HYDROTECHNIK

MultiSystem 4070

Universal Portable Measuring System

Operating Instructions

DEU

Special applications

Special functions

Icon reference

Cleaning and maintenance

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 Kapitel **Technical data** auf Seite 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 4070

- 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).
- The measuring cables MK 01 and MKS may not be lengthened. Otherwise the shielding will be interrupted.
- The data of an ISDS sensor are read in when the measuring instrument is switched on. If sensors are reconnected the measuring instrument must be switched off and on again to allow the sensor data to be adopted.

Information about handling batteries

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

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

Scope

The manual on hand is valid for measuring instruments named **MultiSystem 4070**. 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.

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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 HYDROTECHNIKapply; if desired, we will gladly send you these.

Intended use

The measuring instrument **MultiSystem 4070** 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.

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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.

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 4070

The **MultiSystem 4070** is a practice-oriented, user-friendly hand-held measuring instrument supporting the user in the daily measuring functions. When using sensors with ISDS (intelligent sensor detection), the **MultiSystem 4070** 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 five 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

Connections

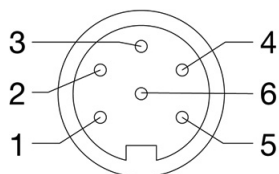| A	Power supply – power pack	F	Input Ch1 – analog input
B	USB interface	G	Digital input and output
C	Combi jack CAN/RS232	H	Input Ch2 – analog input
D	Input Ch5 – frequency input	I	Input Ch4 – frequency/analog input
E	Input Ch3 – analogue input		

Characteristics of analogue inputs

Number	4 (Ch1 to Ch4)
Signal input	Switchable 0/4 … 20 mA; 0/2 … 10 V; ± 10 V; 0.5 … 4.5 V; 1 … 5 V
Resolution	13-bit analogue/digital converter (12-bit + sign)
Measuring rate	1.0 ms = 1 kHz
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

Pin assignment

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Characteristics of frequency/analog inputs
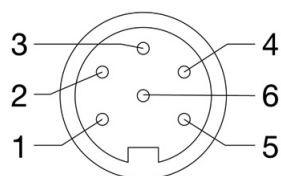
Number	1 (Ch4, Ch5) frequency/counter inputs with switchable direction detection or analog inputs
Signal input (Frequency mode)	5 – 30 VDC 0.25 Hz – 20 kHz
Signal input (Analog mode)	Switchable 0/4 … 20 mA; 0/2 … 10 V; ± 10 V; 0.5 … 4.5 V; 1 … 5 V
Resolution (Analog mode)	13-bit analogue/digital converter (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 (Frequency mode)

Pin assignment (Analog mode)

Characteristics of digital signal input

Hinweis
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 (Ch6).
The digital signal input is isolated.

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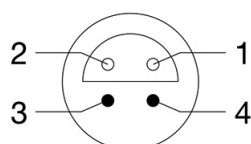
Pin	Function	Limitation	Protection type
3	Signal[a]	30 VDC	VDR Transile diode
4	Ground		

[a] 1 mA constant current

Characteristics digital signal output

Jacks of the digital input/output (Ch7).

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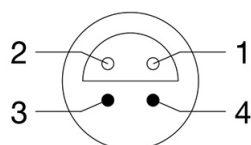
Pin	Function	Limitation	Protection type
1	Ground		
2	Signal	Ub/10 mA	VDR Transile diode

Characteristics of combi jack CAN / RS 232

8-pin M12x1

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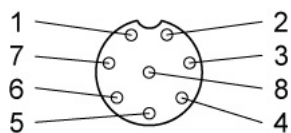
Pin	Function
1	Ground
2	Power supply for MultiXtend or CAN sensors[a]
3	DTR
4	CAN_H
5	TXD
6	RTS from PC (input)
7	CAN_L
8	RXD

[a] ~14.6 to 15 V, max. 800 mA (power supply) / ~ 13 VDC / 180 mA (battery)

Characteristics of USB interface

Micro USB Type B for communication with a PC.

Function	Designation	Remarks
Signal D+	green	twisted cable
Signal D–	white	twisted cable
VCC	red	~ 5 VDC / 500 mA
Ground	black	–

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	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 flashes during mains operation, the batteries are either missing, defective or deep-cycled. Possibly the battery cable isn't plugged correctly.

Keyboard

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

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

**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 measured values display: Delete MinMax memory or reset counter (using Fn)

[a] Use the **0** 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.

Technical data

Casing	PC+ABS+20GF plastic
Weight	795 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, RS232 interface, 1 x CAN
Ambient temperature	-10 °C – 50 °C
Relative humidity	0 – 80% (not condensing)
Storage temperature	-20 °C – 50 °C
Measured values display	5-digit
Trigger	4 channels as start/stop; with connections AND or OR; time trigger
Scanning rate	Selectable between 1 µsec and 999 min
Measuring rate	Analog inputs 1 ms (1 kHz) Frequency inputs 0.25 Hz … 20 kHz
Measured value memory	4 GB SD card, max. 100 measurement series, max. 8 MB per measurement series (2 million values)
Tolerances	Analogue ± 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 4070** measuring instrument
- Plug-in power pack, 230 VAC/24 VDC
- USB data transmission cable

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

> **Hinweis**
>
> **Battery performance endangered!**
> Charge the instrument batteries for 3 hours before you put the instrument into operation. Otherwise, there is the risk of excessive discharge, which would severely impair the battery performance.

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

The instrument is equipped with internal lithium ion batteries. This has only been slightly charged at the factory. Charge them for 3 hours before you put the instrument into operation. An empty battery will be indicated by a red battery symbol.

Information about handling instrument batteries

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

Avoid a complete discharge, continuous charging and immediate re-charging after every use.

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** auf Seite 35.

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

You can also find the operating instructions on 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 instrument**

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

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

Switch the instrument On and Off

DEU
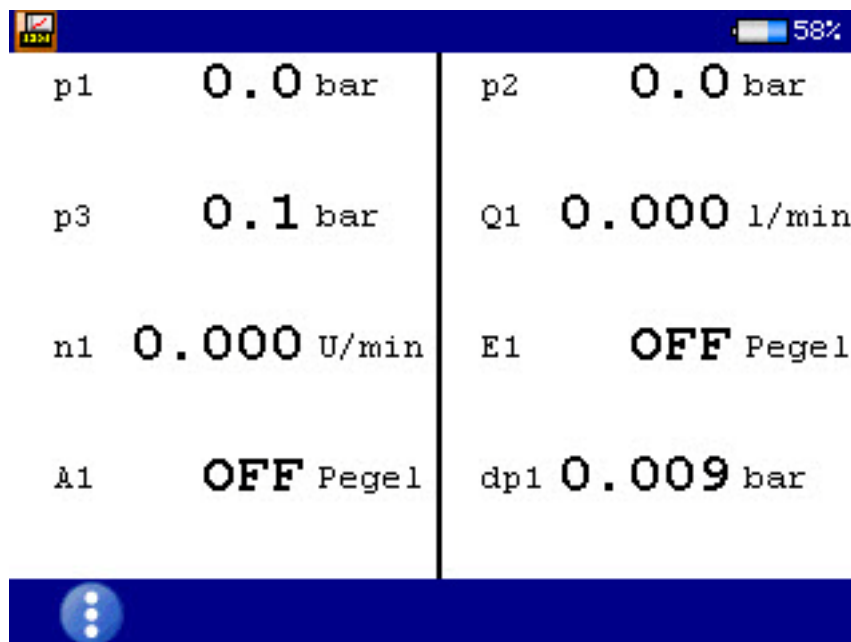
ℹ Make sure that the desired sensors are connected appropriately before switching on (see section Kapitel **Connect sensors** auf Seite 29).

ℹ 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 measured values 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 measured values display is shown, depending on the setting in the **User profile** menu.

If the measured values 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.

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.

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

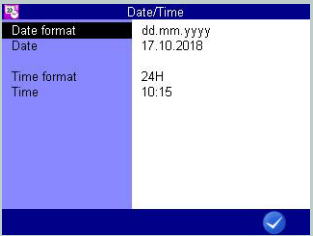| Menu/dialog	Action	Highlight and ENTER	Number keys
	Select the **Setting** menu.	▷ ▽ ENTER	5 JKL
	Select the **Device** menu.	▷ ▷ ENTER	3 DEF
	Select the **Date/Time** dialog.	▽ ENTER	4 GHI

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

■

User-defined softkeys

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

➔ **Create softkeys**
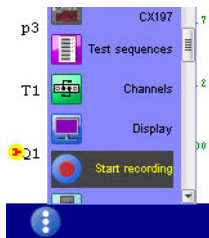
1 Open the **Home** menu: MENU

2 Open **Measure**: ◁▷ △▽ 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 measured values display is now a softkey.

■

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** auf Seite 99.

⇨ See **Softkeys: Symbols/text** auf Seite 143.

Select operating language
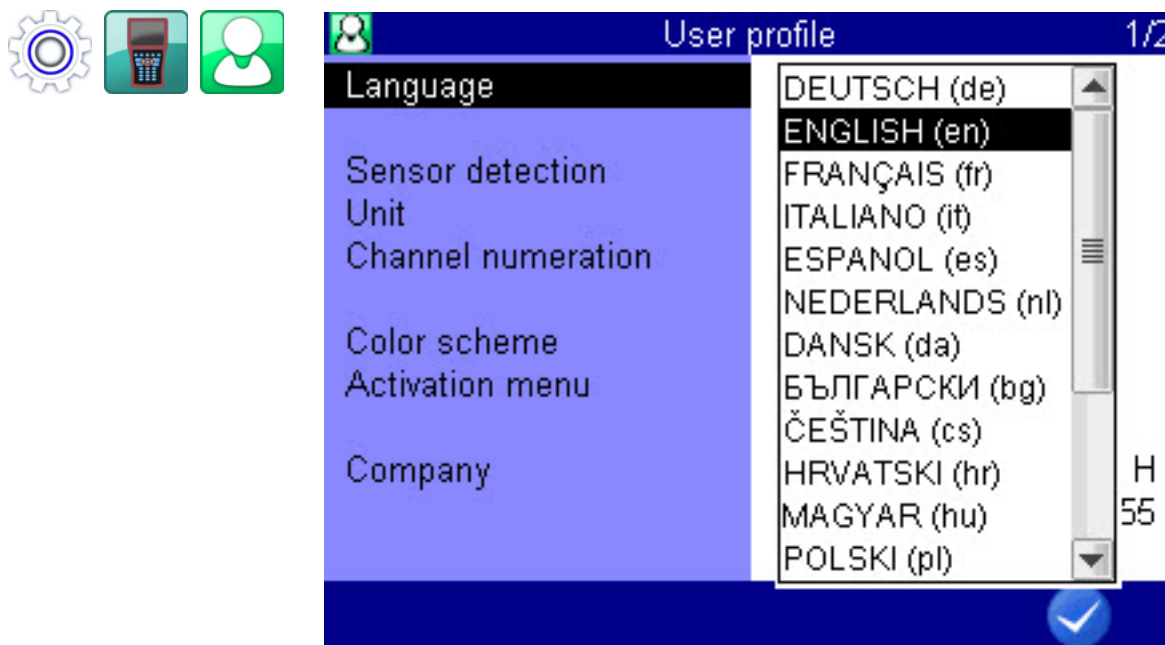
1   Open the **Home** menu: `MENU`

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 dialog: ✓ `F5`

■

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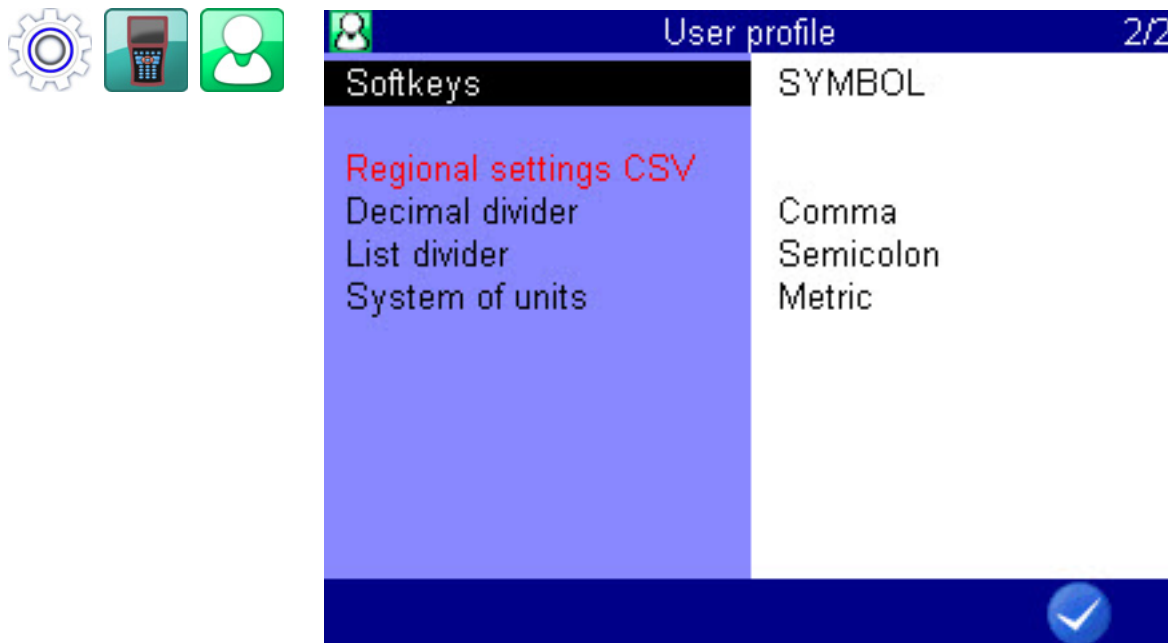
You can adjust the format of the numbers stored in the CSV files to the country settings.

