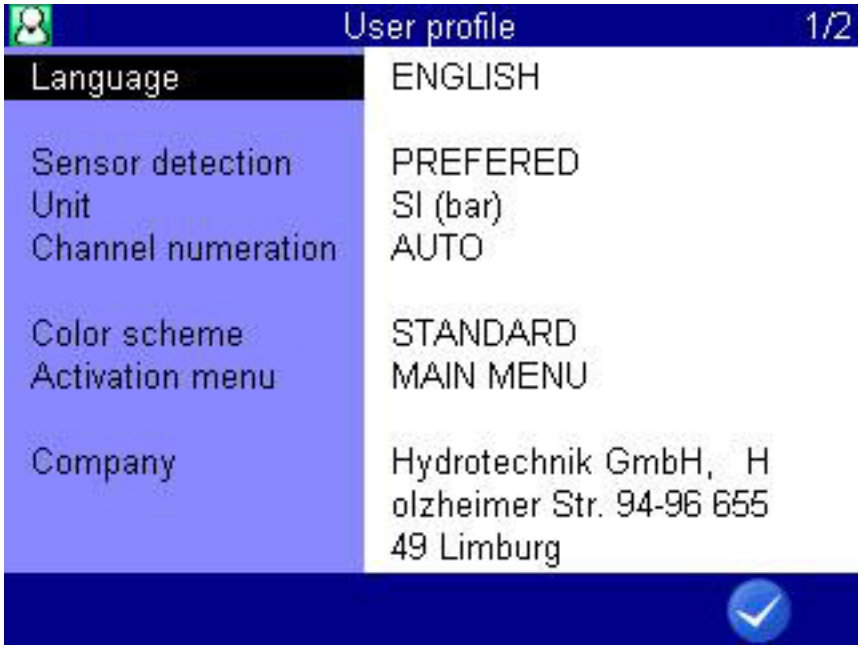
Color scheme Select the color scheme for the user interface.

Activation menu Select which display is shown when the measuring instrument is switched on:

- **MEASURE**
- **MAIN MENU** (displays the **Home** menu)

Company You can enter any text that will be shown in the saved logs.

➔ **Enter company**



F5 **OK** Confirms input/saves changes.

1 In the **User profile** dialog, select the **Company** with △▽ ENTER.

2 Enter text and ENTER.

Use F2 to toggle between capital and small letters.

3 Confirm changes and exit the dialog: F5

■

Softkeys Select whether softkeys are displayed as **TEXT** or **SYMBOL**.

ENG

Unit control Automatic unit control offers the following advantages:

- Sensor parameters can be entered in any unit.
- A different display unit can be set.
- Correct calculation of values with different measuring channel units, e.g. p1 (bar) - p2 (mbar).
- Automatic identification of the unit in the result of a formula, e.g. p1 (psi) * Q1 (gpm) = kW

The setting does not affect special channels. The formulas defined there are not converted. CAN channels with variables in the HYDROTECHNIK units table are an exception.

Select whether to enable automatic unit control.

- **AUTO**:
  The units and linearization tables of the measurement channels are converted to the base units.
- **Disabled**:
  The internal base units and linearization tables are converted to the display units.

Decimal separator Select whether the decimal separator is shown as a **comma** or **dot**.

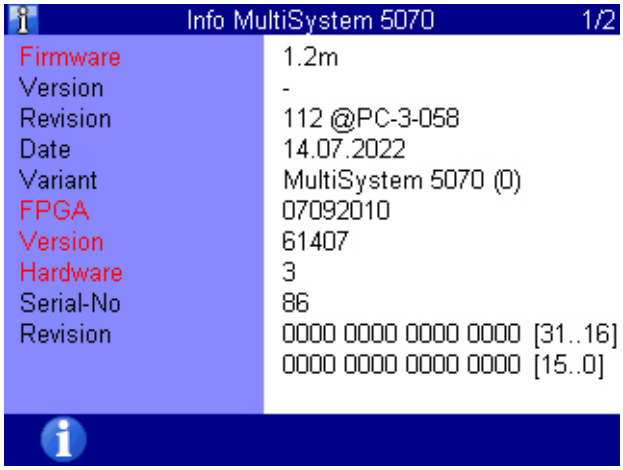
List separator Select whether the list separator is shown as a **semicolon** or **comma**.

System of units Choose from the following options:

- **Metric**: The measuring instrument uses the metric system to display measuring units (e.g. bar, °C).
- **US units**: The measuring instrument uses the US system to display measuring units (e.g. psi, °F).

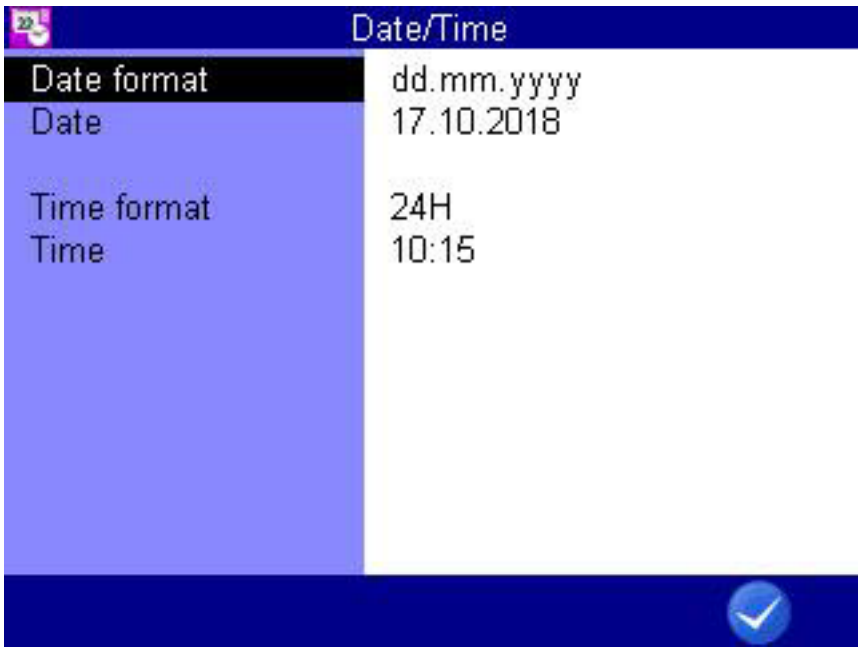
ENG

Info



When calling the HYDROTECHNIK customer service department, you should have the required instrument information ready. This can be found in the **Info** dialog.

Date/Time



OK Confirms input/saves changes.

➔ **Select date format**

1 In the **Date/Time** dialog, select the **Date format** with △▽ ENTER.

2 Use △▽ ENTER to toggle between

- **DD.MM.YYYY** (day.month.year)
- **MM/DD/YYYY** (month/day/year)
- **YYYY.MM.DD** (year.month.day)

■

ENG

➔ **Enter date**

1 In the **Date/Time** dialog, select the **Date** with △▽ ENTER.

2 Select the day with ◁▷ △▽ ENTER.

3 Open the dialog for month selection with F2.

4 Open the dialog for year selection with F3.

■

➔ **Select time format**

1 In the **Date/Time** dialog, select the **Time format** with △▽ ENTER.

2 Use △▽ ENTER to toggle between

- **12h**
- **24h**

■

➔ **Enter time**

1 In the **Date/Time** dialog, select the **Time** with △▽ ENTER.

2 Enter hour and ENTER.

3 Enter minutes and ENTER.

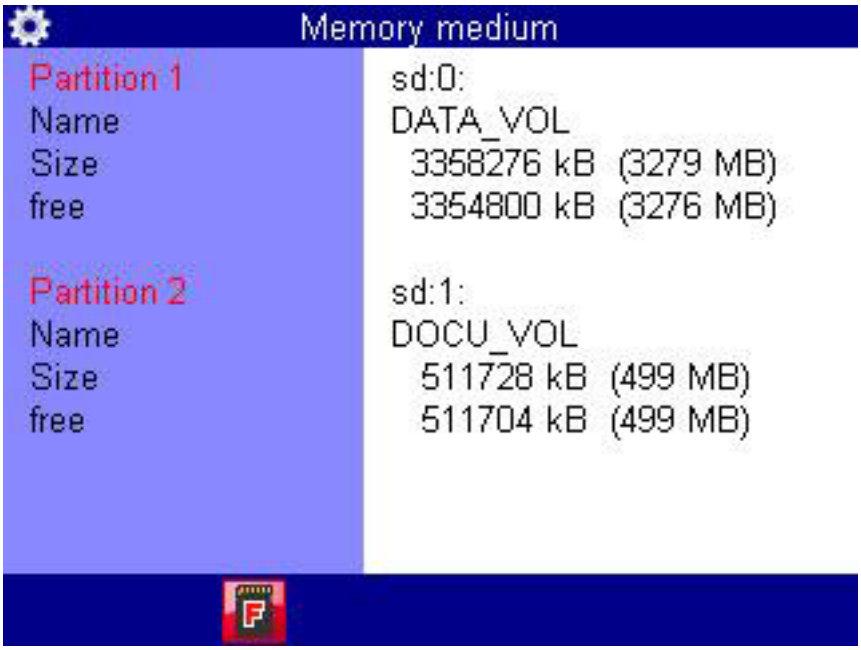
■

Save all changes and exit the dialog with F5.

Memory medium

Note

Loss of data possible
The internal data medium can be formatted in the **Memory medium** dialog.
This will delete permanently delete all contained data and cannot be undone.



F2 

FORMAT Formats Partition 1 (DATA_VOL).

In the **Memory medium** dialog, you can format the internal memory with FORMAT F2. The internal memory is divided up into two partitions.

➔ **Format SD card**

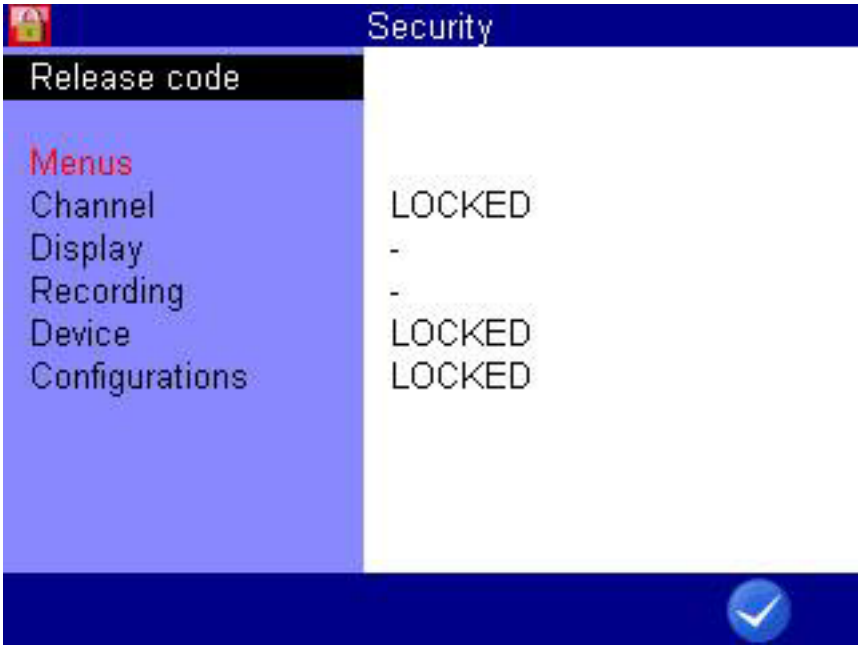
When the **Memory medium** dialog entry is open, you can press F3 to format the inserted SD card. This will delete all data contained on the card (e.g. measurement data). The formatting cannot be undone.

■

Security

ENG

➔ **Lock menus for users**



F5 

OK Confirms input/saves changes.

You can specify whether other users of the instrument can apply changes in certain menus. This allows you to ensure that certain settings are not changed.

1 Open the **Home** menu: MENU
2 Open the **Setting** menu: ◁▷ △▽ ENTER
3 Open the **Device** menu: ◁▷ △▽ ENTER
4 Open the **Security** dialog: ◁▷ △▽ ENTER
5 Open entry for release code: ENTER
6 Enter release code; observe the assignment of the function keys.
7 Confirm release code: ENTER
8 Highlight displayed menus: △▽

9 Press ENTER to toggle between:

- **–**

The settings in the menu can be changed.

- **LOCKED**

The settings in the menu are locked and cannot be changed. When trying to apply a change in a locked menu, a corresponding warning will be displayed after pressing ENTER.

10 Confirm changes and exit the dialog: F5

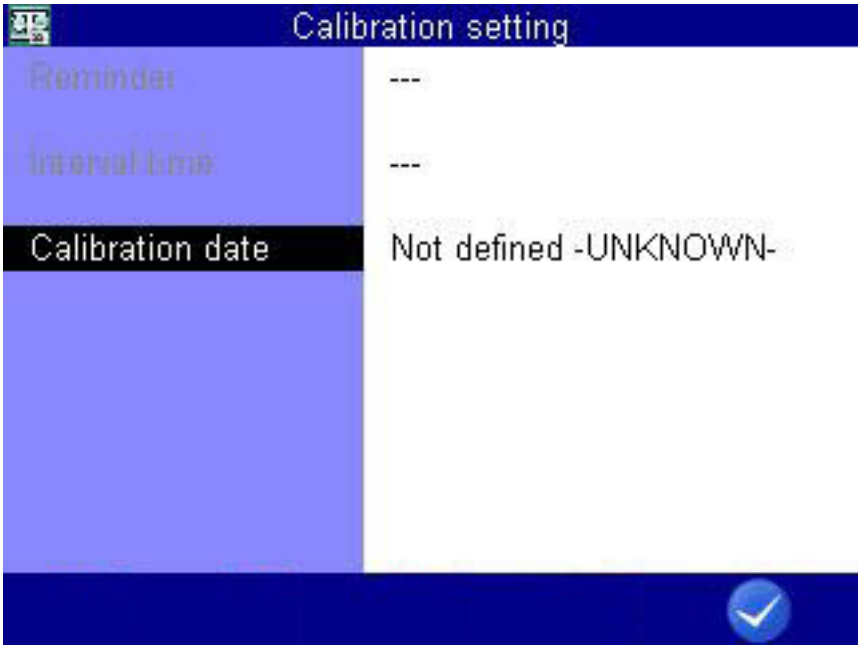
■

Note

If a release code is set in the **Security** dialog, you must enter this release code before attempting to release menus in the dialog or lock additional menus.

Resetting the instrument deletes the password in the **Security** dialog and releases all locks set on the menus.

Calibration



OK Confirms input/saves changes.

The calibration interval is the period of time after which the measuring instrument is to be re-calibrated by the manufacturer.

You can define the calibration interval.

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.

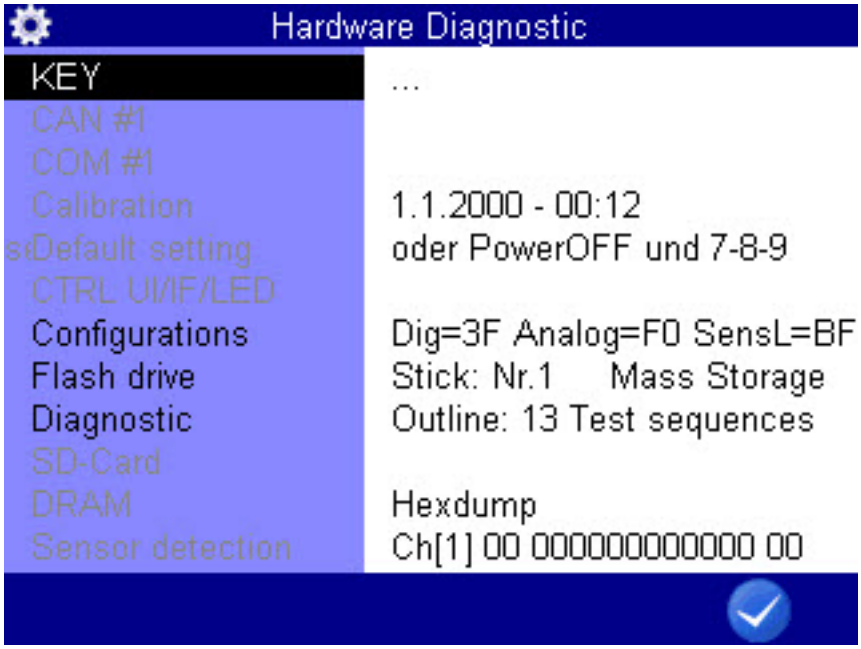
Interval time 6, 12, 18, 24, 30 or 36 months can be set as the calibration interval.

Calibrated until Displays the date up to which the calibration is valid.

Calibr. date Displays the date of the last calibration.

ENG

Hardware Diagnostic

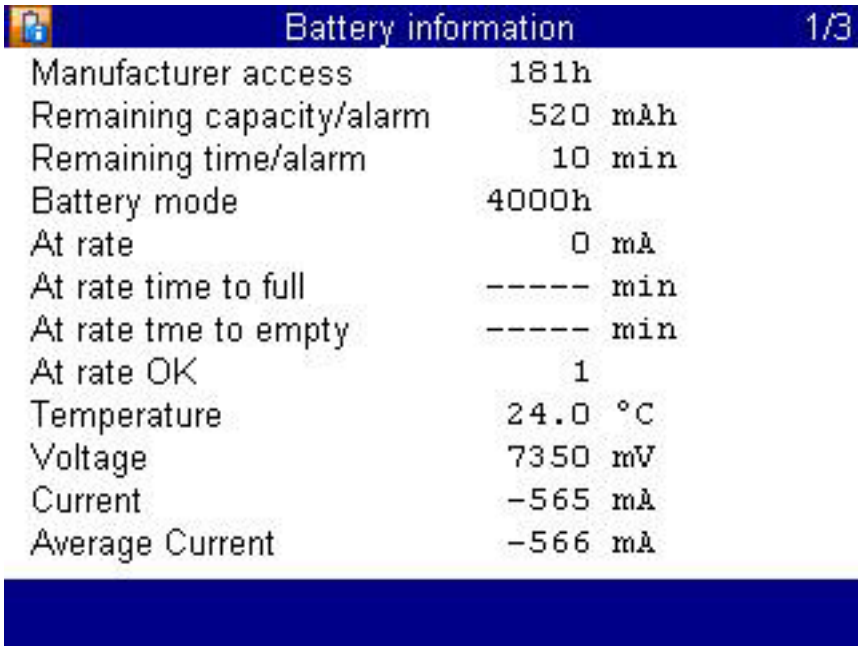


F5 

OK Confirms input/saves changes.

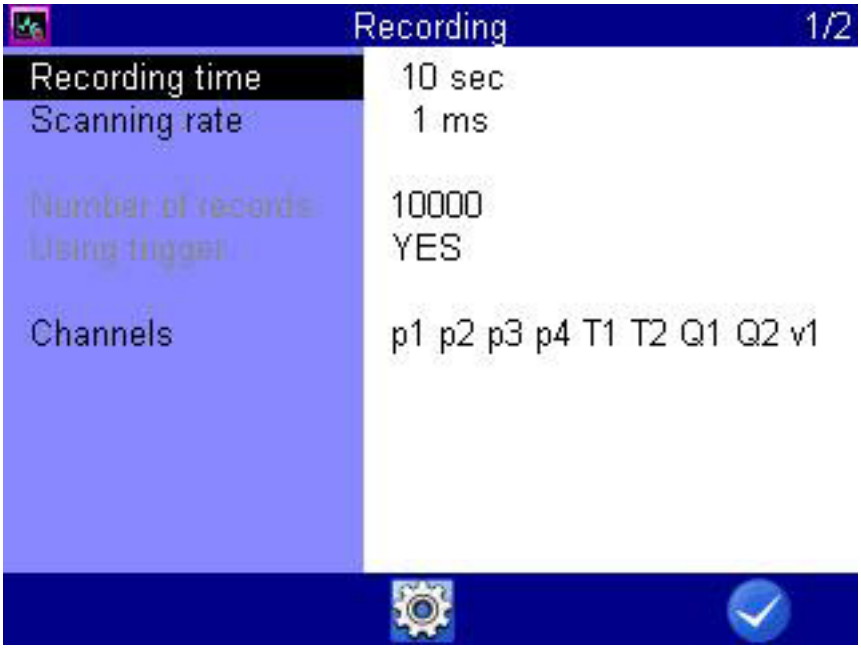
The **Hardware Diagnostic** dialog is for service and is locked with a code.

Battery information



ENG

Recording



F3 

SETUP Opens the **Setup Recording** dialog.

F5 

OK Confirms input/saves changes.

In the **Recording** dialog, you can select the channels that you would like to save in measurement series as well as the storage options.

Recording time Storing duration; ENTER enter time value ENTER – △▽ highlight time interval unit ENTER

Scanning rate Time distance between two measurements in a series; ENTER enter time value ENTER – △▽ highlight time unit ENTERChannels

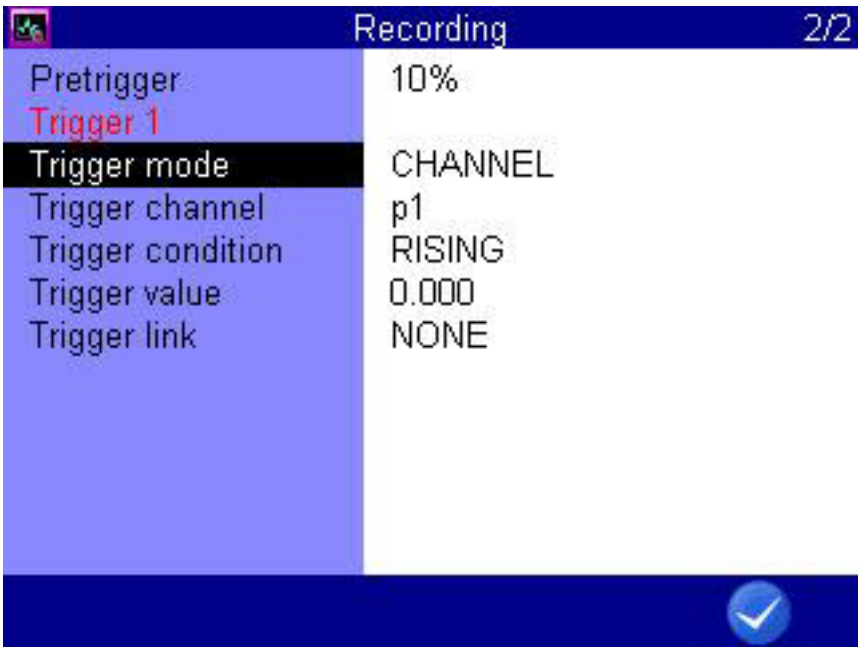
Opens the **Display (channels)** dialog. Select the channels to be stored.

All channels marked with an ☑ check mark are stored.

Select a channel and use ENTER to change highlighting.

Consider the storing capacity of the measuring instrument when setting these options. The amount of data will increase if you configure more channels, a longer recording time, and a shorter scanning time. Large amounts of data may make evaluation and estimation of measuring results more difficult.

Trigger function



F5 

OK Confirms input/saves changes.