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 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
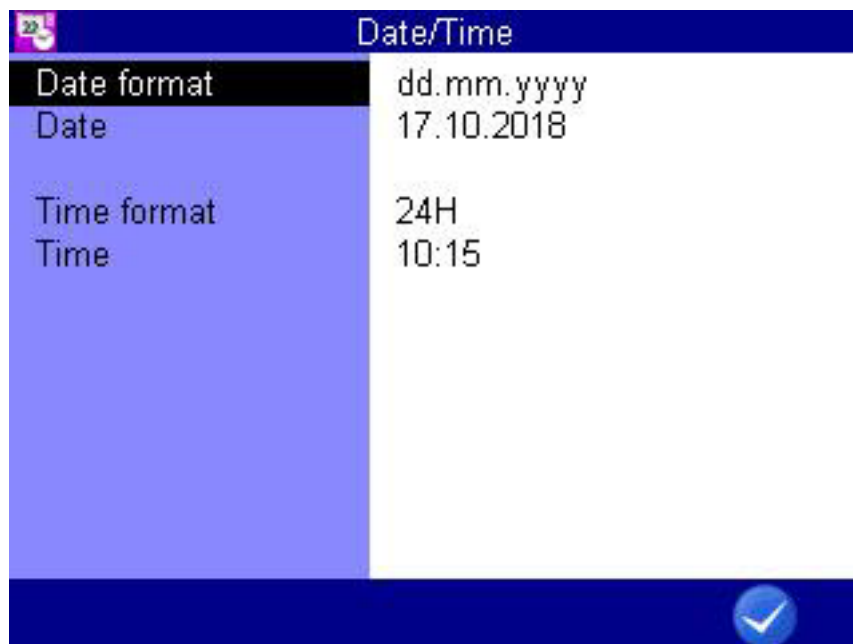
1 Open the **Home** menu: MENU

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 dialog: ✓ F5

■

Connect sensors

1 Switch the instrument off.

2 Connect the desired sensors to the inputs.

   ⇨ See Kapitel **Connections** auf Seite 11.

3 Switch the instrument on.

■

Enter sensor parameters

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

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

All channels				1/2
Ch1:	p1	0/20mA	0/200	
Ch2:	p2	0/20mA	0/600	
Ch3:	p3	0/20mA	0/600	
Ch4:	Q1	FRQ	75.500	
Ch5:	n1	FRQ	1.000	
Ch6:	E1	DIO-IN		
Ch7:	A1	DIO-OUT		
Ch8:	dp1	Ch1-Ch2		
Ch9:	–			
Ch10:	–			
Ch11:	–			
Ch12:	–			

Channel (Ch7)	
Measurand	A
Index Measurand	1
Unit	Pegel
Channel name	
Signal type	DIO-OUT
Mode	Channel
Reference channel	Ch6: E1
Condition	-
Value	-

1 Open the **Home** menu: MENU

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

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

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

5 Highlight a 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 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 (Ch4-Ch5) you can also choose between **FRQ**, **± FRQ, CNT, ± CNT** and **± CNT (4Q)**.
Measuring range	Enter the beginning and end of the measuring range. Confirm these two entries with ENTER.
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.
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 Kapitel **Linearization table** auf Seite 116.
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

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 the measured values display: `ESC`

∎

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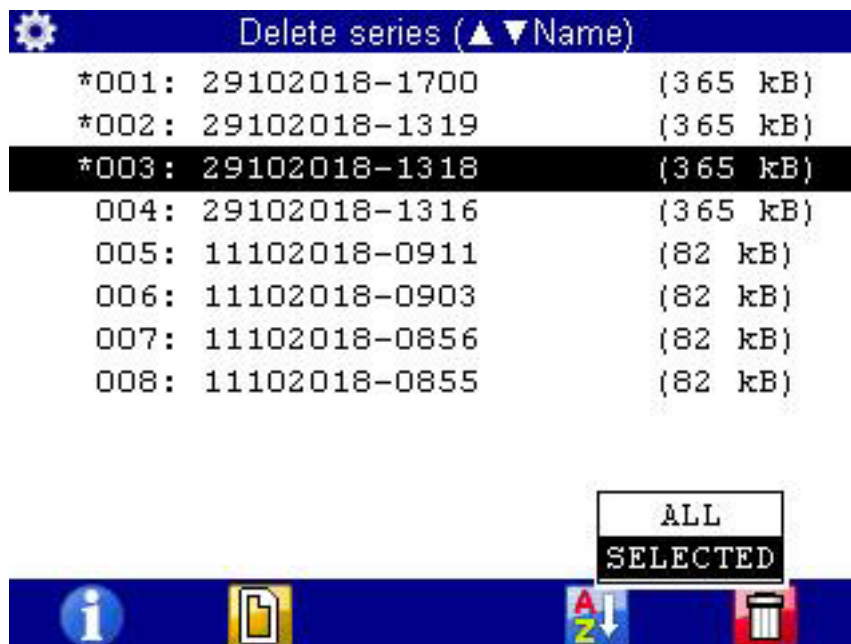
In the example shown, the measurement series 001, 002 and 003 have already been selected for deletion, an * is displayed to the left of the series.

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 **Series of 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:

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.

> ℹ 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 Kapitel **Trigger function** auf Seite 107 for further information on how to use the trigger function.

Display information on selected file

Info: 09122019-1223 1/3	Info: 09122019-1223 2/3	Info: 09122019-1223 3/3
Series name: 09122019-1223	Trigger: TASTE	Note:
Date: 09.12.2019		Carried out by Robin Doe
Time: 12:23:37		
Filename: 20191209-122337.MWF	Trigger record: 1001	
Number of records: 1000		
Scanning rate: 1 ms		
Recording time: 0,999 s		
Channels: p1 p2 p3 Q1 n1 E1 A1 I1		

If you have selected a file (e.g. measurement file, configuration file, screenshot, etc.), you can use ℹ 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.

> ℹ Information about a file can be displayed in many dialogs.

Connect a PC and transfer data

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

ℹ️ **Data transfer with micro USB cable**
The measuring instrument is recognized as a removable storage device. You can therefore open the operating instructions directly from the instrument.
If the measuring instrument is not recognized, this may be due to the USB cable you are using. Use a micro USB Type B cable that supports the "data transfer" function.

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)** auf Seite 92.

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.

Directory structure for DATA-VOL partition
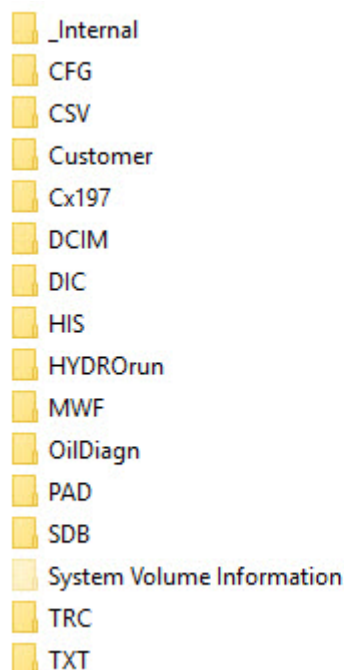
A directory structure has been set up on the **DATA-VOL** partition, the general memory for files (measurement series, images, etc.). The files are saved to different folders by file type.

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** auf Seite 68

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

Reset instrument

ℹ️ All user-defined parameters and settings (channels, display, memory, etc.) will be deleted by resetting the instrument. All data on the SD card remain unaffected (measurement series, sensor and CAN database, projects, test sequences, databases from test sequences, etc.).

1 Switch instrument off: OFF

2 Switch instrument on: ON

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

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.

■
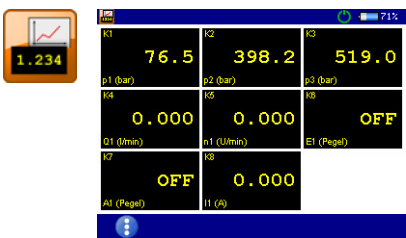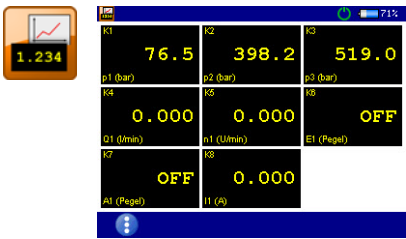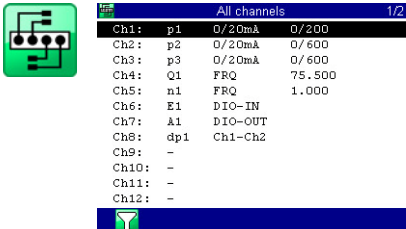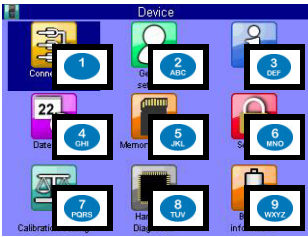
Operating software

The operating software of the **MultiSystem 4070** will be presented and explained on the following pages.

Frequently used functions

Function in menu/dialog	Keys to be used	Step-by-step instructions
Reset minimum/maximum value K1 76.5 K2 398.2 K3 519.0 p1 (bar) p2 (bar) p3 (bar) K4 0.000 K5 0.000 K6 OFF Q1 (l/min) n1 (U/min) E1 (Pegel) K7 OFF K8 0.000 A1 (Pegel) I1 (A)	CLR	1. Open **Home**: MENU 2. Open **Measure**: ◁▷ △▽ ENTER 3. Reset minimum/maximum value: CLR
Reset counter(s) K1 76.5 K2 398.2 K3 519.0 p1 (bar) p2 (bar) p3 (bar) K4 0.000 K5 0.000 K6 OFF Q1 (l/min) n1 (U/min) E1 (Pegel) K7 OFF K8 0.000 A1 (Pegel) I1 (A)	**Fn** + CLR (press simultaneously)	1. Open **Home**: MENU 2. Open **Measure**: ◁▷ △▽ ENTER 3. Reset counter(s): **Fn** CLR

Function in menu/dialog	Keys to be used	Step-by-step instructions

Quickly select a channel to enter sensor parameters
 	
e.g. in:
 	
All channels 1/2
Ch1: p1 0/20mA 0/200
Ch2: p2 0/20mA 0/600
Ch3: p3 0/20mA 0/600
Ch4: Q1 FRQ 75.500
Ch5: n1 FRQ 1.000
Ch6: E1 DIO-IN
Ch7: A1 DIO-OUT
Ch8: dp1 Ch1-Ch2
Ch9: –
Ch10: –
Ch11: –
Ch12: –
	1 2 ABC 3 DEF
	4 GHI 5 JKL 6 MNO
	7 PQRS 8 TUV 9 WXYZ
	– . 0 CLR
		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:
		
		1 K1:
		2 K2:
		3 K3:
		4 K4:
		5 K5:
		6 K6:
		7 K7:
		8 K8:
		9 K9:
		– . K10:
		0 K11:
		CLR K12:

Quickly select a function in an icon menu e.g. in: Device Connections General settings Info Date/Time Memory medium Security Calibration setting Hardware Diagnostic Battery information	1 2 ABC 3 DEF 4 GHI 5 JKL 6 MNO 7 PQRS 8 TUV 9 WXYZ	Select a function in the icon menu by pressing the relevant key, e.g.:

Home

MENU **MENU** opens the **Menu**; you can operate all functions of the **MultiSystem 4070** from here.

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

Available menus

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

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
Series of measurements	Display, present and delete measurement series
Setting	Configure channels, display, instrument and recording
Extras	Settings for USB stick, special applications and games
Favorites	You can save menus or dialogs as favorites here.

⇨ See **Favorites** auf Seite 139.

Start recording

➔ **Start recording**

| F5 | ✓ | **OK** | Confirms input/saves change. |

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

DEU

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

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 recorded measurements**

⇨ See **Series of measurements** auf Seite 50.

Measure (measured values display)

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

There are different measured values 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 measured values display is displayed after the measuring instrument is switched on.

⇨ See **General Settings** auf Seite 95.

Change display

Use F1 to open the display selection menu. Choose from the following options:
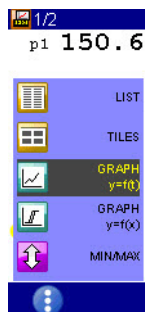
List view
⇨ **Symbols in the measured values display** auf Seite 46

Tile view
⇨ **Tiles per page** auf Seite 83

Graph view y=f$_{(t)}$
⇨ **Graphic presentation in display menu** auf Seite 122
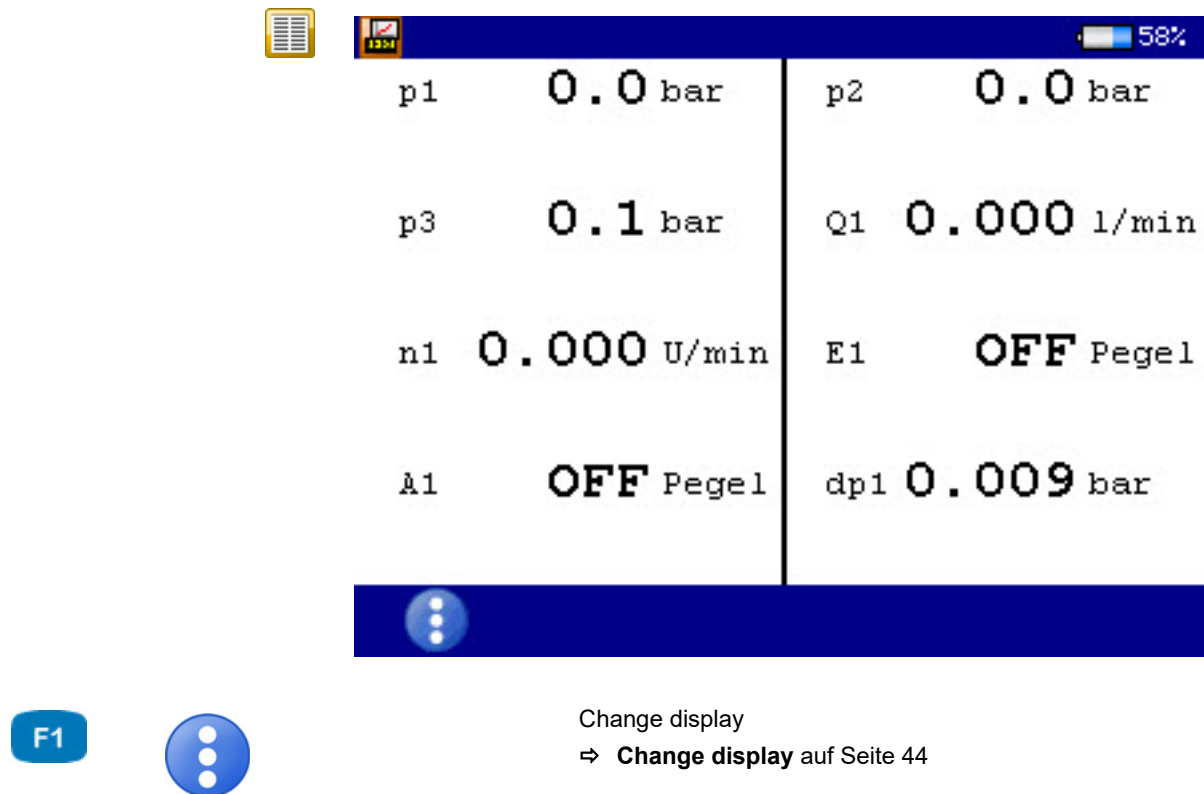
Graph view y=f$_{(x)}$
⇨ **Graphic presentation in display menu** auf Seite 122