You can use the trigger function to reduce the amount of stored data by allowing the instrument to start the storing when the “interesting moments” are coming. Here you can define up to four triggers.

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

You may define any measurement 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 four 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.

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.

Select a percent value as pretrigger – ENTER.

Trigger mode Define the trigger:

- **INACTIVE**
  The trigger is not enabled
- **CHANNEL**
  Definition of a measurement channel as trigger
- **KEY**
  Triggering at the press of a key
- **TIMER**
  Definition of a trigger time

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

1 For the **Trigger mode**, select the **CHANNEL** option.

2 Open the **Trigger condition** dialog entry and highlight the desired option. Then press ENTER.

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

3 △▽ ENTER Enter trigger value ENTER.

4 Confirm changes and exit the dialog: F5

■

➔ **Definition of a trigger time**

1 For the **Trigger mode**, select the **TIMER** option.

2 Enter the date of the trigger time – ENTER.

3 Enter the time of day of the trigger time – ENTER.

4 Confirm changes and exit the dialog: F5

■

➔ **Trigger link**

F5 

OK Confirms input/saves changes.

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

1 Select the **Trigger link** dialog entry: △▽ ENTER

2 Select an option: △▽ ENTER

- **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

3 Define **Trigger condition** and **Trigger value** for **Trigger 2**.

⇨ See **Definition of a measurement channel as trigger** on page 112.

4 Repeat steps 2 and 3 to define additional triggers.

Example of a trigger recording

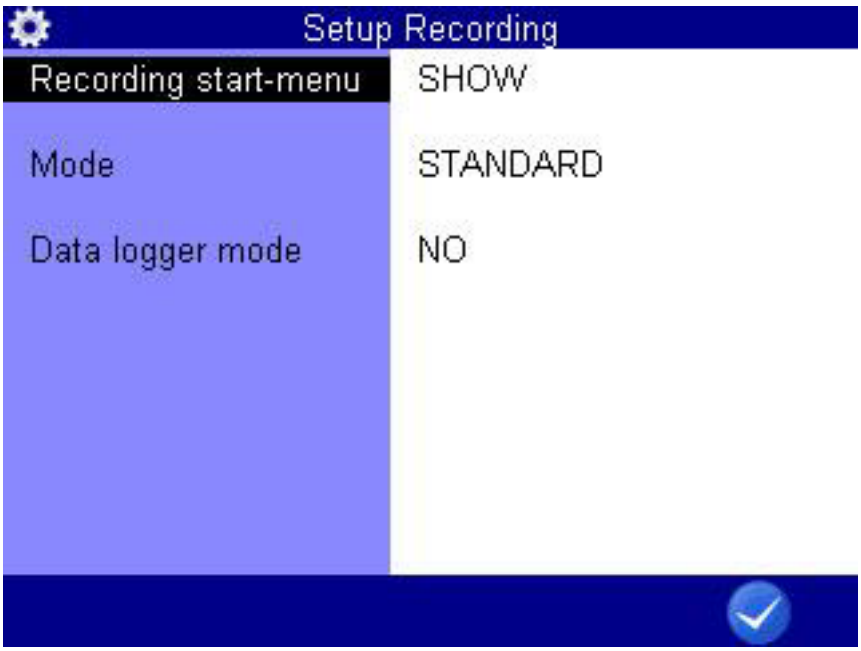
A 2-minute recording is to be started when the measured value for p2 falls below 50 bar and temperature T1 rises above 30 °C. The recording is to start 60 seconds before the trigger incident.

Required programming:

Recording time	2 min.
Trigger 1	p2
Trigger condition	FALLING
Trigger value	50.00
Pretrigger	50%
Trigger link	AND
Trigger 2	T1
Trigger condition	RISING
Trigger value	30.00

ENG

Setup Recording



F5 

OK Confirms input/saves changes.

In the **Setup Recording** dialog, you can predefine settings for the recording.

Recording start menu Select whether the **Start recording** dialog is displayed before a recording starts or whether the recording should start directly.

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

Data logger mode Enable or disable data logger mode.

When data logger mode is enabled, the measuring instrument starts the recording directly after it is switched on.

For example, you can switch the instrument via the CAN2 jack so that it is started when you switch a machine on and recording begins.

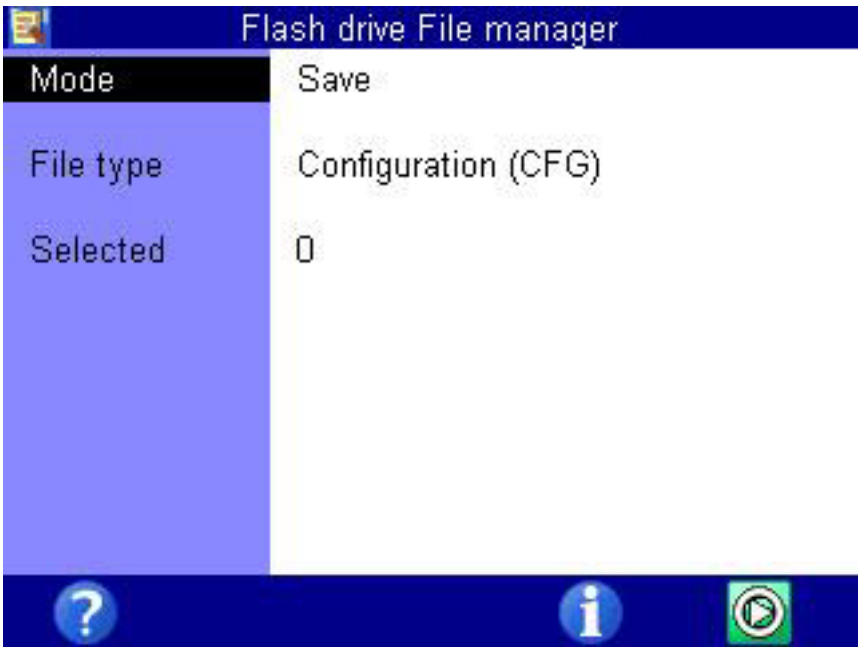
Tools


Extras
Flash drive
File manager
Special
Applications
Games

ENG

Flash drive file manager

In the **Flash drive file manager** dialog you can move files between the stick and the measuring system, as well as display information about the USB stick.



F1  Displays Help.

F4  **INFO** Displays information about the selected object.

⇨ **Display information on selected file** on page 35

F5  **START** Starts the transfer process.

The dialog cannot always be opened
The **Flash drive file manager** dialog can only be opened if a USB stick is inserted and detected.

➔ **Saving to a USB stick**

To transfer files from the measuring instrument's SD card to a USB stick, proceed as follows:

1 Open the **Home** menu: MENU
2 Open the **Tools** menu: ◁▷ △▽ ENTER
3 Open the **Flash drive file manager** dialog: ◁▷ △▽ ENTER
4 Select **Save** mode: ENTER

5 Select **File type**: △▽ ENTER △▽ ENTER
- Measurement (MWF)
- Configuration (CFG)
- Sensor database (SDB)
- CSV files (CSV)
- CAN trace file (TRC)
- Images (BMP)
- HYDROrun database (DBF)

6 Select files.

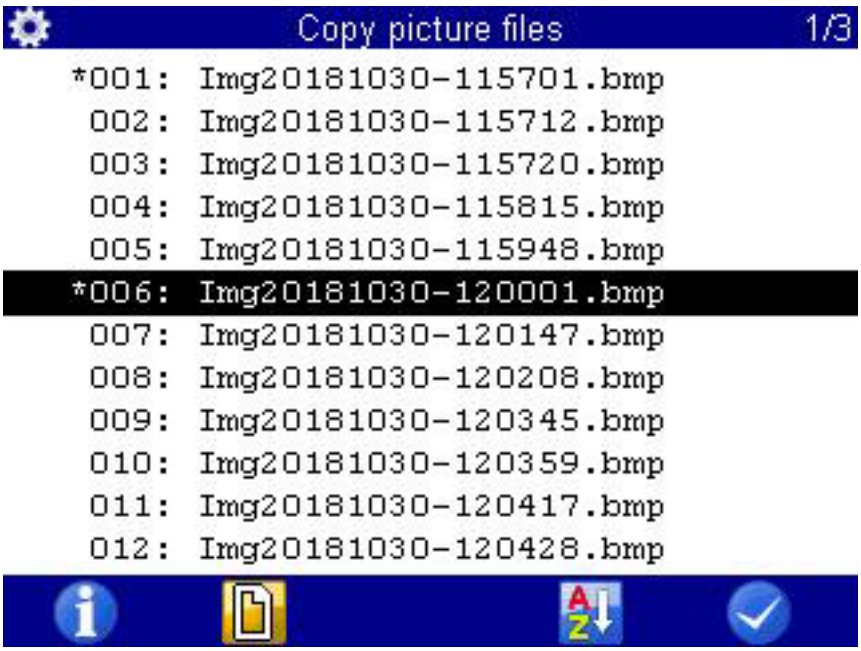
⇨ See **Select files** on page 119.

7 Start copying: **START** F5

■

ENG

➔ **Select files**



F1 

INFO Displays information about the selected object.
Displays a preview for saved screenshots.
⇨ **Display information on selected file** on page 35

F2 

FILE Only for display of measurements.
Converts the display to file name.

F2 

NAME Only for display of measurements.
Converts the display to series name.

F3 

PAGE Quick selection of a page in the dialog. This function is available where there are more than 5 pages in the dialog.

F4 

SORT Sorts the displayed list/table.

F5 

OK Confirms input/saves changes.

1 In the **Flash drive file manager** dialog, select **Selected**: △▽

2 Open file selection: ENTER

3 Select desired file(s): △▽ ENTER

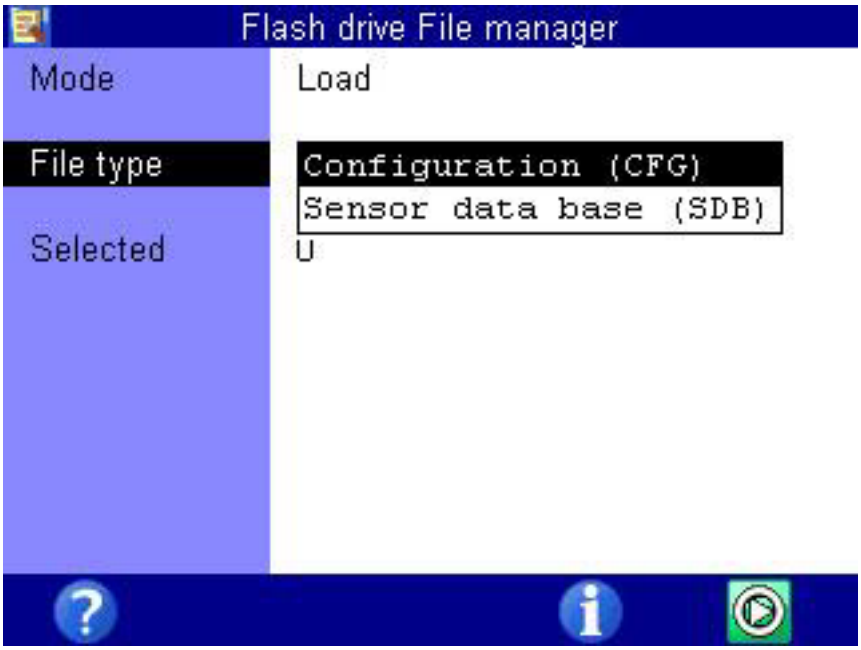
Selected files are marked with a * to the left next to the line (here the files **001** and **002**).