MinMax view
⇨ **Measured values with MinMax** auf Seite 46

Measured values with their units

p1	**0.0** bar
p3	**0.1** bar
n1	**0.000** U/min
A1	**OFF** Pegel

p2	**0.0** bar
Q1	**0.000** l/min
E1	**OFF** Pegel
dp1	**0.009** bar

58%

F1

Change display
⇨ **Change display** auf Seite 44

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

Measured values with MinMax

 F1

Change display
⇨ **Change display** auf Seite 44

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

Symbols in the measured values display

 Channel with ISDS sensor

 Channel is recorded

Error display

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

Error message	Explanation
NoCan	The CAN channel is defined but the CAN bus is not enabled. ⇨ **CAN #1** auf Seite 89
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 configuration** 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 dialog: F2

■

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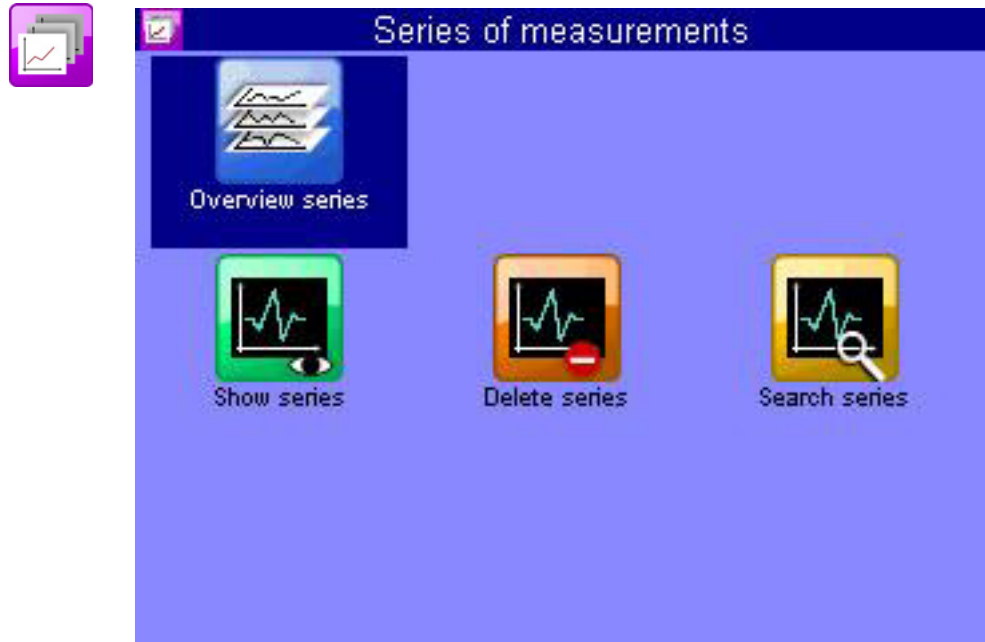
In this menu you can process, display, delete, search for and configure the presentation of recorded measurement series.

Overview series

Show series

F2	👁	**DISPLAY**	Displays the selected measurement.
F3	ℹ	**INFO**	Displays information about the selected object.
			⇨ **Display information on selected file** auf Seite 34
F5	✓	**OK**	Confirms input/saves change.

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

Series

001: 20181029-1700		(365 kB)	
002: 20181011-0855		(82 kB)	
003: 20181011-0856		(82 kB)	
004: 20181011-0903		(82 kB)	
005: 20181011-0911		(82 kB)	

Key	Icon	Label	Description
F1	(i)	**INFO**	Displays information about the selected object.
			⇨ **Display information on selected file** auf Seite 34
F2	(file)	**FILE**	Converts the display to file name.
F2	(NAME)	**NAME**	Converts the display to series name.
F4	(A-Z)	**SORT**	Sorts the displayed list/table.

➔ **Select the measurement series**

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

2 Open **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.

■

HYDROTECHNIK

Presentation   The data of the selected measurement series can be presented in four differ-ent 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: 28112019-1050	1/2

[sec]	p1	p2	p3	Q1
0,000	14.395	480.09	640.52	158.81
0,099	14.449	480.25	640.68	158.81
0,199	14.503	480.25	640.68	158.81
0,299	14.503	480.09	640.52	158.81
0,399	14.503	480.25	640.84	158.81
0,499	14.449	480.25	640.68	158.81
0,599	14.449	480.09	640.52	158.81
0,699	14.449	480.25	640.52	158.81
0,799	14.449	480.25	640.84	158.81
0,899	14.449	480.25	640.68	158.81
0,999	14.449	480.25	640.52	158.81

STATISTICS: 28112019-1050

	Min	Max	Mean
p1	14.395	14.503	14.445
p2	479.929	480.415	480.195
p3	640.357	640.843	640.612
Q1	158.805	158.811	158.809
n1	0.000	0.000	0.000
E1	0.000	0.000	0.000
A1	0.000	0.000	0.000
dp1	466.02	465.48	465.75

GRAPH y=f(t): 29102018-1700

t(sec)	0,419
p1	37.305
p2	527.905
p3	346.191
Q1	0.000
n1	0.000
E1	1.000
A1	0.000
I1	0.000

Table	Statistics	Graph

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

⇨ Kapitel **Presentation type "Table"** auf Seite 59

⇨ Kapitel **Presentation type "Graph"** auf Seite 60

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.

Type scaling

	Show series	1/2
Meas. series	28112019-1050	
Presentation	TABLE	
Channel on X-axis		
Type scaling	MANUAL	
Scaling		
Outline	TOTAL	
From/To		
Channels	p1p2p3Q1n1E1A1dp1	
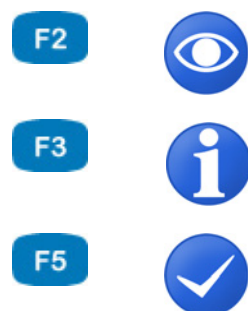
F2	👁 (DISPLAY icon)	**DISPLAY**	Displays the selected measurement.
F3	ℹ (INFO icon)	**INFO**	Displays information about the selected object.
			⇨ **Display information on selected file** auf Seite 34
F5	✓ (OK icon)	**OK**	Confirms input/saves change.

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.

∎

Scaling

Scaling series		
Channels	Min	Max
p1	0.000	200.0
p2	0.000	300.0
p3	40.00	100.0
Q1	0.000	200.0
n1	0.000	200.0
E1	0.000	200.0
A1	0.000	200.0
dp1	0.000	200.0

F5 ✓   **OK**   Confirms input/saves change.

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 measurand: △▽ ENTER

2 Enter minimal value and ENTER.

3 Enter maximum value and ENTER.

4 Save scaling and exit dialog: F5
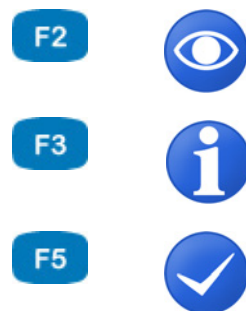
■

Outline

DEU

F2 👁	**DISPLAY**	Displays the selected measurement.
F3 ℹ	**INFO**	Displays information about the selected object.
		⇨ **Display information on selected file** auf Seite 34
F5 ✓	**OK**	Confirms input/saves change.

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.

To adapt the range of presentation:

1 Select **Outline**:△▽.

2 Select **CLIPPING**: ⏎

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

∎

Channels

F3 **ALL**	**ALL**	Selects all entries. Removes all selections.
F5 ✓	**OK**	Confirms input/saves change.

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

All channels marked with a ☑ check mark are presented.

Select a channel and use ⊕ENTER to change highlighting.

Press ⊡F3 to select or deselect all channels.

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

■

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Symbols/colors Select the symbols and colors that are to be used for the presentation of individual channels.
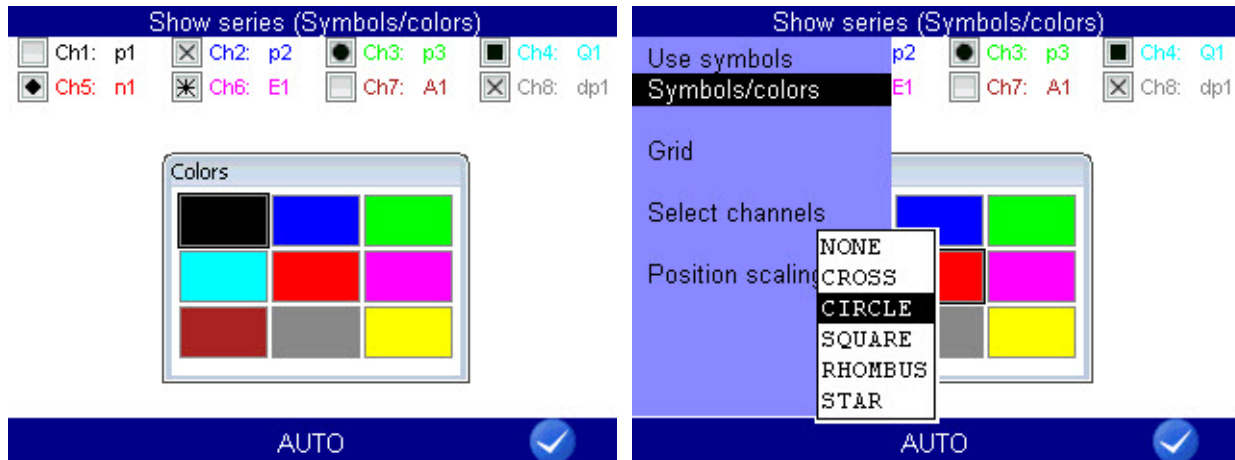
F3	**AUTO** Automatically assigns symbols and colors.
F5 ✓	**OK** Confirms input/saves change.

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

1 Select a channel: ◁▷ △▽ ⏎
2 Select the color for the channel: ◁▷ △▽ ⏎
3 Select a symbol for the channel: △▽ ⏎

■

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"

	DETAIL	Presentation type "Table": Zooms into the table.
F2		
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"
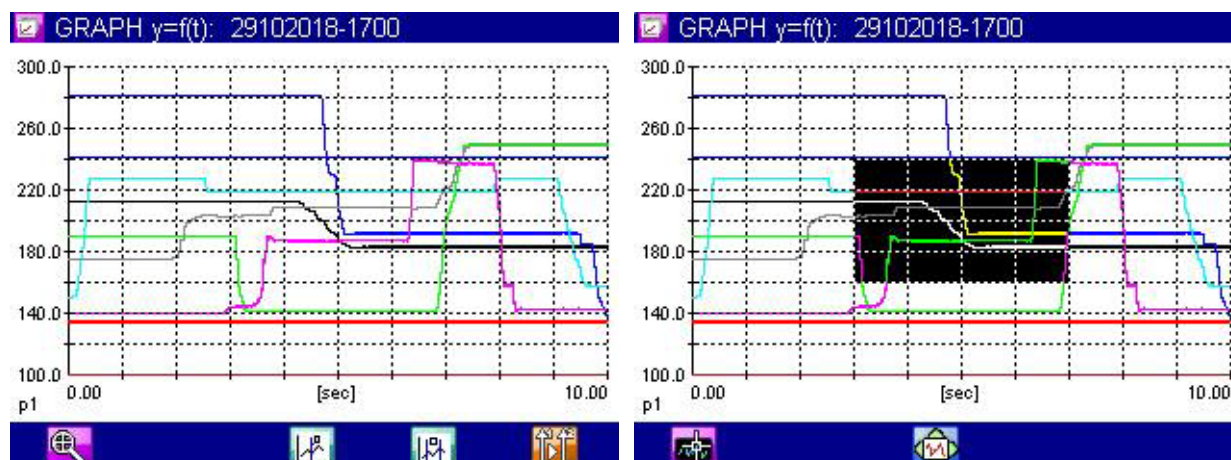
F1		**ZOOM+**	Activates the zoom function.
F2		**ZOOM-**	Resets the last zoom.
F1		**POS**	Positions the zoom section.
F3		**SIZE**	Changes the zoom section.
F3		**SPOT**	Enables the spot function. ⇨ **Spot function** auf Seite 62
F4		**D-SPOT**	Enables the delta-spot function. ⇨ **Delta-spot function** auf Seite 63
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 the 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`

■

HYDROTECHNIK

Spot function

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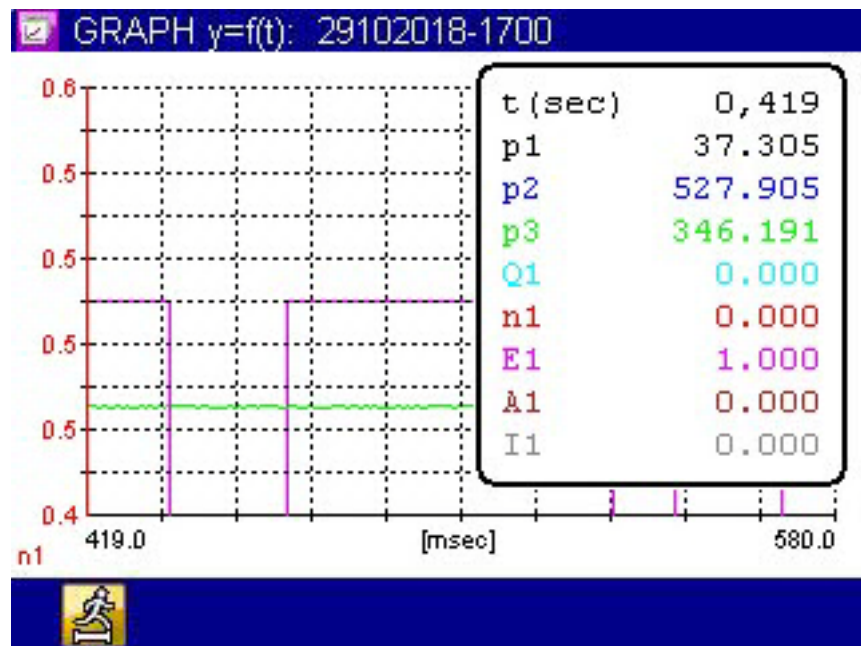
Increment   Changes the step width in the spot and delta-spot functions.