4 Confirm selection and exit the selection dialog: F5

■

Color coding during file selection
Individual files are color coded as follows:
- Black = default
- Blue = The file meets the filter criterion
- Red = The file is faulty (e.g. a configuration file in a legacy format or a file from another measuring instrument)

➔ **Loading files from the USB stick**



F1 — Displays Help.

INFO — Displays information about the selected object.
⇨ **Display information on selected file** on page 35

START — Starts the transfer process.

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

1 Open the **Home** menu: MENU
2 Open the **Tools** menu: ◁▷ △▽ ENTER
3 Open the **Flash drive file manager** dialog: ◁▷ △▽ ENTER
4 Select mode **Load**: ENTER
5 Select **File type**: △▽ ENTER △▽ ENTER
   - Configuration (CFG)
   - Sensor database (SDB)

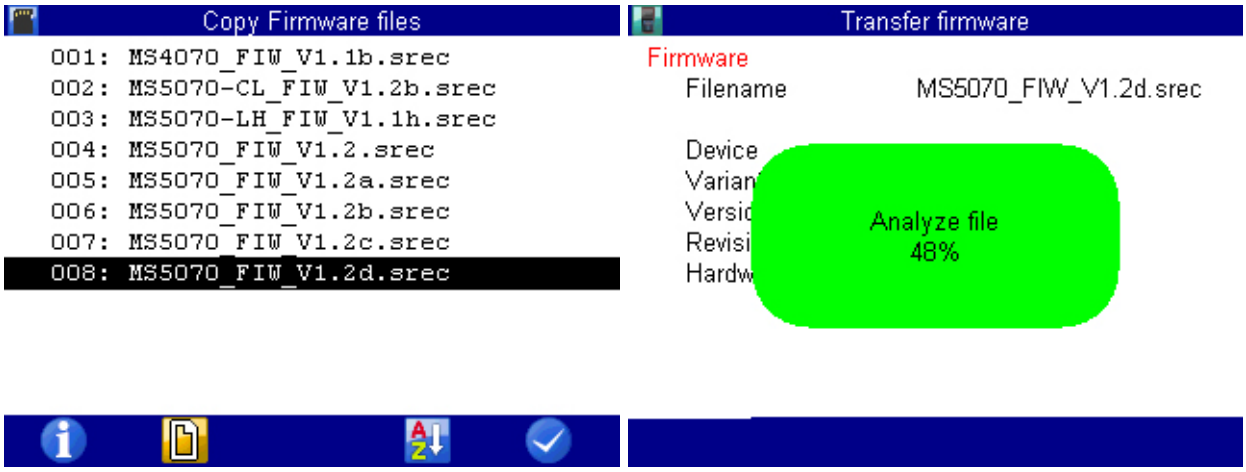
6 Select files.

⇨ See **Select files** on page 119.

7 Start copying: F5

■

➔ **Performing firmware update from USB stick**



F1	**INFO**	Displays information about the selected firmware file. The firmware file is first converted for this purpose. ⇨ **Display information on selected file** on page 35
F2	**FILE**	Only for display of measurements. Converts the display to file name.
F3	**PAGE**	Quick selection of a page in the dialog. This function is available where there are more than 5 pages in the dialog.
F4	**SORT**	Sorts the displayed list/table.
F5	**OK**	Confirms input/saves changes.

1 Open the **Home** menu: MENU

2 Open the **Tools** menu: ◁▷ △▽ ENTER

3 Open the **Flash drive file manager** dialog: ◁▷ △▽ ENTER

4 Select mode **Load**: ENTER

5 Select **File type**: Firmware file (SREG) △▽ ENTER △▽ ENTER

6 Select the firmware file.

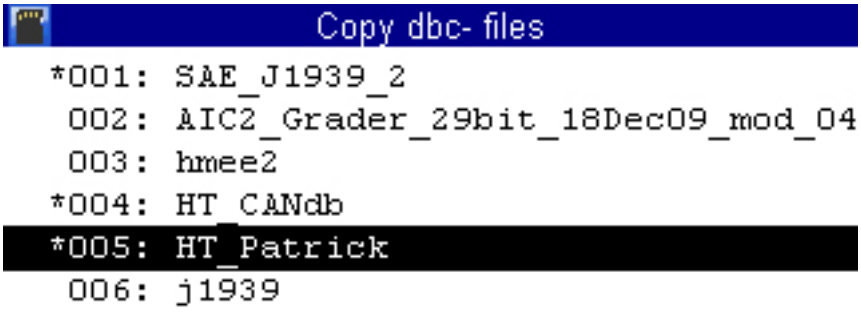
⇨ See **Select files** on page 119.

7 Start the update: F5

The firmware update's progress is displayed as a percentage. The instrument restarts once the update is complete.

■

➔ **Loading the CAN database from the USB stick**



F1 

INFO Displays information about the selected firmware file. The firmware file is first converted for this purpose.

⇨ **Display information on selected file** on page 35

F2 

FILE Only for display of measurements.

Converts the display to file name.

F3 

PAGE Quick selection of a page in the dialog. This function is available where there are more than 5 pages in the dialog.

F4 

SORT Sorts the displayed list/table.

F5 

OK Confirms input/saves changes.

1 Open the **Home** menu: MENU

2 Open the **Tools** menu: ◁▷ △▽ ENTER

3 Open the **Flash drive file manager** dialog: ◁▷ △▽ ENTER

4 Select mode **Load**: ENTER

5 Select **File type**: CAN database (dbc) △▽ ENTER △▽ ENTER

6 Select the CAN database.

⇨ See **Select files** on page 119.

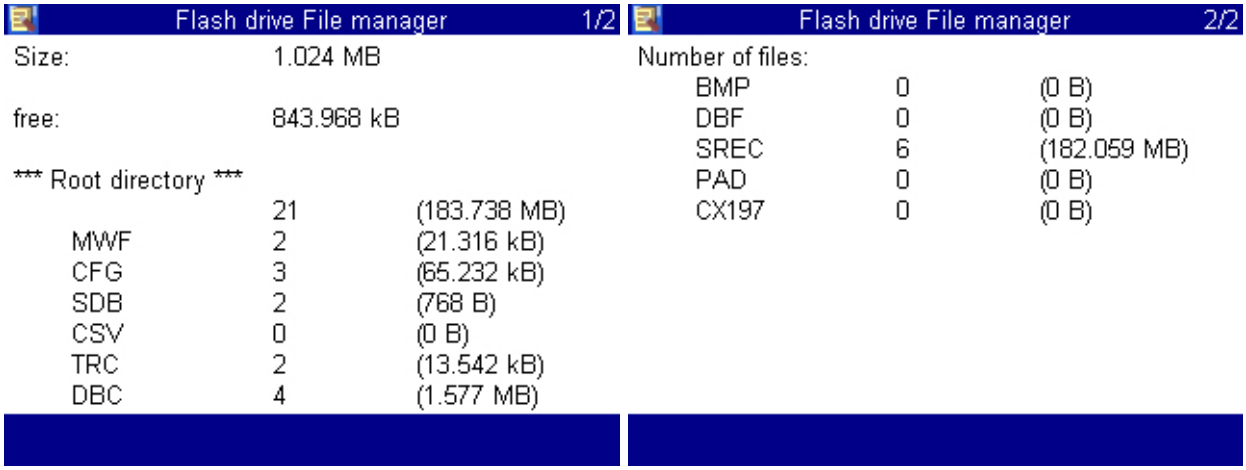
7 Start copying: F5

The CAN database is stored in the CanDB directory on the DATA-VOL partition of the internal memory.

■

ENG

➔ **Displaying info about the USB stick**

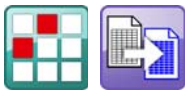


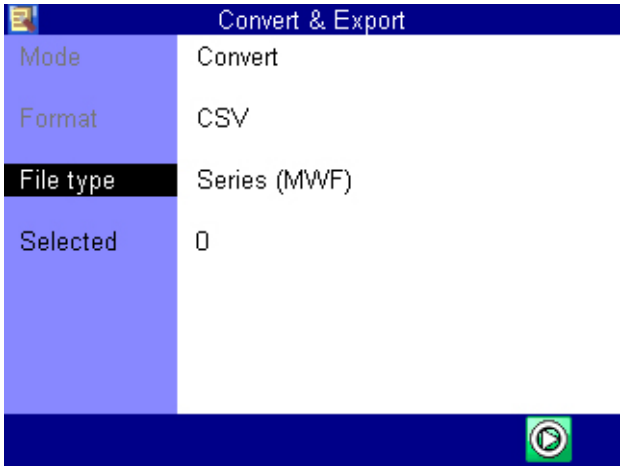
While the **Flash drive file manager** dialog is displayed, you can use F4 to display information about the inserted USB stick. The memory capacity of the USB stick is then checked. Subsequently, a screen like the one shown in the figure appears.

Here you can see the amount of the total and free memory as well as a list of the files relevant to **MultiSystem 5070** that are on the USB stick. Press ESC to exit the dialog.

Convert and Export

In the **Convert and Export** dialog, you can convert the measurement files into CSV format. The CSV files are saved to the instrument and can then be transferred to a computer or a USB stick.





F5 

START Starts converting the selected files to CSV format.

➔ **Convert measurement files into CSV format**

1 Open the **Home** menu: MENU

2 Open the **Tools** menu: ◁▷ △▽ ENTER

3 Open the **Convert and Export** dialog: ◁▷ △▽ ENTER

4 Select **File type**: ENTER △▽ ENTER

- Measurement (MWF)
- CX197 series (CX197)
- Oil diagnostics files
- History file (PHIS)
- History file (HHIS)
- History file (LHIS)
- History file (VHIS)

5 Highlight **Selected** in the **Convert and Export** dialog: △▽

6 Open file selection: ENTER

7 Select files.

⇨ See **Select files** on page 119.

8 Start converting: F5

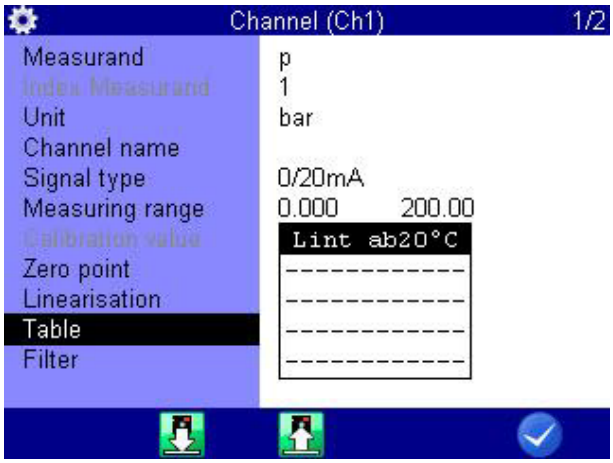
■

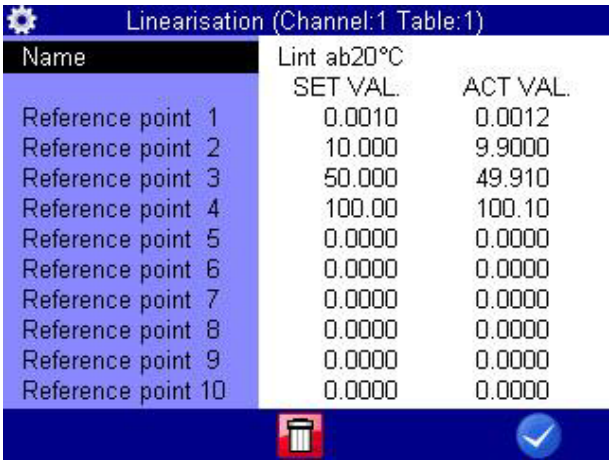
Instrument functions

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

ENG

Linearization table





F2		**LOAD**	Loads sensor parameters from the database.
F3		**SAVE**	Stores the current sensor parameters in the database.
F3		**DELETE**	Enables the delete function.
F5		**OK**	Confirms input/saves changes.