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

1 Enable the spot function: `F4`

2 Choose the move factor: `F1` △▽ `ENTER`

3 Move the spot line: ◁▷

4 Read measured values.

5 End spot function: `ESC`

■

Delta-spot function
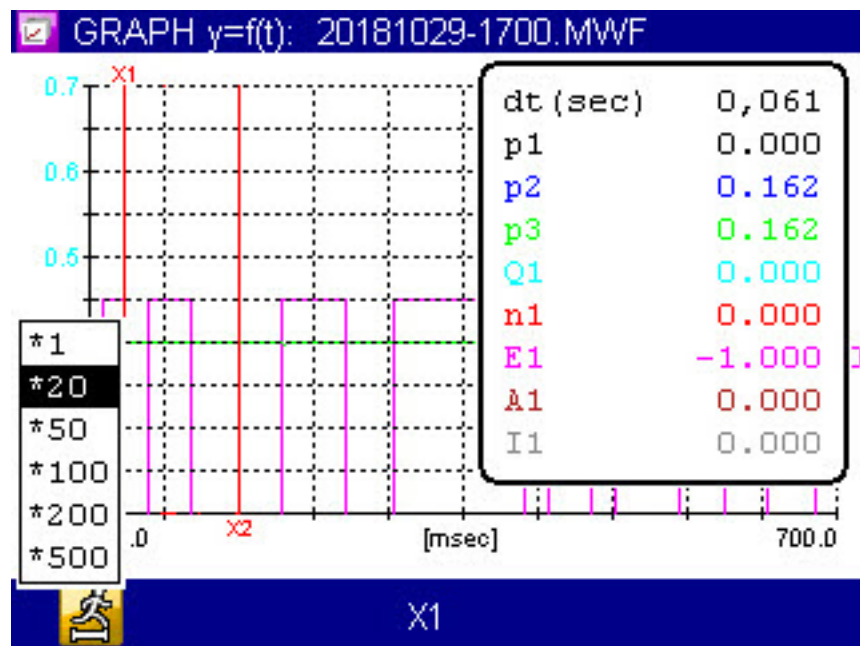
DEU

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

X1	Changes the spot line that is moved with the ◁ ▷ keys.
X2	
X1+X2	

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 factors and **F3** to choose whether the left (**X1**), the right (**X2**) or both (**X1+X2**) spot lines are to be moved.

Delete series
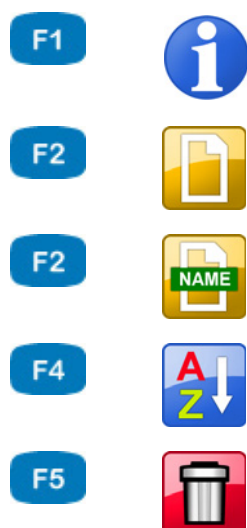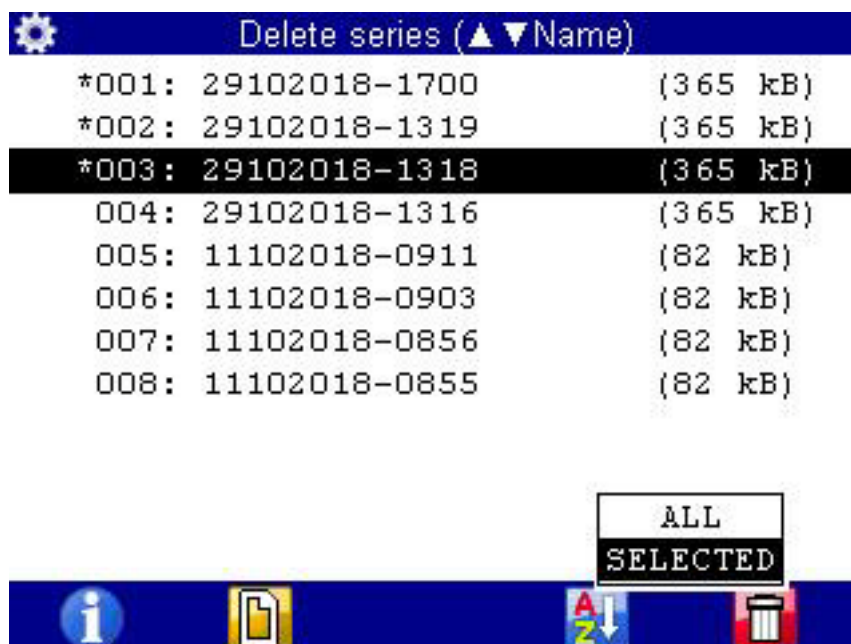
INFO — Displays information about the selected object.
⇨ **Display information on selected file** auf Seite 34

FILE — Converts the display to file name.

NAME — Converts the display to series name.

SORT — Sorts the displayed list/table.

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

		SEARCH	Starts the search.
		RESET	Resets the search result.
		OK	Confirms input/saves change.

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 search and close dialog: `F1` `F5`

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

6 Open **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`

■

Setting

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

Channels

| F1 | | **FILTER** | Opens the **Overview Filter** dialog. |
| | | | ⇨ **Overview Filter** auf Seite 78 |

There are 17 channels available:

- **Ch1** ... **Ch5**

  Measurement channels; sensor connectors at the rear of the instrument

- **Ch6**

  Trigger input

- **Ch7**

  Trigger output

- **Ch8** ... **Ch17**

  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 17.

➜   Configure measurement channels (Ch1 ... Ch5)

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

⚙	Channel (Ch1)	1/2
Measurand	p	
Index Measurand	1	
Unit	bar	
Channel name		
Signal type	0/20mA	
Measuring range	0.000 200.00	
Calibration value		
Zero point	0.000	
Linearisation	NO	
Table		
Filter	NO (50kHz)	

Key	Icon	Label	Description
F2	⬇	**LOAD**	Loads sensor parameters from the database.
F3	⬆	**SAVE**	Stores the current sensor parameters in the database.
F5	✓	**OK**	Confirms input/saves change.

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** auf Seite 95), 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.

DEU

Channel name	You may enter an individual name for each channel
	The name will now be shown in the tile display of the measured values display.
	⇨ See **Tiles per page** auf Seite 83.
Signal type	Sensor-specific
	The correct signal type is given on the type plate of the sensor or in its documentation.
	For frequency channels (Ch4-Ch5), signal type **±CNT(4Q)** runs a precise measurement of all 4 quadrants, not only the rising edges.
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** auf Seite 71)
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 Kapitel **Linearization table** auf Seite 116.
Filter	Choose from three digital filters:

- **NONE**

  No filter applied; peak pressure measurements up to 10 kHz on channels Ch1 and Ch5
- **STANDARD**

  A 5 kHz filter is applied to channels Ch1 and Ch5.
- **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**
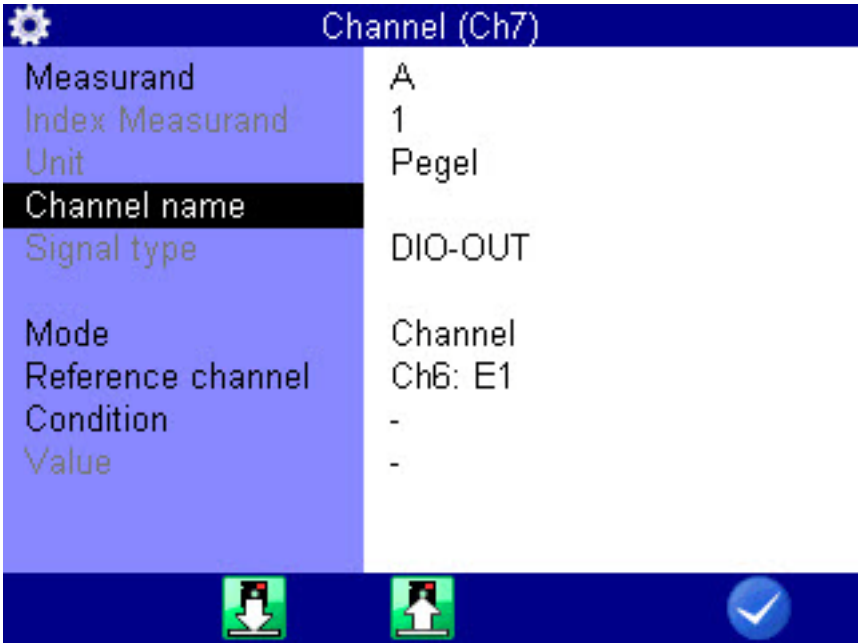
After selecting the function (ENTER) a display will appear for confirming the zero point alignment.

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 (Ch6)**

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

➜ **Configure digital signal output (Ch7)**

⚙	Channel (Ch7)
Measurand	A
Index Measurand	1
Unit	Pegel
Channel name	
Signal type	DIO-OUT
Mode	Channel
Reference channel	Ch6: E1
Condition	-
Value	-

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

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

You are able to define up to 5 parameters here.

DEU

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 (Ch8 ... Ch17)**

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

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** auf Seite 74.

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** auf Seite 95), 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** auf Seite 74)

➜ **Possible assignments of the special channels**
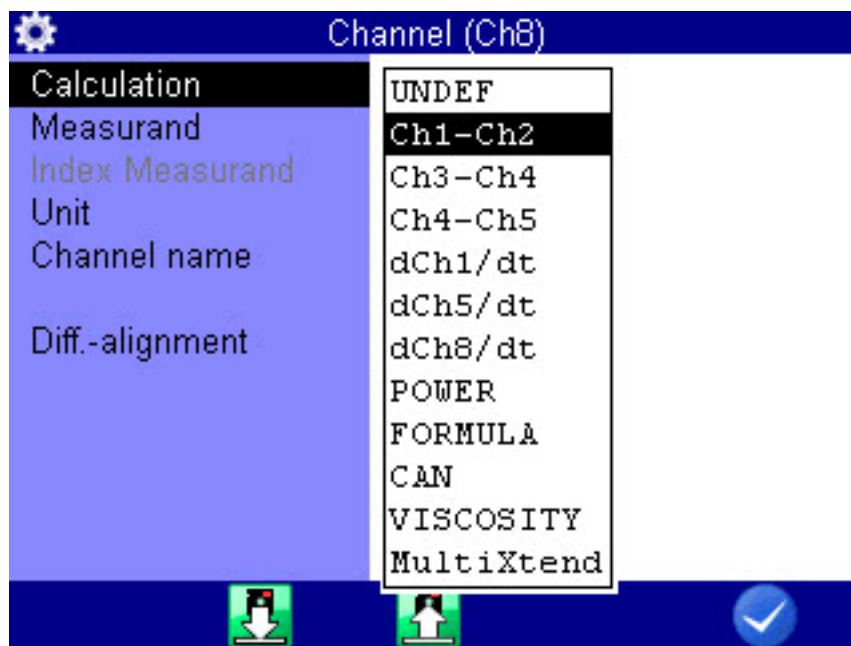
⚙	Channel (Ch8)	
Calculation	UNDEF	
Measurand	**Ch1-Ch2**	
Index Measurand	Ch3-Ch4	
Unit	Ch4-Ch5	
Channel name	dCh1/dt	
	dCh5/dt	
Diff.-alignment	dCh8/dt	
	POWER	
	FORMULA	
	CAN	
	VISCOSITY	
	MultiXtend	

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

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** auf Seite 76.

CAN   Observe the information in chapter **Define CAN channel** auf Seite 118

Viscosity   For viscosity calculation

⇨ See **Viscosity-compensated volume flow rate measurement** auf Seite 131.

➜   **Set up the MultiXtend**

Channel (Ch12)	
Calculation	MultiXtend
Measurand	
Index Measurand	?
Unit	
Channel name	
Signal type	MultiXtend A_4I
Node ID	20
Port	1
Measuring range	0.000 0.000

F5   ✔   **OK**   Confirms input/saves change.
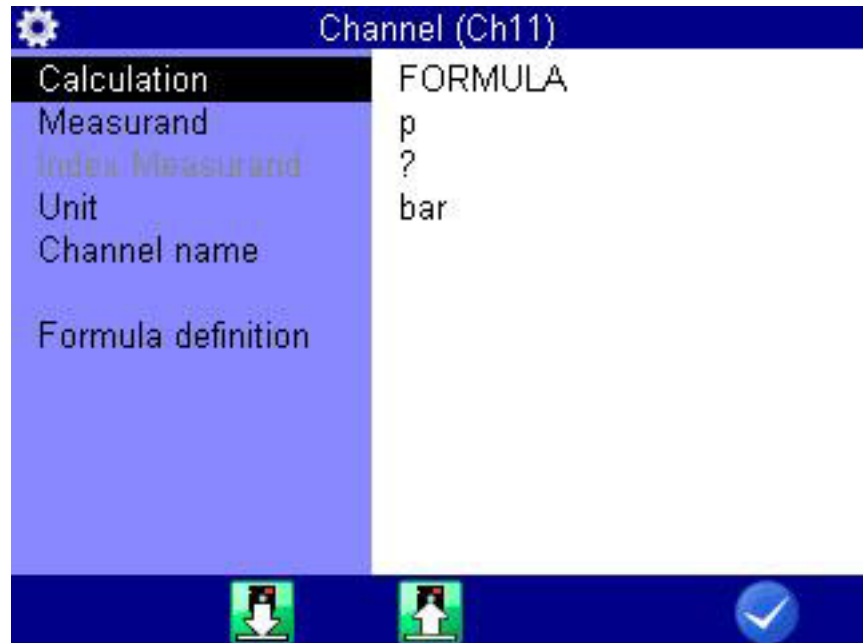
1   Select the **Calculation** dialog entry: △▽ ENTER

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 dialog: ✔ F5

DEU

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

■

⇨ See **Connecting MultiXtend A and T** auf Seite 127.

➔ **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 change.

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   *Ch5/600*(Ch1-Ch2)*

> ℹ 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 4**: Measurement of volume V1 in liters (l)
- **Channel 5**: 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)

Overview Filter

```
⚙        Overview Filter
Ch1:   NO  (50kHz)
Ch2:   NO  (50kHz)
Ch3:   NO  (50kHz)
Ch4:   NO  (50kHz)
Ch5:   NO  (50kHz)
Ch6:   NO  (50kHz)
Ch7:   Gate time         0.050 s
       Min.Frequency     0.25 Hz
Ch8:   Gate time         0.050 s
       Min.Frequency     0.25 Hz
```

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 Ch5

- **STANDARD**

  A 5 kHz filter is applied to channels Ch1 and Ch5.

- **DAMPED**

  A 50 Hz filter is applied to Ch1 to Ch5; peak pressures are suppressed; this is ideal for static measurements or slow processes.

Channel extension

	SCAN	Scans the CAN bus for messages.
F1		

	CREATE	Compiles a list of the supported channel extension boxes.
F2		

	Setting	Opens the dialog for settings of the highlighted measurement channel.
F2		

	LEFT	Switches to next column to the left.
F3		

	RIGHT	Switches to next column to the right.
F4		

	OK	Confirms input/saves change.
F5		

You can use the **Channel extension** dialog to select and configure a channel extension.

➜ **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 ⊙ △▽ ⊙ 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 channel extension box is selected, Firmware Version 1.2 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 (Ch8 ... Ch17)** auf Seite 73
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.

Display

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

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

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

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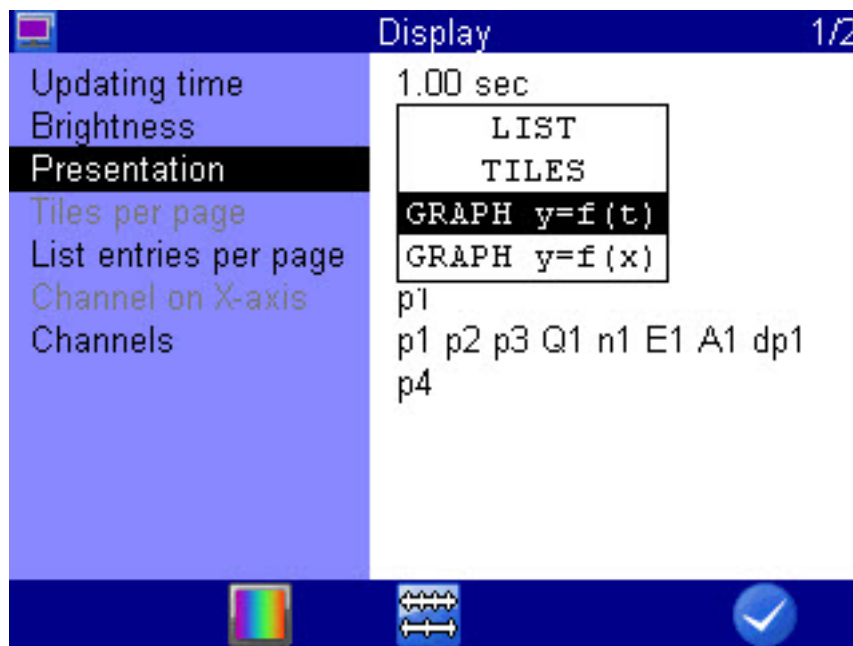
F2		**COL/SYM**	Opens the **Display (Symbols/colors)** dialog.
F3		**SCAL**	Opens the **Scaling display** dialog.
F5		**OK**	Confirms input/saves change.

Tiles per page   Here you have three possibilities for the tile presentation:

- **4**

  Shows 4 tiles in the measured values display.

- **9**

  Shows 9 tiles in the measured values display.

- **12**

  Shows 12 tiles in the measured values display.
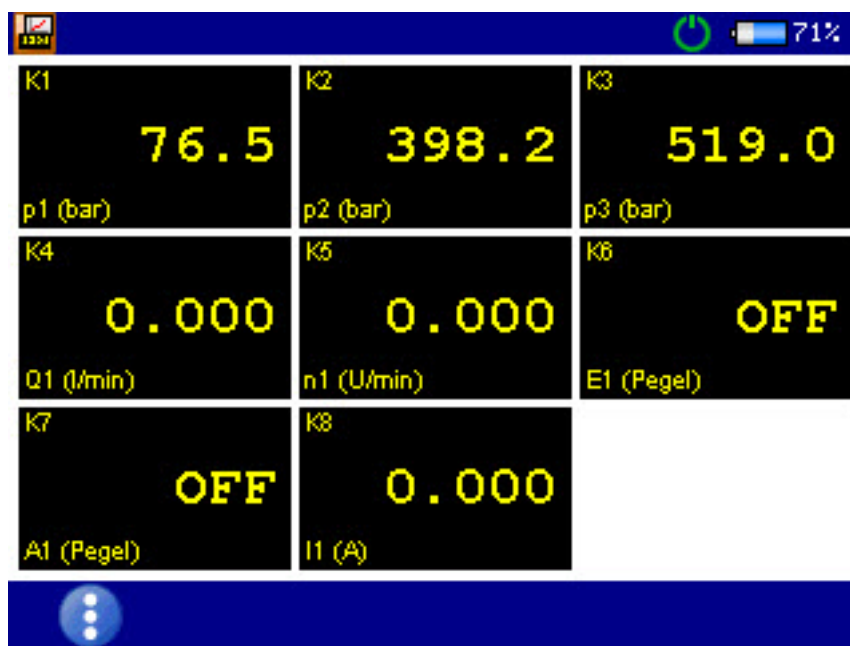
F1   Change display
      ⇨ **Change display** auf Seite 44

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 ... Ch5)** auf Seite 69.

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 measured values display.
	All channels marked with a ☑ 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** auf Seite 85.
SCAL.	Select the measurement range of the channel which is to be displayed in the graphical presentation.
	⇨ See **Display scaling dialog** auf Seite 86.

DEU

Display (Symbols/colors) dialog
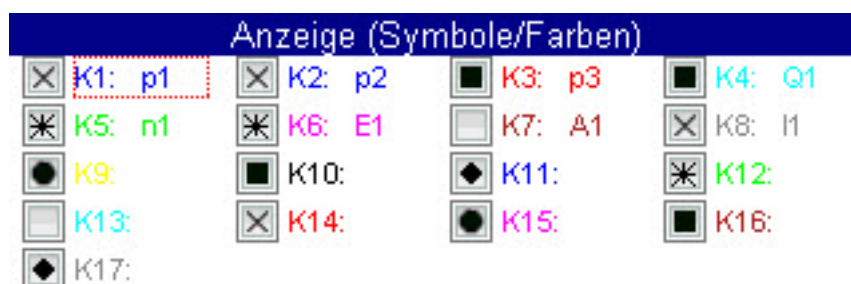
AUTO	Automatically assigns symbols and colors.
OK	Confirms input/saves change.

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 dialog: ✓ `F5`

■

Display scaling dialog

F5	✓	**OK**	Confirms input/saves change.

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

⇨ See **Configure measurement channels (Ch1 ... Ch5)** auf Seite 69.

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 Use △▽ ENTER 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 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 setting	Specifying the calibration interval
Hardware Diagnostic	Expanded settings for diagnosis of hardware (for service personnel)
Battery information	Information and current state of battery

Connections

HYDROTECHNIK
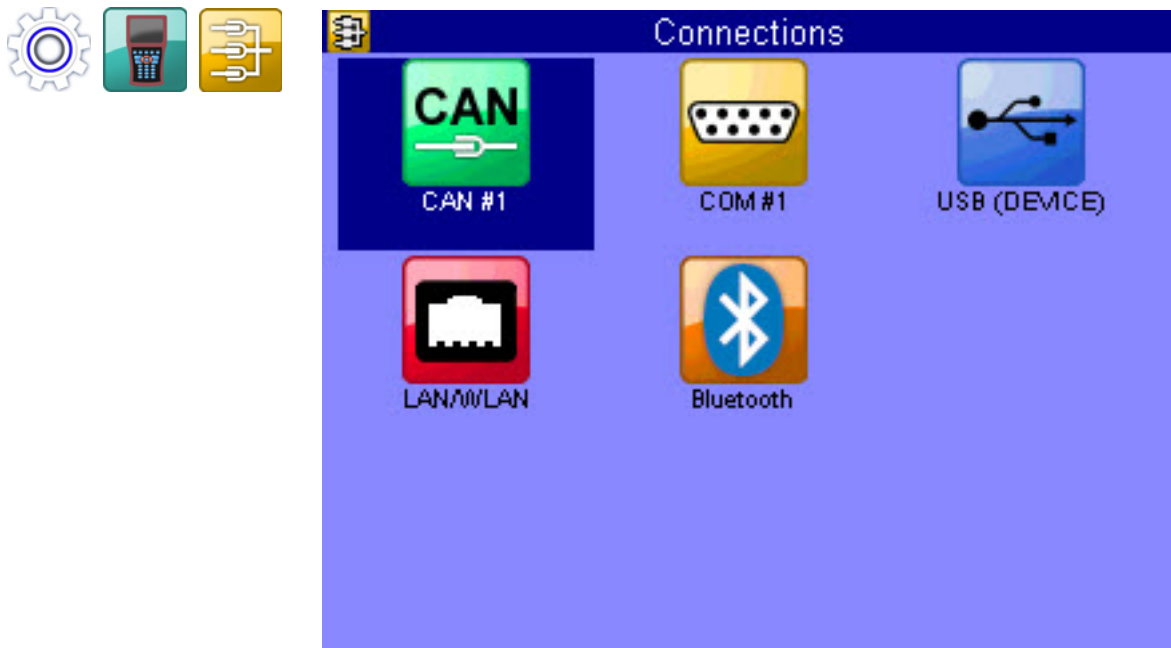
CAN #1
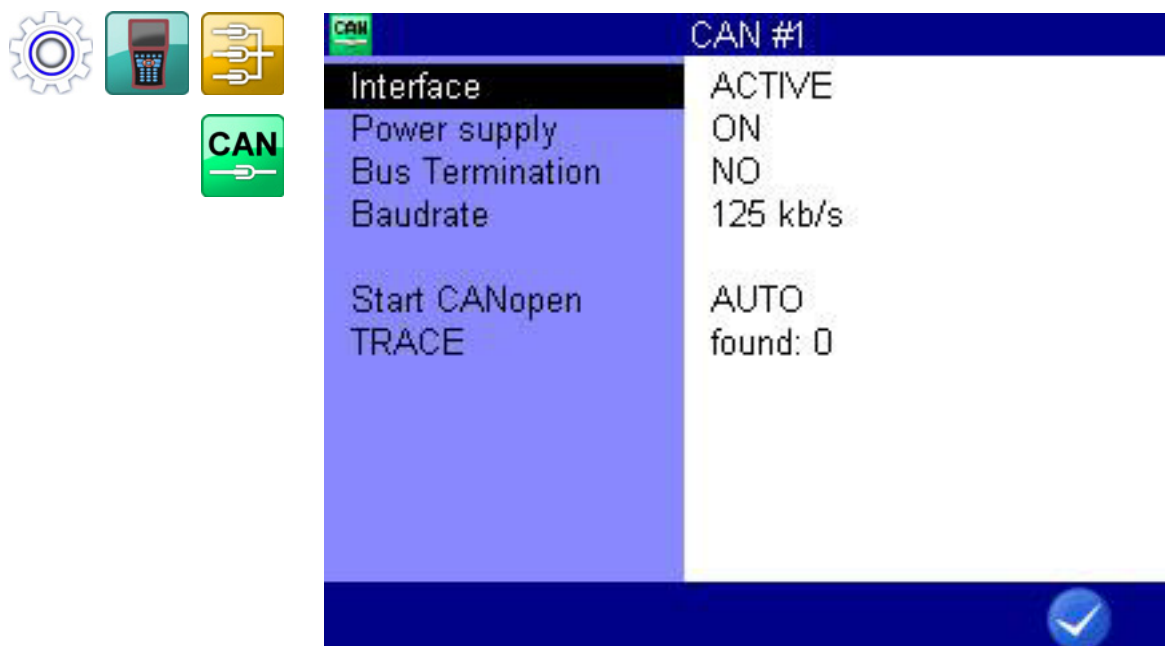
| | | **OK** | Confirms input/saves change. |

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 ⊕ 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 Kapitel **Define CAN channel** auf Seite 118). To enable this, you have to activate the CAN bus here and set the data transmission rate.

1   Select **CAN#1** in the **Connections** menu: ◁▷ △▽ ⊕

2   Select the bus termination: △▽ ⊕ △▽ ⊕

3   Toggle to input the baud rate: △▽ ⊕

4   Select the desired baud rate: △▽ ⊕

5   Confirm changes and exit 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.
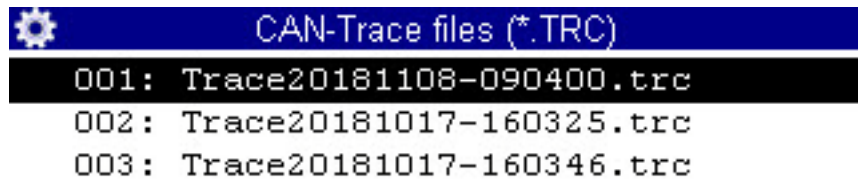
```
⚙        CAN-Trace files (*.TRC)
001:  Trace20181108-090400.trc
002:  Trace20181017-160325.trc
003:  Trace20181017-160346.trc
```

ℹ️	NAME	A↓Z	✔️

[F1]	ℹ️	**INFO**	Displays information about the selected object. ⇨ **Display information on selected file** auf Seite 34
[F2]	📄	**FILE**	Converts the display to file name.
[F2]	NAME	**NAME**	Converts the display to series name.
[F5]	A↓Z	**SORT**	Sorts the displayed list/table.