The linearization table can be utilized to compensate for sensor non-linearities. By calibrating a sensor, you will obtain this table, which can be entered into the measuring instrument. Five different linearization tables, each with ten value pairs, are available for each measurement channel.

1 Select the option **YES** at the **Linearisation** menu option. ENTER.

2 Highlight **Table**: ENTER.

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

4 Highlight the **Name** entry: ENTER.

5 Enter a name for the new table: ENTER.

6 Highlight **Reference point 1**: ENTER.

7 Enter the first set value: ENTER.

8 Enter the first actual value: ENTER.

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 changes and exit the dialog: F5

The new table is selected as active.

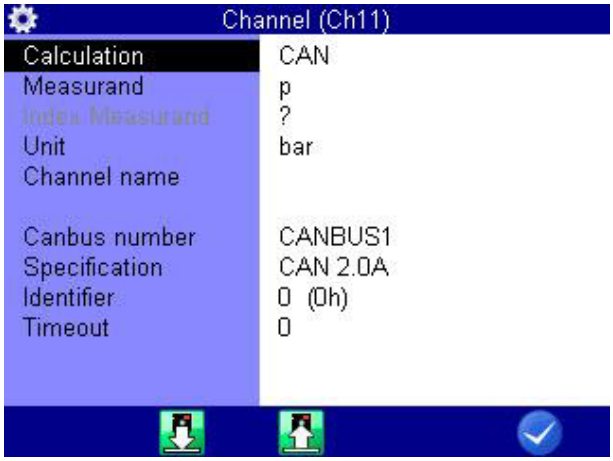
■

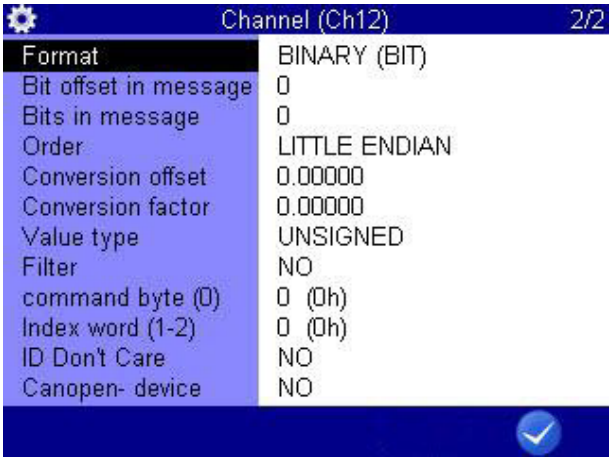
Define CAN channel

Note

The CAN bus must be activated in the Device menu to enable the use of a CAN channel. See chapter CAN configuration on page 91

ENG





F2 

LOAD Loads sensor parameters from the database.

F3 

SAVE Stores the current sensor parameters in the database.

F4 

CAN database Opens the dialog for selecting a CAN database.

⇨ **Loading the CAN database from the USB stick** on page 122

F5 

OK Confirms input/saves changes.

After you have set a calculation channel to **CAN**, you can select measurand and unit from a list or enter them freely. Then you have to define the CAN parameters. Please have the documentation of the CAN sensor available; all required information is included there.

1 Select the **Specification**: ENTER.

2 Enter the **Timeout**: ENTER.

3 Enter the **Identifier** as a decimal number or hexadecimal value.

Change the input format (decimal/hexadecimal): F3

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

4 Select the **Format**: ENTER.
Depending on the selected format, further input options are displayed.

5 Select the **Channel name**.

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

7 ENTER – store entered name.

For the use of a **MultiXtend** instrument, select MultiXtend in the **Calculation** dialog entry.

ENG

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 series. During the subsequent data evaluation with **HYDRO***com*, these data can be interpreted.

This allows the recording of so-called “multichannels”, which are channels on which the data from several sources can be transmitted together. These can be switch states (max. 32 switches on a channel), but also various sensor signals.

If you want to record CAN original data, you will only have to define the number of **Bit offset in message** (bits at the beginning of a CAN message that shall be skipped) and **Bits in message** (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.

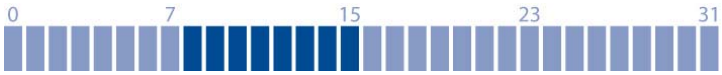
Use of multichannels

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 measurement channel of the instrument must be used for each status / status bit. Thanks to the multichannel function, all state bits can be recorded on a single channel. A separation into the individual states can be done later with **HYDRO***com*. You may also use **HYDRO***com* to combine single bits of a multichannel to one measured value. This allows to collect several measured values using one channel of the MS 5070. 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 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:

- 1st channel: Bit offset 6, data bits 2;
- 2nd channel: Bit offset 14, data bits 2;
- 3rd channel: Bit offset 24, data bits 8

Format:	ORIGINAL
Bit offset:	6
Data bits:	26

Here the measured values of a temperature sensor (bits 0 to 7) and a pressure sensor (bits 8 to 15) are received 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*.

ENG

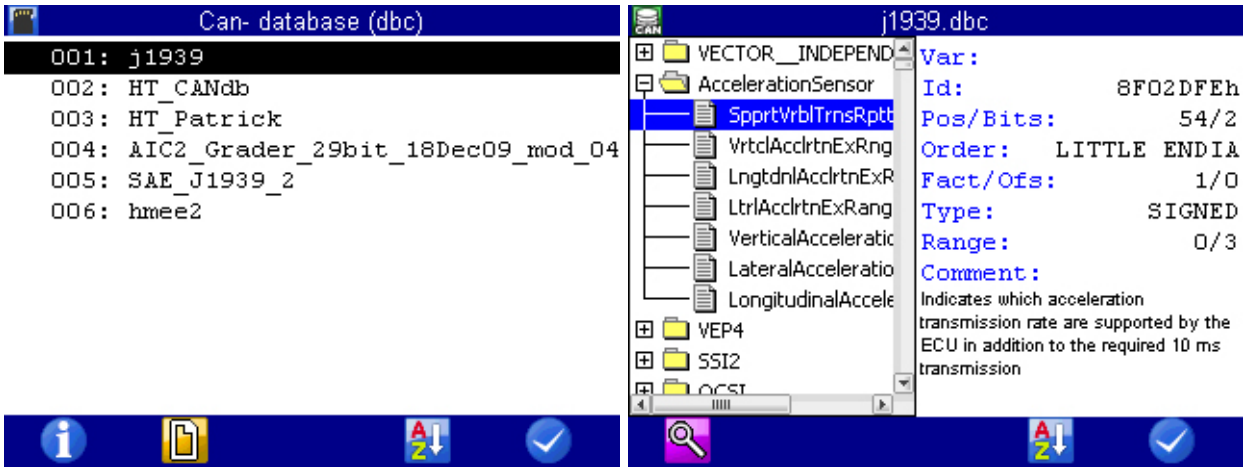
You need two special channels to display the measured values with the **MultiSystem 5070**.

- On the first one, you define the following for the temperature sensor: **Format** = **BINARY (BIT)**, bit offset = 0, data bits = 8.
- For the pressure sensor, you require a different special channel and define here: **Format** = **BINARY (BIT)**, bit offset = 8, data bits = 8.

Format:	ORIGINAL
Bit offset:	0
Data bits:	16

ENG

➔ **Using the CAN database**



F1	**INFO**	Displays information about the selected object. ⇨ **Display information on selected file** on page 35
F1	**SEARCH**	Searches for a keyword in the database. ⇨ **Searching the CAN database** on page 131
F2	**FILE**	Converts the display to file name.
F2	**NAME**	Converts the display to series name.
F4	**SORT**	Sorts the displayed list/table.
F5	**OK**	Confirms input/saves changes.

1 Select the **Calculation** dialog entry: △▽ ENTER

2 Select the **CAN** entry: △▽ ENTER

3 Open the CAN databases dialog: F4

4 Select the CAN database: △▽

5 Confirm selection: F5

The instrument analyzes the database. This can take up to 50 seconds.

The contents of the database are displayed in a tree structure.

6 Select the signals in the database: ◁▷ △▽

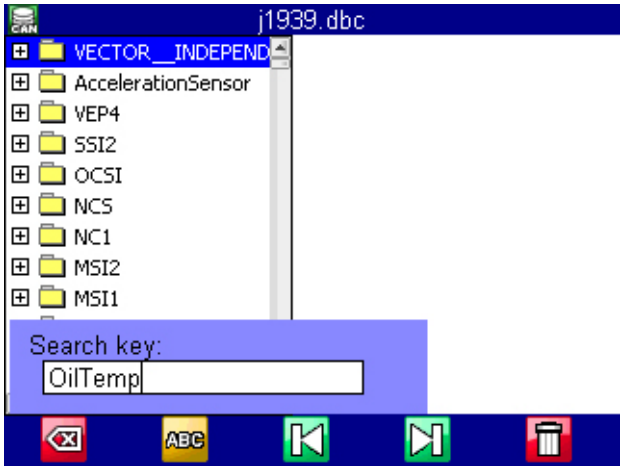
If a signal is selected, its data is displayed on the right-hand side. If a signal folder is selected, the right-hand side is empty.

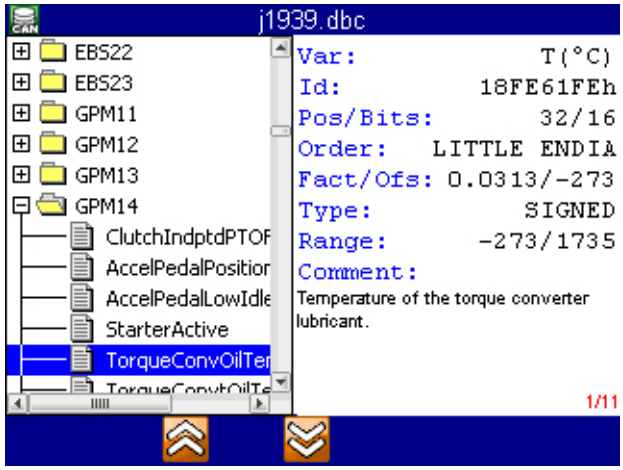
Use the ◁▷ buttons to move the tree view sideways to display the entire name of a signal.

■

ENG

➔ **Searching the CAN database**





F1		**BACKSP**	Backspace function: Deletes the character to the left of the cursor.
F2		**ABC**	Toggle function: Switches to UPPER CASE.
F3		**POS1**	Positions the cursor at the start of the entry.
F3		**>>**	Page Up
F4		**END**	Positions the cursor at the end of the entry.
F4		**<<**	Page Down

F5 

OK Enables the delete function.

Press to access the search function. The last search term used is displayed in the search field. Press ENTER to start a search. The search will only look for names of signals and signal folders. Entries in a signal comment field will not be searched.

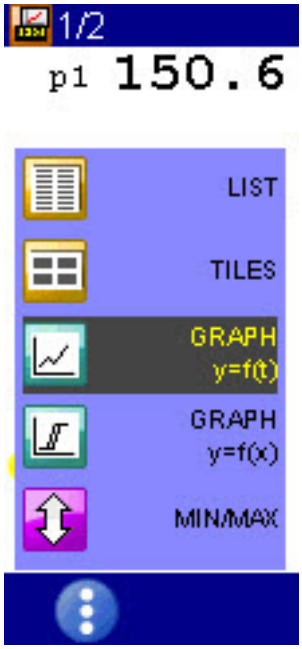
The search will display the first match found in the tree structure. In the lower right corner of the display you can see which match is currently displayed and how many matches there are. Use and to navigate to the individual matches.