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

Open a loaded recording with the `F2` key.

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

Trace20181108-090400.trc 1/3

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

COM #1
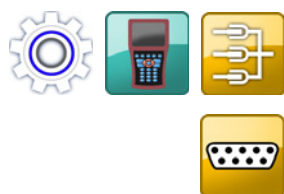
COM #1

Interface	ACTIVE
Baudrate	115200 Bit/s

`F5`	✓	**OK**	Confirms input/saves change.

Interface	Enable/disable COM bus
Baud rate	Set transmission speed for COM data

USB (DEVICE)

USB (DEVICE)	
USB- mode	Mass storage device
DATA volume	Expose
DOCU volume	Expose

OK   Confirms input/saves change.
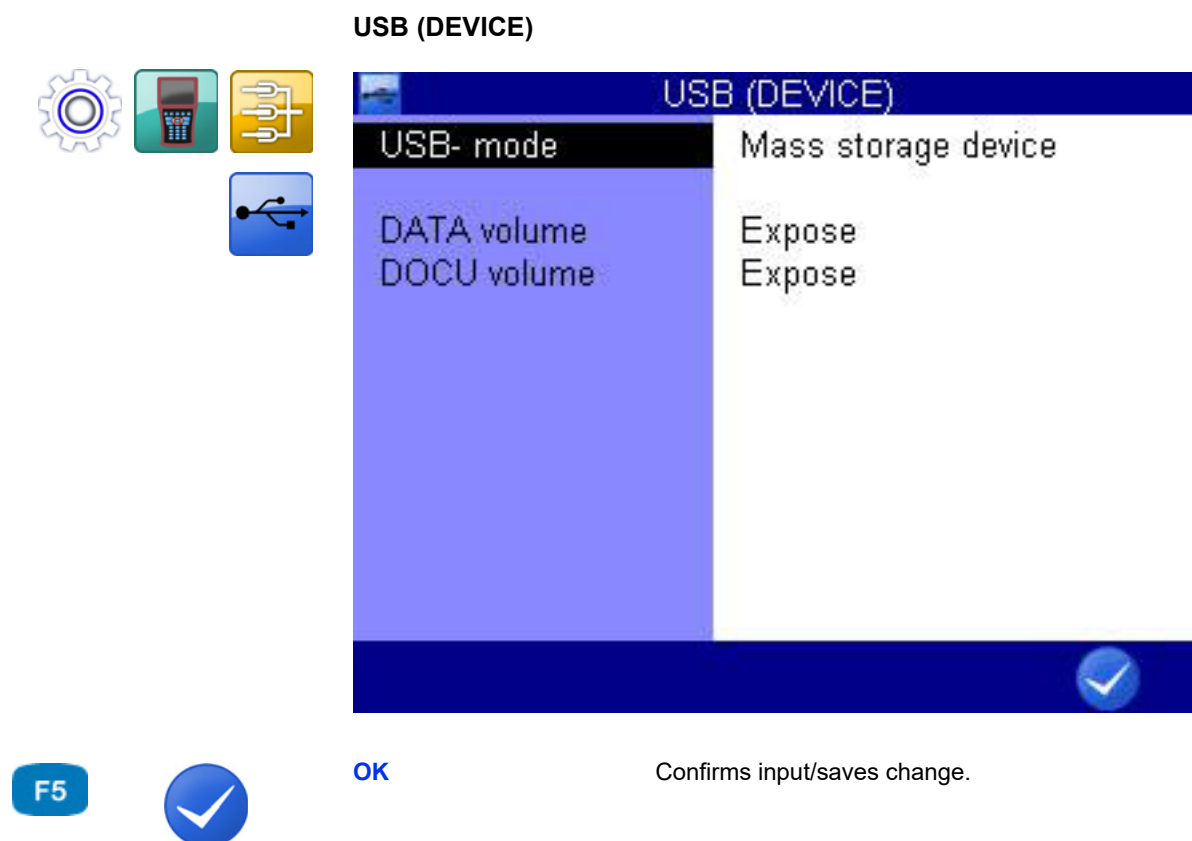
USB mode   Choose from the following options:

- **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** auf Seite 35.

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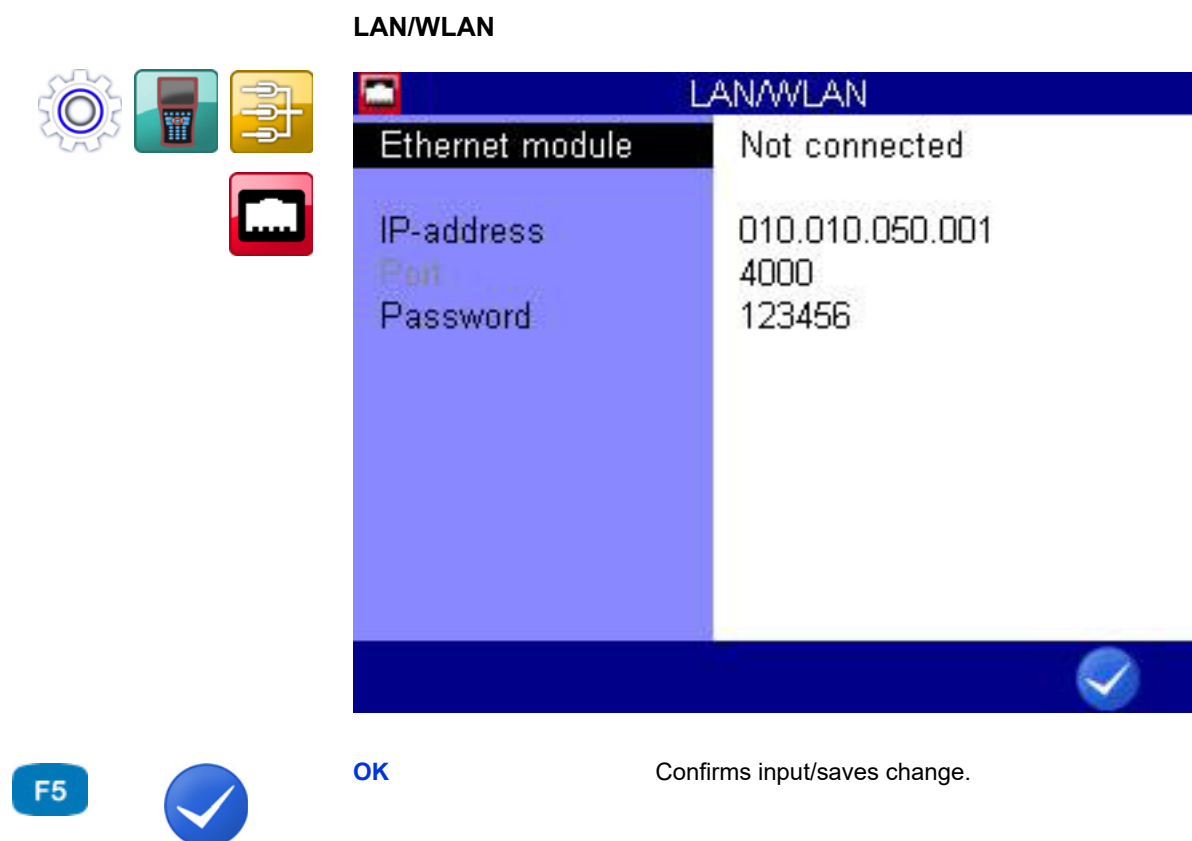
Ethernet module   For the connection of the Ethernet module, **Not connected**, **MultiXtend/Lan** and **USB/WLAN** can be selected.

IP address   Enter the IP address that the **MultiSystem 4070** 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: △▽ ⒠ₙₜₑᵣ

2 Select the desired option: △▽ ⒠ₙₜₑᵣ

3 Select the desired setting or enter the required information.

4 Confirm entries: ⒠ₙₜₑᵣ

5 Confirm changes and exit dialog: ✓ ⒡₅

■
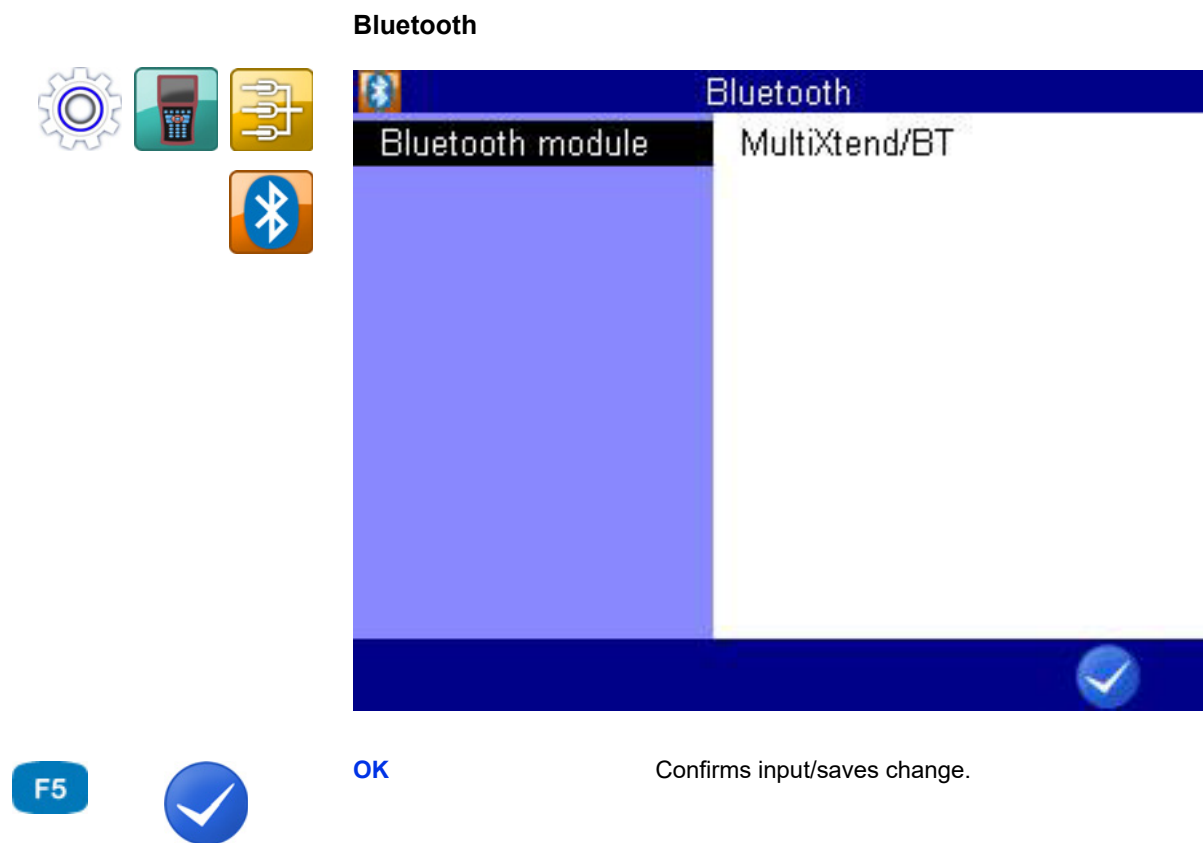
Bluetooth

OK		Confirms input/saves change.

Select a **Bluetooth module**.

General Settings

| F5 | | **OK** | Confirms input/saves change. |

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 4070**. 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 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 **YES**: △▽ 🔵ᴱᴺᵀᴱᴿ

DEU

3 Open the **Unit** dialog entry: △▽ (ENTER)

4 Select the desired unit: △▽ (ENTER)

5 Confirm changes and exit dialog: ✅ (F5)

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

∎

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.

Channel numeration   Select between automatic and manual channel numbering.

➔   **Channel numeration function**

As a standard, the MS 4070 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 Kapitel **Configure measurement channels (Ch1 ... Ch5)** auf Seite 69). 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**.
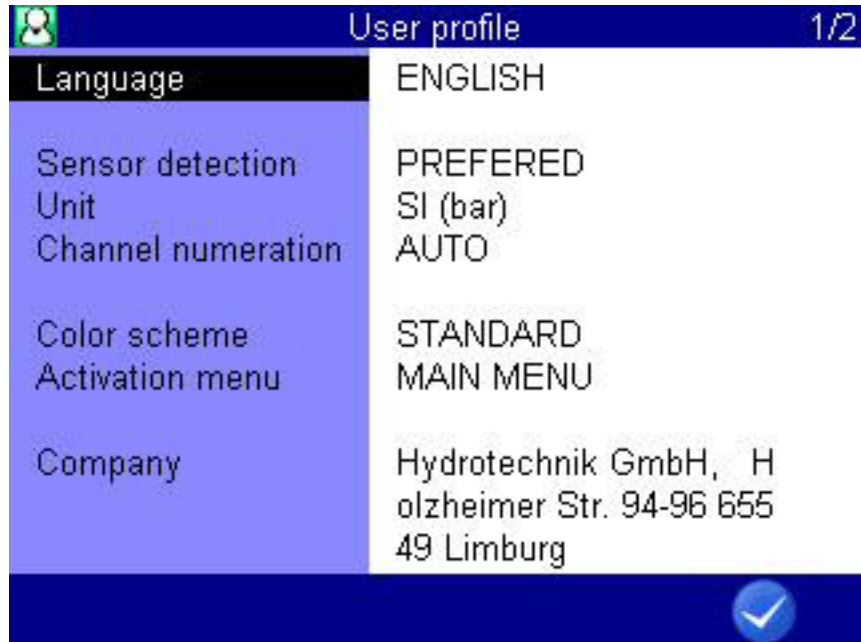
Color scheme   Select the color scheme for the user interface.

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**

DEU

F5   ✓   **OK**   Confirms input/saves change.

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 dialog: ✓ ⟨F5⟩

■

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

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).

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 change.

➔ **Select date format**

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

2   Use △▽ Ⓔⁿᵗᵉʳ to toggle between

•   **DD.MM.YYYY** (day.month.year)

•   **MM/DD/YYYY** (month/day/year)

•   **YYYY.MM.DD** (year.month.day)

■

➔ **Enter date**

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

2   Select the day with ◁▷ △▽ Ⓔⁿᵗᵉʳ.

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 △▽ Ⓔⁿᵗᵉʳ.

2   Use △▽ Ⓔⁿᵗᵉʳ to toggle between

•   **12h**

- **24h**

  ■

➔ **Enter time**

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

2 Enter hour and ⏎.

3 Enter minutes and ⏎.

  ■

Save all changes and exit the dialog with ✔ F5.

Memory medium

Hinweis
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.
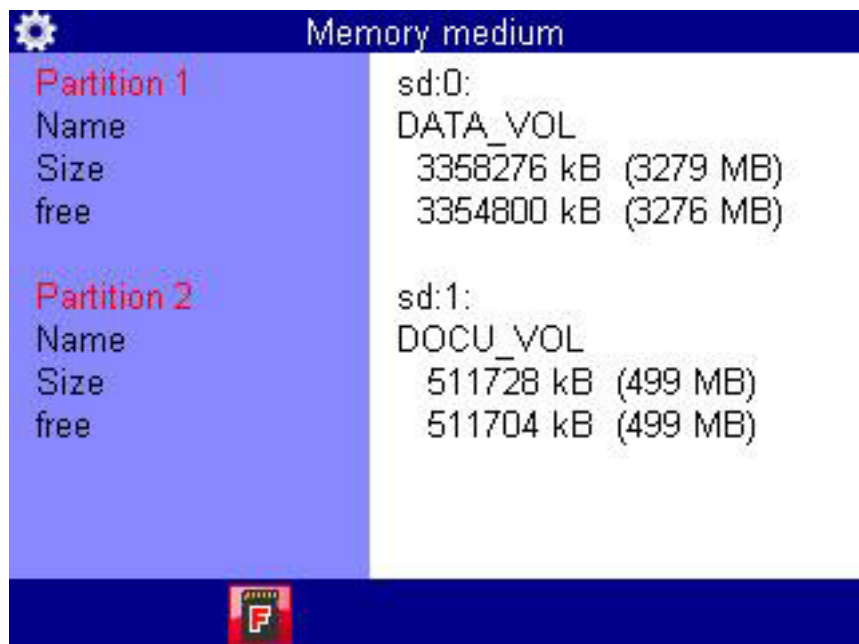
FORMAT	Formats Partition 1 (DATA_VOL).

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

➔ **Lock menus for users**

OK	Confirms input/saves change.

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 dialog: ✓ (F5)

■

Hinweis
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 setting
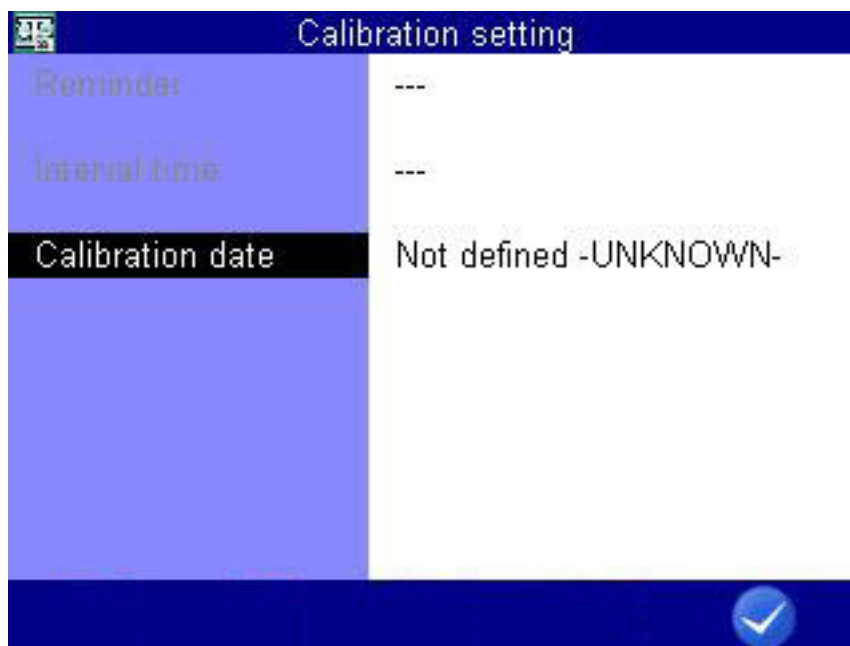
F5	✓	**OK**	Confirms input/saves change.

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.

DEU

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.
Calibration date	Displays the date of the last calibration.
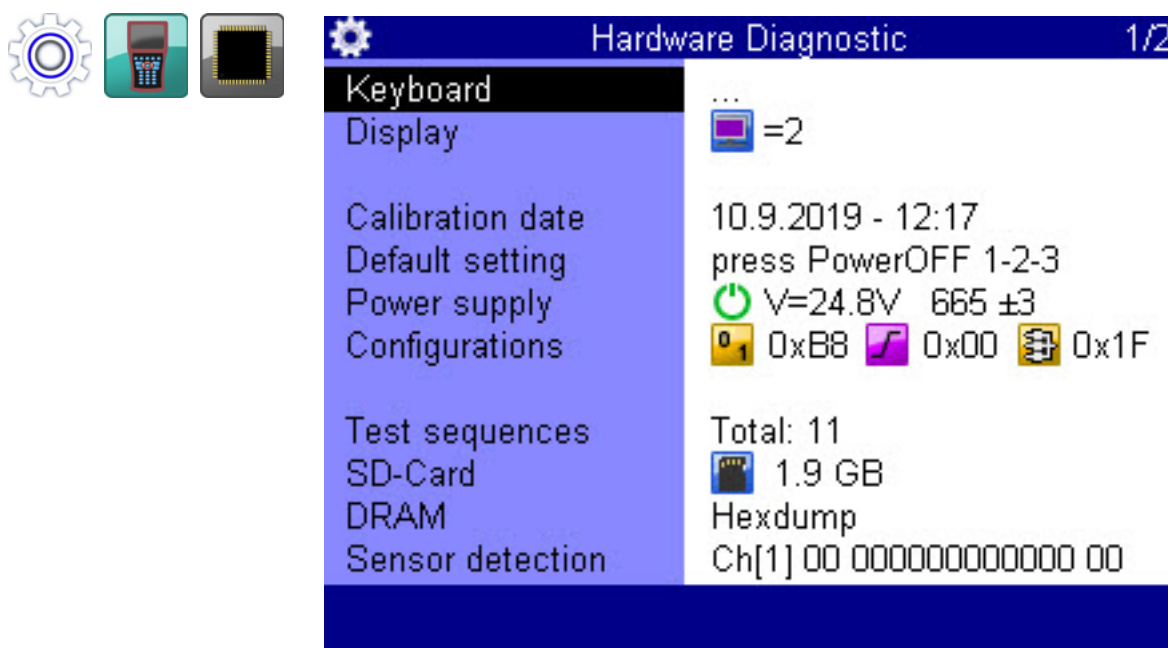
Hardware Diagnostic

OK   Confirms input/saves change.

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

Battery information

Battery information	1/3
Manufacturer access	181h
Remaining capacity/alarm	520 mAh
Remaining time/alarm	10 min
Battery mode	4000h
At rate	0 mA
At rate time to full	----- min
At rate tme to empty	----- min
At rate OK	1
Temperature	24.0 °C
Voltage	7350 mV
Current	-565 mA
Average Current	-566 mA
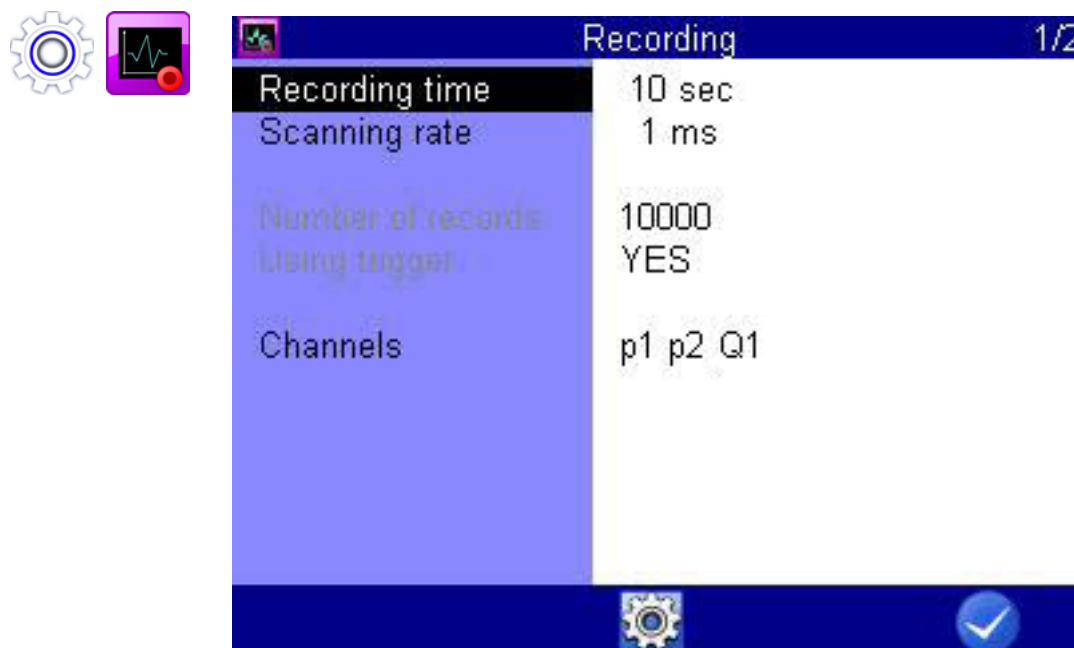
Recording

F3 ⚙	**SETUP**	Opens the **Setup Recording** dialog.
F5 ✓	**OK**	Confirms input/saves change.

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 time; ⏎ enter time value ⏎ – △▽ highlight time interval unit ⏎

Scanning rate

Time distance between two measurements in a series; ⏎ enter time value ⏎ – △▽ highlight time unit ⏎ **Channels** ⓘ

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

All channels marked with a ☑ check mark are stored.

Select a channel and use ⏎ 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

OK	Confirms input/saves change.

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 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 dialog: ✓ (F5)

   ■

➔ **Trigger link**

OK		Confirms input/saves change.

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

1 Select the **Trigger link** dialog entry: △▽ ⓔⁿᵗᵉʳ

2 Select an option: △▽ ⓔⁿᵗᵉʳ

- **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** auf Seite 108.

4 Repeat steps 2 and 3 to define additional triggers.

DEU

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

DEU

Setup Recording

| | | **OK** | Confirms input/saves change. |

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 socket so that it is started when you switch a machine on and recording begins.

Extras

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.

Mode	Convert
Format	CSV
File type	Series (MWF)
Selected	2

Mode	Convert
Format	Series (MWF)
File type	CX197-Series (CX197)
	Oil diagnosis files
	History-File (PHIS)
Selected	History-File (HHIS)
	History-File (LHIS)
	History-File (VHIS)
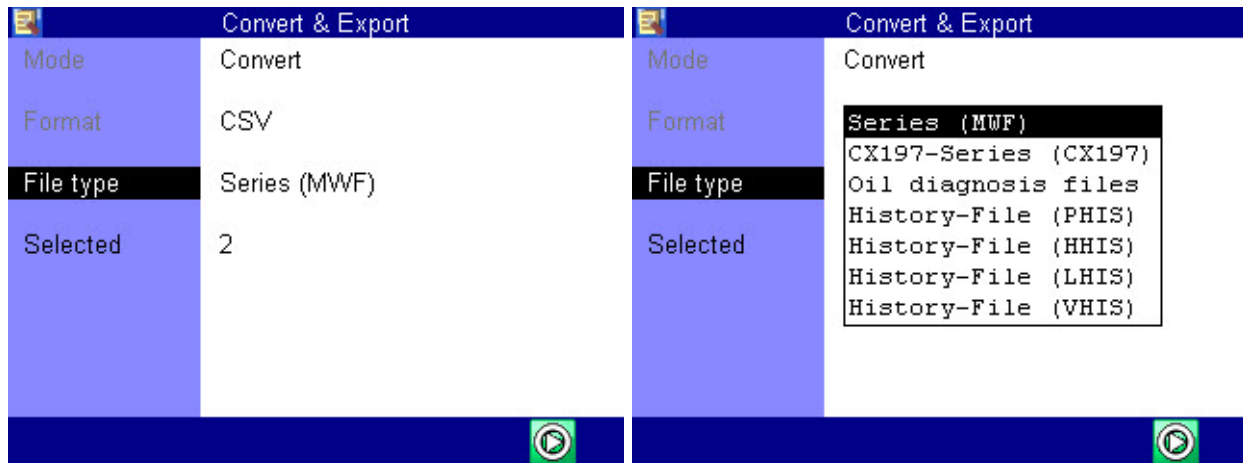
START   Starts converting the selected files to CSV format.

➔ **Convert measurement files into CSV format**

1 Open the **Home** menu: MENU

2 Open the **Extras** 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** auf Seite 114.

8 Start converting: ✓ F5

■

➔ **Select files**

F1	ℹ️	**INFO**	Displays information about the selected object.
			⇨ **Display information on selected file** auf Seite 34
F2	📄	**FILE**	Only for display of measurements.
			Converts the display to file name.
F2	📄 NAME	**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 change.

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

2 Open file selection: ⏎ENTER

3 Select the 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 selection dialog: ✔️ F5

■

DEU

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)

Special functions

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

Linearization table

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

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 dialog: ✓ `F5`

The new table is selected as active.

■

Define CAN channel

DEU

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

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 a name, use [F2] to toggle between the entry of capital and small letters – ⏎ .

7 ⏎ – store the entered name.

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

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 6, 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 6. You may also use **HYDRO**com 6 to combine single bits of a multichannel to one measured value. This allows to collect several measured values using one channel of the MS 4070. Due to the HEX format, a readable display of these measured values in the instrument is not possible.

Examples

Here you save all 32 bits of a multichannel.

Format:	ORIGINAL
Bit offset:	0
Data bits:	32

Here you save data bits 8 to 15.