Press ESC to cancel the search. Press ENTER to confirm your selection. All channel parameters are then populated.

ENG

Graphic presentation in display menu

After configuring the graphic presentation in the display menu (see Chapter **Display** on page 83) in the result display, the measured values will then look like this, for example:



F1

Change display

⇨ **Change display** on page 45

F2 =1,0

VALUE Displays the current measurement values instead of scaling.

F2

SCAL Displays scaling instead of the current measurement values.

- Channel p1 is displayed as a blue line with crosses.
- Channel p3 is displayed as a red line with rectangles.
- The current measured values are displayed beneath the graph.

Coupling of several instruments

You can couple several **MultiSystem 5070** measuring instruments and increase the number of available input channels with almost no limitations. But please be aware that the parameters scanning rate, recording time and pre-triggers must be programmed identically at all coupled measuring instruments.

ENG

You can also couple **MultiSystem 5070** instruments with **MultiSystem 5060 Plus** 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

Coupling of two instruments

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

Coupling of several instruments

Use the connection cable for external trigger TKZ 8824-D8-05.00 and couple the instruments serial or parallel:

ENG

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.

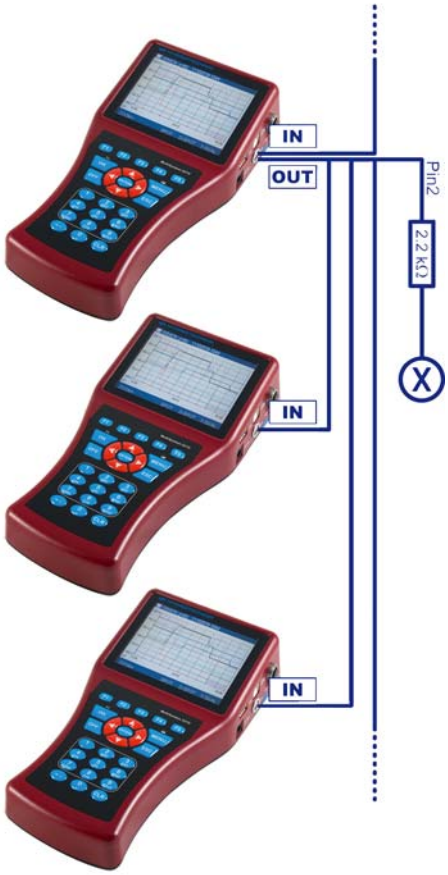
Restrictions of the serial coupling

You will see synchronization delays with the serial coupling:

- max. 0.1 ms between Master and Slave 1
- max. 0.1 ms between Slave 1 and Slave 2
- max. 0.2 ms between Master and Slave 2
- max. 0.4 ms between Master and Slave 4

ENG

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 measurement channel [X].

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 synchronization delays of max. 0.1 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).

ENG

Program instruments

Programming Master instrument

1 Program the memory channels as desired.

2 Program scanning rate, recording time and pretriggers 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).

■

Program 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 recording and the occurrence of the trigger incident to allow all instruments to store the set pretrigger; otherwise the measuring data cannot be synchronized between instruments.
  Example: the pretrigger is 10 sec (20% pretrigger at a recording time of 50 sec) and the trigger incident occurs 5 sec after the recording activation on 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 synchronization becomes impossible
- Avoid cyclic storage due to a possible triggering ahead of the desired time

Transfer and evaluate measured values

Transfer the measurement series from all instruments to a PC. Use the **Combine** function of the **HYDRO***com* software to combine the measurement series.

Programming and recording with HYDROlink
You can simplify the coupling of instruments by using the **HYDRO***link* software.
- This PC software programs the master instrument and the slave instruments automatically.
- During the recording, only an MWF file is created, which contains the storage channels of all participating instruments.

ENG

Connecting MultiXtend A and T

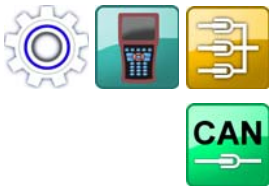
You can use the MultiXtend A and T instruments to connect additional analog sensors or thermocouples to the **MultiSystem 5070**. Their signals are digitalized by MultiXtend and transmitted to the CAN input of the measuring instrument. The presentation, recording and evaluation of the measuring data is then done on the instrument.

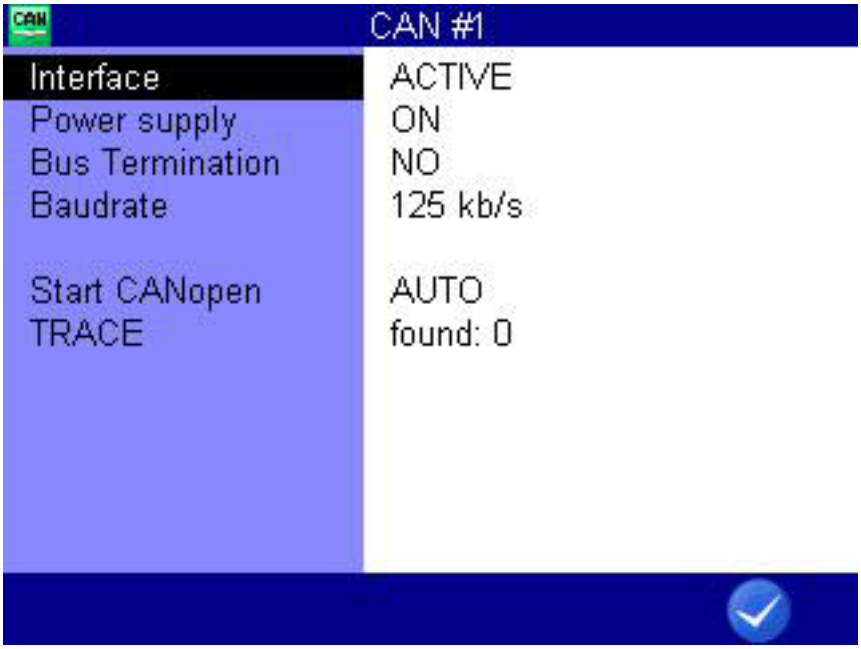
The following steps are required to use the MS 5070:

- Enable CAN bus
- Program CAN channels
- Activate MultiXtend power supply
- Start MultiXtend

ENG

Enable CAN bus





OK Confirms input/saves changes.

You will have to enable the CAN bus in the **CAN #1** or **CAN #2** dialog first.

Note

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

1 Open the **Home** menu: MENU

2 Open the **Setting** menu: ◁▷ △▽ ENTER

3 Open the **Device** menu: ◁▷ △▽ ENTER

1 Open the **Connections** menu: ◁▷ △▽ ENTER

2 Open the **CAN #1** or **CAN #2** dialog: ◁▷ △▽ ENTER

3 Select **Interface**: △▽

4 Set function to **ACTIVE**: ENTER

5 Toggle to input the **Baud rate**: △▽ ENTER

6 Select desired baud rate: △▽ ENTER

7 Confirm changes and exit the dialog: F5

■

Program CAN channels

Observe the information in chapter **Define CAN channel** on page 127.

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 special channels on the **MultiSystem 5070**, for example, channels 13 to 15.

In the **Calculation** field, select *MultiXtend* for each channel.

Activate MultiXtend power supply

MultiXtend can either be supplied by its own power pack, or by the MS 5070 (CAN1 jack). If the instrument shall supply the required power, this function must be activated:

1 Open the **Home** menu: MENU

2 Open the **Setting** menu: ◁▷ △▽ ENTER

3 Open the **Device** menu: ◁▷ △▽ ENTER

4 Open the **Connections** menu: ◁▷ △▽ ENTER

5 Open the **CAN #1** dialog: ◁▷ △▽ ENTER

6 Select **Power supply**: △▽

7 Set to **ON**: ENTER

8 Confirm changes and exit the dialog: F5

■

Start MultiXtend

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

Note

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

ENG

1 Open the **Home** menu: MENU

2 Open the **Setting** menu: ◁ ▷ △ ▽ ENTER

3 Open the **Device** menu: ◁ ▷ △ ▽ ENTER

4 Open the **Connections** menu: ◁ ▷ △ ▽ ENTER

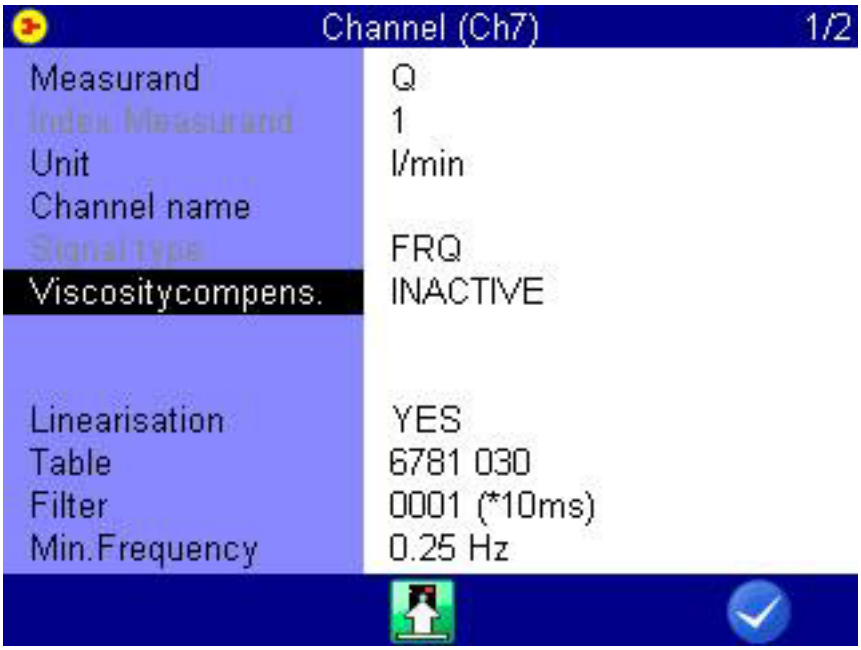
5 Open the **CAN #1** dialog: ◁ ▷ △ ▽ ENTER

6 Select **Start CANopen**: △ ▽

7 Start MultiXtend: F3

■

Viscosity-compensated volume flow rate measurement



F3 

SAVE Stores the current sensor parameters in the database.

F5 

OK Confirms input/saves changes.

The oil viscosity depends on its temperature. To account for these variations during the measurement of the volume flow, the following channels must be correspondingly programmed:

- One measurement channel for temperature (if the viscosity of the oil is not known)
- One measurement channel for the viscosity-compensated volume flow rate measurement
- If the viscosity is to be displayed/saved, a virtual channel for the calculation of the viscosity

Sensor For the viscosity-compensated measurement of the volume flow, you will require a suitable turbine volume flow sensor with ISDS function (example: **HySense QT 600**). Use the integrated test point for the temperature measurement.

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

ENG

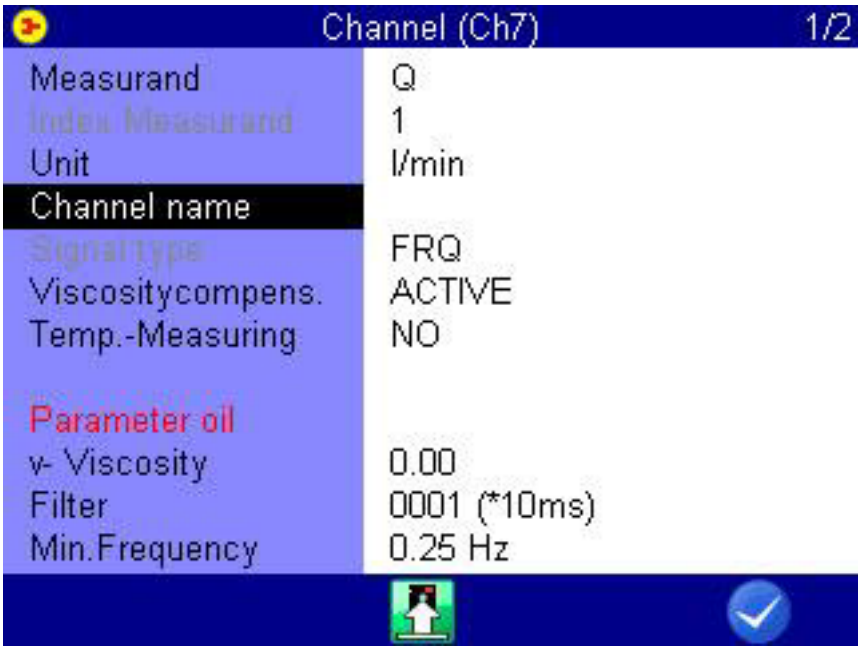
Temperature measurement

Program one measurement channel for temperature measurement. You can find additional information under Chapter **Configure measurement channels (Ch1 ... Ch8)** on page 71.

Volume flow rate measurement

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

Further options will be displayed:



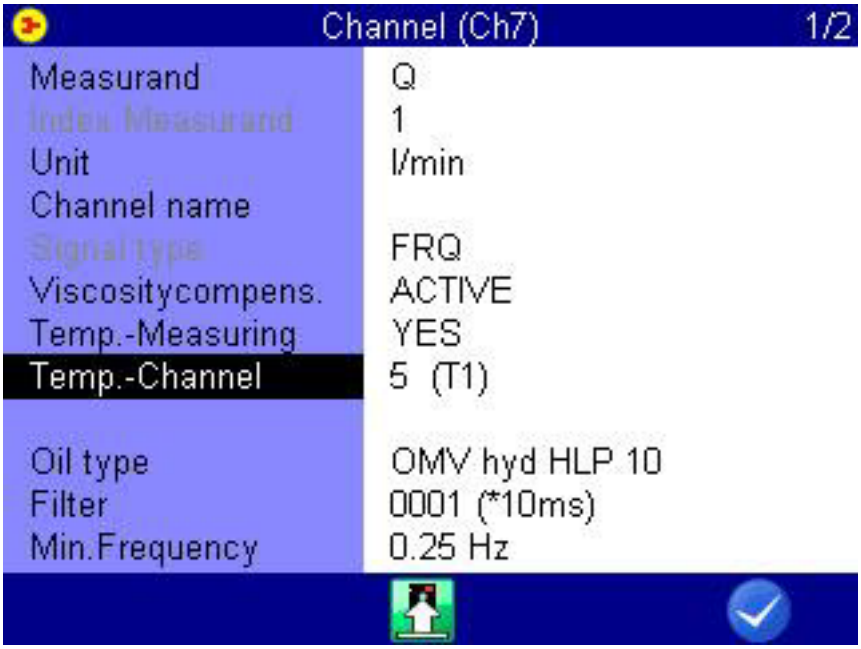
F3  **SAVE** Stores the current sensor parameters in the database.

F5  **OK** Confirms input/saves changes.

ENG

You can enable/disable temperature measurement 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. meas.** and press ENTER to switch it on.

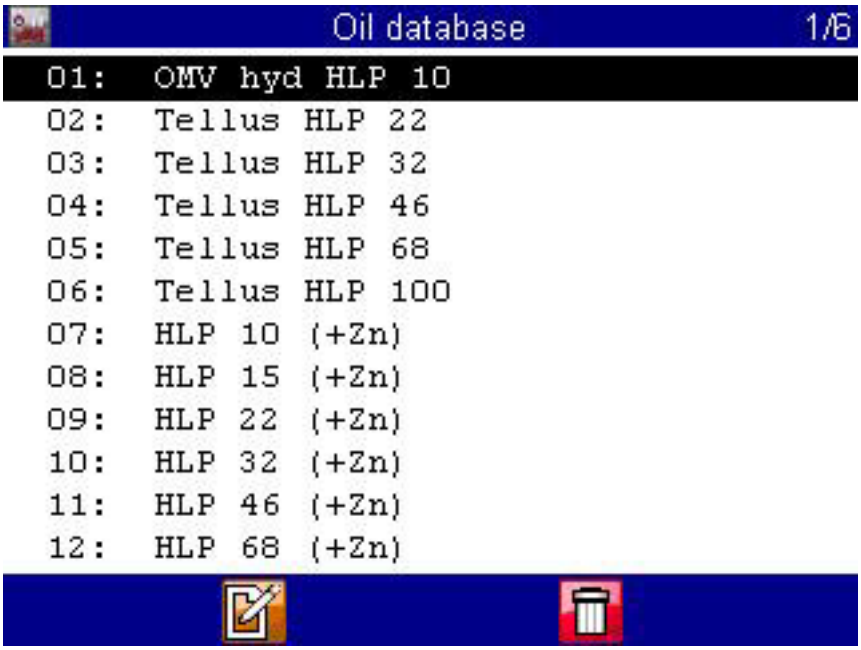


Highlight the next line, press ENTER and select the measurement channel, where the oil temperature is measured.

Then highlight the item **Oil parameter** and press ENTER to select or program the oil being used.

ENG

Selection of the oil in use



F2 

EDIT Edits the current entry.

F4 

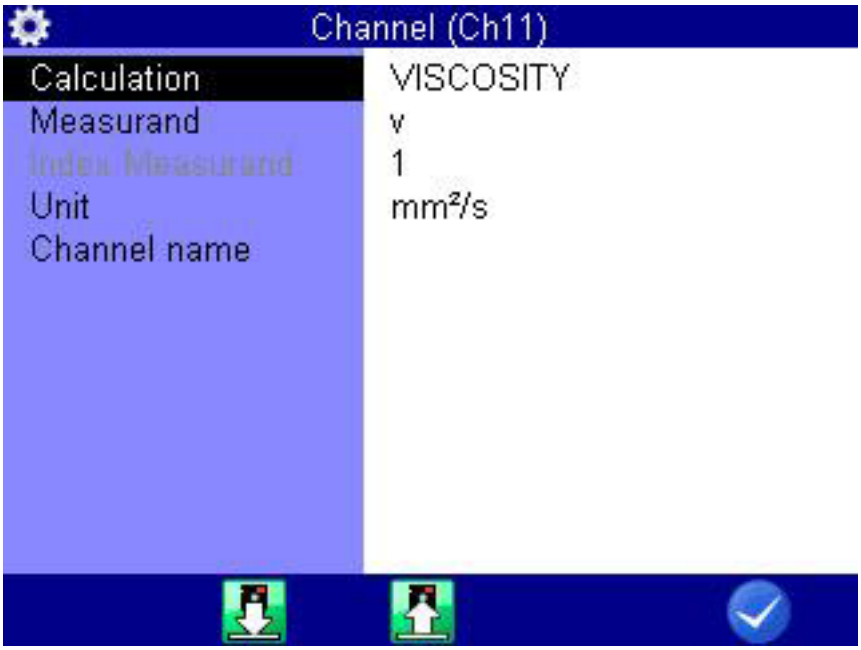
DELETE Enables the delete function.

The database already contains several types of oil. Highlight the item **Name**, press ENTER 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



F2 

LOAD Loads sensor parameters from the database.

F3 

SAVE Stores the current sensor parameters in the database.

F5 

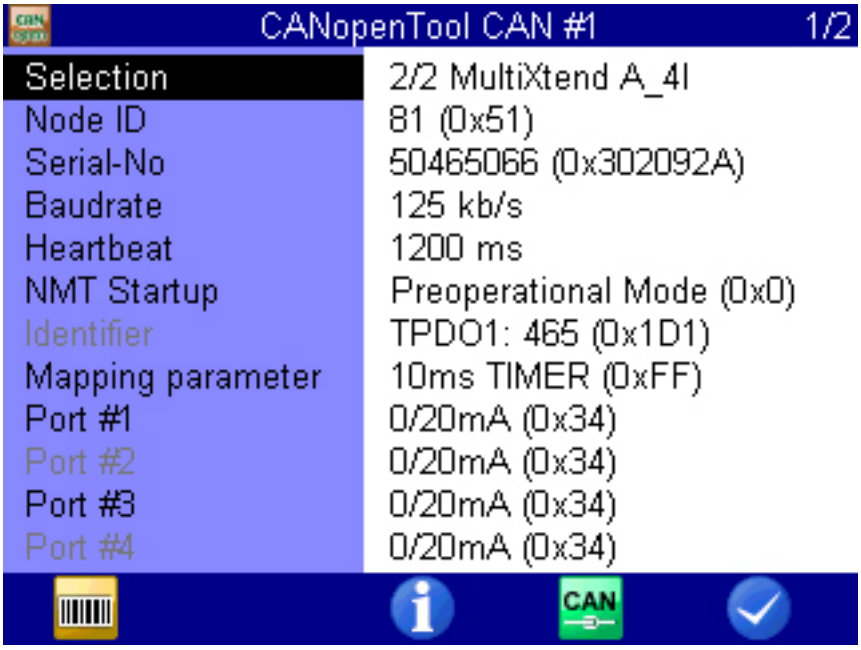
OK Confirms input/saves changes.

If desired, you can program a virtual channel (see Chapter **Configure special channels (Ch11 ... Ch42)** on page 75) 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.

ENG

Reprogram CAN parameters



ENG

F1		**SCAN**	Scans the CAN bus for messages.
F3		**INFO**	Displays information about the selected object. ⇨ **Display information on selected file** on page 35
F4		**Port**	Selects the CAN input.
F5		**OK**	Confirms input/saves changes.

You can use the **CANopen tool** to reprogram the most commonly used CAN parameters provided by a CANopen instrument such as node ID or sending rate.
The specific parameters and total number of parameters that are displayed in the dialog depend on the scope of performance of each CANopen instrument.

➔ **Find connected CANopen instruments**

1 Open the **Home** menu: MENU
2 Open the **Tools** menu: ◁▷ △▽ ENTER
3 Open the **CANopen Tool** menu: ◁▷ △▽ ENTER
4 Select the CAN input: F4

5 Scan CAN bus 1 for CANopen instruments: F1

■

Selection Select one of the node IDs of the CANopen instruments. “No CANopen device” means that a scan has not yet been performed.

Node ID Here you can see the current node IDs of the selected CANopen instrument. Possible node IDs are from 1 to 127. The node IDs are listed as decimal and hexadecimal numbers.

Serial number Displays the serial number of the CANopen instrument as decimal and hexadecimal numbers.

Baud rate You can change the current baud rate setting but only if no more than one CANopen instrument is found.

Heartbeat The CANopen instrument can transmit a heartbeat if required. You can activate the heartbeat by setting a time for cyclical transmission of the heartbeat. Or you can deactivate the heartbeat by setting the time to “0”. The time is displayed in milliseconds.

NMT Startup You can use NMT Startup to specify the behavior of the CANopen instrument when it is switched on provided that an NMT Startup has been stored.

- **8**: Operational Mode
  The CANopen instrument sends the measurement values immediately after it is switched on using “Power ON”.
- **0**: Preoperational Mode
  The CANopen instrument waits for the “Start node” command.

Identifier Displays the identifier, on which the measurement value for TPDO1 is sent.

Mapping Parameter (TPDO1)

TIMER

Use this to edit the cyclic sending rate. The sending rate is displayed in milliseconds.

SYNC

Reprogramming the setting to “SYNC” is not supported.
You can reprogram a sensor currently set to “SYNC” to the “TIMER” setting.

Input signal port You can configure the four input ports when a MultiXtend 4UI is deployed. Choose between:

- **0-20 mA**
- **4-20 mA**

Gate Time #1-4 You can configure the four gate times for frequency measurements when a MultiXtend 4 F is deployed.

Mapping Parameter (TPDO2) (See “Mapping Parameter (TPDO1)”)

COB ID storage

Various multiboxes can be preset to a specific node ID via a DIP switch. You can edit this setting with COB ID storage. The associated CANObject 0x201A is described in the documentation for the relevant CANopen instrument. Choose between:

- **Firmware**

  The TPDO address is not defined by the DIP switch but it can be reprogrammed via the node ID.
  This setting retains the heartbeat on the DIP switch's node ID.
- **DIP**

  The TPDO address is defined by the DIP switch.
- **Firmware+DIP**

  The TPDO address is not defined by the DIP switch/firmware combination.

It may not be possible to adjust individual parameters on all CANopen instruments. If this is the case, the error message "Function not supported" or "Product code not supported" will be displayed.

Icon reference

The operating software uses icons.

ENG

Favorites

You can assign the following icons as favorites in the **Home** menu or as soft-keys in the result display.

	**Favorite**	⇨ **Favorites** on page 25
	**Overview series**	**Saved measurements** > **Series overview** ⇨ **Series overview** on page 52
	**Show series**	**Saved measurements** > **Show series** ⇨ **Show series** on page 53
	**Delete series**	**Saved measurements** > **Delete series** ⇨ **Delete measuring data** on page 34 ⇨ **Delete series** on page 66
	**Search series**	**Saved measurements** > **Search series** ⇨ **Search series** on page 67
	**Overview configuration**	**Configurations** > **Configuration overview** ⇨ **Configurations** on page 49
	**Save configuration**	**Configurations** > **Save configuration** ⇨ **Save a new configuration** on page 49
	**Load configuration**	**Configurations** > **Load configuration** ⇨ **Load a saved configuration** on page 50
	**Delete configurations**	**Configurations** > **Delete configurations** ⇨ **Delete a saved configuration** on page 50
	**Oil condition**	**Special applications** > **Oil condition** ⇨ **Special applications** on page 161

ENG

	**Load valve**	**Special applications** > **Load valve** ⇨ **Special applications** on page 161
	**Patrick**	**Special applications** > **Patrick** ⇨ **Special applications** on page 161
	**Measuring section CX197**	**Special applications** > **Meas. section CX197** ⇨ **Special applications** on page 161
	**Test sequences**	**Special applications** > **Test sequences** ⇨ **Special applications** on page 161
	**Channels**	**Settings** > **Channels** ⇨ **Enter sensor parameters** on page 31 ⇨ **Channels** on page 70
	**Display**	**Settings** > **Display** ⇨ **Display** on page 83
	**Start recording**	**Start recording** ⇨ **Start recording** on page 43
	**Device**	**Settings** > **Device** ⇨ **Device** on page 89
	**All channels**	**Settings** > **Channels** > **All channels** ⇨ **Enter sensor parameters** on page 31 ⇨ **Channels** on page 70
	**Analog channels**	**Settings** > **Channels** > **Analog channels** ⇨ **Configure measurement channels (Ch1 ... Ch8)** on page 71
	**Frequency channels**	**Settings** > **Channels** > **Frequency channels** ⇨ **Configure measurement channels (Ch1 ... Ch8)** on page 71
	**Digital channels**	**Settings** > **Channels** > **Digital channels** ⇨ **Configure digital signal input (Ch9)** on page 73 ⇨ **Configure digital signal output (Ch10)** on page 73
	**Calculation channels**	**Settings** > **Channels** > **Calculation channels** ⇨ **Configure special channels (Ch11 ... Ch42)** on page 75 ⇨ **Possible assignments of the special channels** on page 76 ⇨ **Calculations with formulas** on page 78
	**CAN channels**	**Settings** > **Channels** > **CAN channels** ⇨ **CAN configuration** on page 91

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	**Channel extension**	**Settings** > **Channels** > **Channel extension** ⇨ **Channel extension** on page 81
	**Date/Time**	**Settings** > **Device** > **Date/Time** ⇨ **Set date and time** on page 30 ⇨ **Date/Time** on page 103
	**User profile**	**Settings** > **Device** > **General Settings** ⇨ **Select operating language** on page 28 ⇨ **General Settings** on page 98
	**Info**	**Settings** > **Device** > **Info** ⇨ **Info** on page 103
	**Connections/port**	• **Settings** > **Device** > **Connections** ⇨ **Connections** on page 90 • Opens selection dialog for CAN connection
	**Memory medium**	**Settings** > **Device** > **Memory medium** ⇨ **Memory medium** on page 105
	**Security**	**Settings** > **Device** > **Security** ⇨ **Security** on page 106
	**Calibration**	**Settings** > **Device** > **Calibration** ⇨ **Calibration** on page 107
	**Hardware Diagnostic**	**Settings** > **Device** > **Hardware Diagnostic** ⇨ **Hardware Diagnostic** on page 108
	**CAN #1**	**Settings** > **Device** > **Connections** > **CAN #1** ⇨ **CAN #1 and CAN #2** on page 91
	**CAN #2**	**Settings** > **Device** > **Connections** > **CAN #2** ⇨ **CAN #1 and CAN #2** on page 91
	**USB (DEVICE)**	**Settings** > **Device** > **Connections** > **USB (DEVICE)** ⇨ **USB (DEVICE)** on page 95
	**LAN/WLAN**	**Settings** > **Device** > **Connections** > **LAN/WLAN** ⇨ **LAN/WLAN** on page 96
	**Bluetooth**	**Settings** > **Device** > **Connections** > **Bluetooth** ⇨ **Bluetooth** on page 97

	**COM #1**	**Settings** > **Device** > **Connections** > **COM #1** ⇨ **COM #1** on page 94
	**Flash drive file manager**	**Tools** > **Flash drive file manager** ⇨ **Flash drive file manager** on page 117
	**Convert and Export**	**Tools** > **Convert and Export** ⇨ **Convert and Export** on page 124
	**CANopen Tool**	**Tools** > **CANopen Tool** ⇨ **Reprogram CAN parameters** on page 147
	**HOLD**	Only permissible as softkey. “Freezes” the result display.

ENG

Softkeys: Symbols/text

In the **User profile** dialog, select whether softkeys are displayed in the dialogs as symbols or text.

⇨ See **User-defined softkeys** on page 26.

ENG

 **DETAIL**	Presentation type “Table”: Zooms into the table.
 **RESET**	Presentation type “Table”: Zooms out of the table.
 **ZOOM+**	Presentation type “Graph”: Activates the zoom function.
 **ZOOM-**	Presentation type “Graph”: Zooms out of the graphic.
 **POS**	Presentation type “Graph”: Positions the zoom section.
 **SIZE**	Presentation type “Graph”: Changes the zoom section.
 **SPOT**	Presentation type “Graph”: Enables the spot function.
 **D-SPOT**	Presentation type “Graph”: Enables the delta-spot function.
 **Y-SCAL**	Presentation type “Graph”: Toggles the channel for which the scaling is displayed at the y-axis. For measurement series with two or more channels only.
 **INCREMENT**	Move factors in presentation type “Graph”: Changes the step width in the spot and delta-spot functions.
 **ESC**	Escape function: Exits the dialog without saving.
 **BACKSP**	Backspace function: Deletes the character to the left of the cursor.

ENG

	**ABC**	Toggle function: Switches to UPPER CASE.
	**abc**	Toggle function: Switches to lower case.
	**POS1**	Positions the cursor at the start of the entry.
	**END**	Positions the cursor at the end of the entry.
	**LEFT**	Switches to next column to the left.
	**RIGHT**	Switches to next column to the right.
	**DELETE**	Enables the delete function.
	**NO**	Cancel: Declines confirmation.
	**YES**	Confirms the action.
	**START**	Starts action, e.g. scanning of CAN communication.
	**YEAR**	Opens the selection dialog for the current year.
	**MONTH**	Opens the selection dialog for the current month.
	**DEC**	Converts to decimal numbers.
	**HEX**	Converts to hexadecimal numbers.

ENG

	**ALL**	Selects all entries. Removes all selections.
	**COL/SYM**	Opens the **Display (Symbols/colors)** dialog.
	**NOTE**	Adds a note.
	**FORMAT**	Formats the selected volume.
	**FILE**	Converts the display to file name.
	**NAME**	Converts the display to series name.
	**SORT**	Sorts the displayed list/table.
	**>>**	Page up
	**<<**	Page down
	**SCAL**	Result display, Graphic presentation: Displays scaling instead of the current measurement values.
	**VALUE**	Result display, Graphic presentation: Displays the current measurement values instead of scaling.
	**OK**	Confirms input/saves changes.
	**INFO**	Displays information about the selected object. Displays a preview for saved screenshots. ⇨ **Display information on selected file** on page 35
	**DISPLAY**	Displays the selected measurement.

ENG

	**SETUP/Setting**	• Opens the **Setup Recording** dialog. • Opens the dialog for setting the highlighted channel.
	**SEARCH**	Starts the search.
	**RESET**	Resets the search result.
	**LOAD**	Loads data, e.g. sensor parameters.
	**SAVE**	Saves data, e.g. sensor parameters.
	**SELECT**	Opens the editing function.
	**DETAIL**	See special applications.
	**EDIT**	Edits the current function.
	**FILTER**	Opens the **Overview Filter** dialog.
	**SCAN**	Scans the CAN bus for messages.
	**DAY**	Opens the selection dialog for the current day.
	**CREATE**	Creates elements for demonstrations. Creates, for example, demo test sequences, oil diagnostics files, and generates channel extension boxes.

Cleaning and maintenance

Cleaning

ENG

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 instrument.

Caution

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

- If the casing becomes dirty, wipe it with a soft, slightly damp cloth.
- Any stubborn dirt can be removed with a mild household cleaning product.

Shipping the measuring instrument

The instrument is equipped with internal lithium ion batteries.

The battery was tested according to the test requirements of the UN manual *Tests and criteria, Part 3, Subsection 38.3*. The battery is categorized in class 9 of hazardous materials, however eased transport according to Special Regulation 188 (ADR, RID, ADN, IMDG) and Packaging Instruction 965/968, Part 2 and Part 1B (IATA) apply.

When shipping the measuring instrument, you must comply with the hazardous goods transport regulations applicable for your country. You can also send the measuring instrument without the battery.

Maintenance

This instrument is maintenance-free. However, it is still essential to have it re-calibrated regularly. If the instrument is in frequent use, we recommend recalibrating it every 2 years.

HYDROTECHNIK maintains a high-performance calibration laboratory. Please contact us:

HYDROTECHNIK GmbH

Holzheimer Strasse 94
D-65549 Limburg an der Lahn

Tel.: +49 6431 4004 555

E-mail: service@hydrotechnik.com
Website: www.hydrotechnik.com

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 instrument, please also attach the following information:

- Company, department, contact person
- Address, telephone and fax number, email address
- Faulty part (instrument, sensor, cable, power pack)
- PC used (CPU, operating system, RAM, HDD)
- Software version used (**HYDRO***com* or **HYDRO***link*)
- Description of fault (please leave the settings on your instrument exactly as they appeared at the time of the fault/error; please briefly describe the use of the instrument, the connection of the sensors, the instrument set-up such as recording parameters, triggers, how many measurements were recorded, 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 555

E-mail: service@hydrotechnik.com
Website: www.hydrotechnik.com

Special applications

This submenu contains several functions which enhance the functionality of the MS 5070 or which are required for the operation of external devices.

There is a detailed description of the menus in a separate document.

ENG

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