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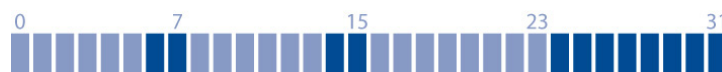
Here you save the data bits 6 to 31. If you do not want to save the "uninterest-ing" bits 8 to 13 and 16 to 23, you will have to assign the multichannel to three special channels and define different settings:

- 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 spec-ifications, you record the measured values of both channels, but they cannot be displayed at the measuring instrument. The decoding will be done later us-ing **HYDRO**com 6.

You need two special channels to display the measured values with the **MultiSystem 4070**.

- 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

Graphic presentation in display menu

After configuring the graphic presentation in the display menu (see Kapitel **Display** auf Seite 81) in the measured values display, the measured values will then look like this, for example:
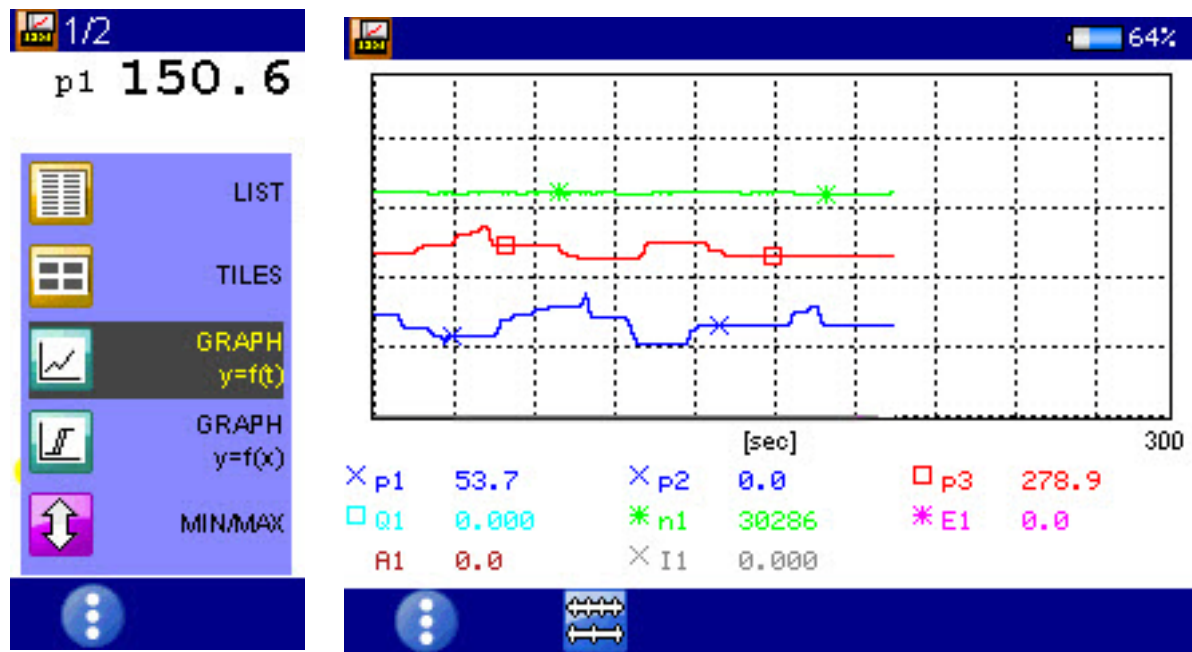
F1 (⋮ button)		Change display ⇨ **Change display** auf Seite 44
F2 (=1,0 button)	**VALUE**	Displays the current measurement values instead of scaling.
F2 (scaling button)	**SCAL**	Displays scaling instead of the current measurement values.

- 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.

DEU

Coupling of several instruments

You can couple several **MultiSystem 4070** 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.

> ℹ️ You can also couple **MultiSystem 4070** instruments with **MultiSystem 5060 Plus** instruments.

Connecting a measuring instrument electrically

Hinweis
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-D8-04.00 and couple the instruments serial or parallel:

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

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).

Program instruments

Program the 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.

ℹ **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.

Connecting MultiXtend A and T

You can use the MultiXtend A and T instruments to connect additional analog sensors or thermocouples to the **MultiSystem 4070**. Their signals are digitalized by the 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 4070:

• Enable CAN bus
• Program CAN channels
• Activate MultiXtend power supply
• Start the MultiXtend

Enable CAN bus
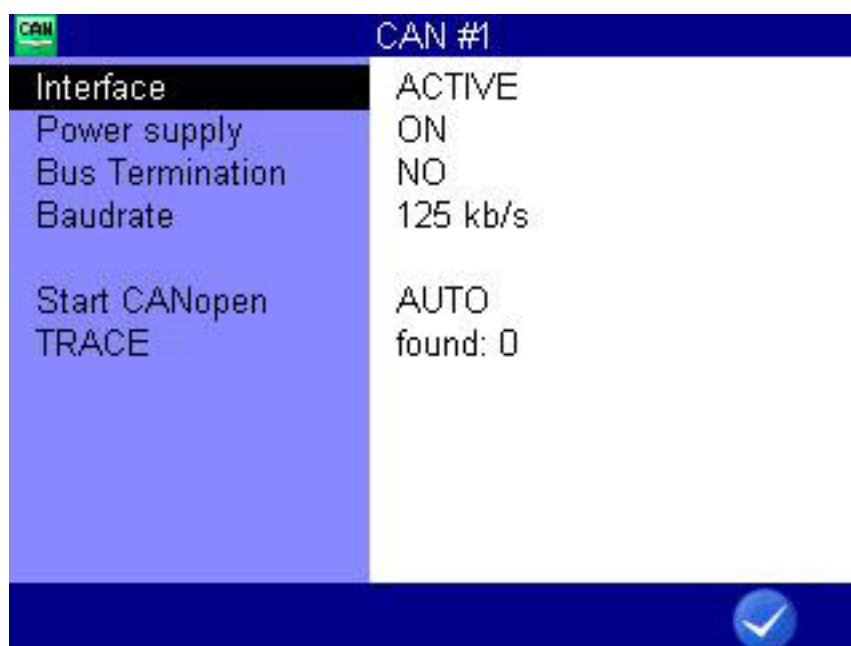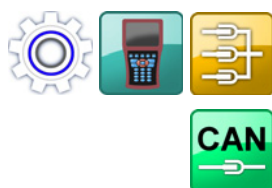
OK	Confirms input/saves change.

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

Hinweis
Malfunctions possible!
Make sure that the 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** dialog: ◁▷ △▽ ENTER

3 Select **Interface**: △▽

4 Set to **ACTIVE**: ENTER

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

6 Select the desired baud rate: △▽ ENTER

7 Confirm changes and exit dialog: ✓ F5

■

Program CAN channels

Observe the information in chapter **Define CAN channel** auf Seite 118.

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 4070**, for example, channels 13 to 15.

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

Activate MultiXtend power supply

The **MultiXtend** can either be supplied by its own power pack, or by the MS 4070 (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 dialog: ✓ F5

■

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Start the MultiXtend

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

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

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 the MultiXtend: F3

■

Viscosity-compensated volume flow rate measurement

| F3 | | **SAVE** | Stores the current sensor parameters in the database. |
| F5 | | **OK** | Confirms input/saves change. |

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.

Temperature measurement	Program one measurement channel for temperature measurement. You can find additional information under Kapitel **Configure measurement channels (Ch1 ... Ch5)** auf Seite 69.
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 ⏎ to switch it to **ACTIVE**.

Further options will be displayed:

Channel (Ch4)	1/2
Measurand	Q
Index Measurand	1
Unit	l/min
Channel name	
Signal type	FRQ
Viscositycompens.	ACTIVE
Temp.-Measuring	NO
Parameter oil	
v- Viscosity	0.00
Gate time	0001 (*10 ms)
Min.Frequency	0.25 Hz

F3	**SAVE**	Stores the current sensor parameters in the database.
F5	**OK**	Confirms input/saves change.

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 to switch it on.

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

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

Selection of the oil in use

```
                    Oil database              1/6
01:    OMV hyd HLP 10
02:    Tellus HLP 22
03:    Tellus HLP 32
04:    Tellus HLP 46
05:    Tellus HLP 68
06:    Tellus HLP 100
07:    HLP 10  (+Zn)
08:    HLP 15  (+Zn)
09:    HLP 22  (+Zn)
10:    HLP 32  (+Zn)
11:    HLP 46  (+Zn)
12:    HLP 68  (+Zn)
```

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

LOAD	Loads sensor parameters from the database.
SAVE	Stores the current sensor parameters in the database.
OK	Confirms input/saves change.

If desired, you can program a virtual channel (see Kapitel **Configure special channels (Ch8 ... Ch17)** auf Seite 73) 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.

Reprogram CAN parameters

CANopenTool	
Selection	3/4 HySense TE-126
Node ID	37 (0x25)
Serial-No	305419896 (0x12345678)
Baudrate	125 kb/s
Heartbeat	1000 ms
NMT Startup	Preoperational Mode (0x2)
Identifier	TPDO1: 421 (0x1A5)
Mapping parameter	950ms TIMER (0xFE)

SCAN Scans the CAN bus for messages.

INFO Displays information about the selected object.

⇨ **Display information on selected file** auf Seite 34

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.

> **Hinweis**
>
> The **CANopen tool** searches for connected CANopen sensors with node IDs between 1 and 127 on the CAN bus 1.

➔ **Find connected CANopen instruments**

1 Open the **Home** menu: MENU

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

3 Open the **CANopen Tool** menu: ◁▷ △▽ ENTER

4 Scan CAN bus 1 for CANopen instruments: F1

■

Selection Select one of the node IDs of the CANopen instruments.

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 4AI 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.

> ℹ️ 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.

Favorites

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

	Favorite	⇨ **Favorites** auf Seite 25
	Overview series	**Series of measurements** > **Overview series** ⇨ **Overview series** auf Seite 50
	Show series	**Series of measurements** > **Show series** ⇨ **Show series** auf Seite 51
	Delete series	**Series of measurements** > **Delete series** ⇨ **Delete measuring data** auf Seite 33 ⇨ **Delete series** auf Seite 64
	Search series	**Series of measurements** > **Search series** ⇨ **Search series** auf Seite 65
	Overview configuration	**Configurations** > **Overview configuration** ⇨ **Configurations** auf Seite 48
	Save configuration	**Configurations** > **Save configuration** ⇨ **Save a new configuration** auf Seite 48
	Load configuration	**Configurations** > **Load configuration** ⇨ **Load a saved configuration** auf Seite 49
	Delete configuration	**Configurations** > **Delete configuration** ⇨ **Delete a saved configuration** auf Seite 49
	Oil condition	**Special applications** > **Oil condition** ⇨ **Special applications** auf Seite 149

	Load valve	**Special applications** > **Load valve**
		⇨ **Special applications** auf Seite 149
	Patrick	**Special applications** > **Patrick**
		⇨ **Special applications** auf Seite 149
	Measuring section CX197	**Special applications** > **Meas. section CX197**
		⇨ **Special applications** auf Seite 149
	Test sequences	**Special applications** > **Test sequences**
		⇨ **Special applications** auf Seite 149
	Channels	**Settings** > **Channels**
		⇨ **Enter sensor parameters** auf Seite 30
		⇨ **Channels** auf Seite 68
	Display	**Settings** > **Display**
		⇨ **Display** auf Seite 81
	Start recording	**Start recording**
		⇨ **Start recording** auf Seite 42
	Device	**Settings** > **Device**
		⇨ **Device** auf Seite 87
	All channels	**Settings** > **Channels** > **All channels**
		⇨ **Enter sensor parameters** auf Seite 30
		⇨ **Channels** auf Seite 68
	Analog channels	**Settings** > **Channels** > **Analog channels**
		⇨ **Configure measurement channels (Ch1 ... Ch5)** auf Seite 69
	Frequency channels	**Settings** > **Channels** > **Frequency channels**
		⇨ **Configure measurement channels (Ch1 ... Ch5)** auf Seite 69
	Digital channels	**Settings** > **Channels** > **Digital channels**
		⇨ **Configure digital signal input (Ch6)** auf Seite 71
		⇨ **Configure digital signal output (Ch7)** auf Seite 71
	Calculation channels	**Settings** > **Channels** > **Calculation channels**
		⇨ **Configure special channels (Ch8 ... Ch17)** auf Seite 73
		⇨ **Possible assignments of the special channels** auf Seite 74
		⇨ **Calculations with formulas** auf Seite 76
	CAN channels	**Settings** > **Channels** > **CAN channels**
		⇨ **CAN configuration** auf Seite 89

	Channel extension	**Settings** > **Channels** > **Channel extension**
		⇨ **Channel extension** auf Seite 79
	Date/Time	**Settings** > **Device** > **Date/Time**
		⇨ **Set date and time** auf Seite 29
		⇨ **Date/Time** auf Seite 100
	User profile	**Settings** > **Device** > **General Settings**
		⇨ **Select operating language** auf Seite 27
		⇨ **General Settings** auf Seite 95
	Info	**Settings** > **Device** > **Info**
		⇨ **Info** auf Seite 99
	Connections/port	• **Settings** > **Device** > **Connections**
		⇨ **Connections** auf Seite 88
		• Opens selection dialog for CAN connection
	Memory medium	**Settings** > **Device** > **Memory medium**
		⇨ **Memory medium** auf Seite 101
	Security	**Settings** > **Device** > **Security**
		⇨ **Security** auf Seite 102
	Calibration setting	**Settings** > **Device** > **Calibration setting**
		⇨ **Calibration setting** auf Seite 103
	Hardware Diagnostic	**Settings** > **Device** > **Hardware Diagnostic**
		⇨ **Hardware Diagnostic** auf Seite 104
	CAN #1	**Settings** > **Device** > **Connections** > **CAN #1**
		⇨ **CAN #1** auf Seite 89
	USB (DEVICE)	**Settings** > **Device** > **Connections** > **USB (DEVICE)**
		⇨ **USB (DEVICE)** auf Seite 92
	LAN/WLAN	**Settings** > **Device** > **Connections** > **LAN/WLAN**
		⇨ **LAN/WLAN** auf Seite 93
	Bluetooth	**Settings** > **Device** > **Connections** > **Bluetooth**
		⇨ **Bluetooth** auf Seite 94
	COM #1	**Settings** > **Device** > **Connections** > **COM #1**
		⇨ **COM #1** auf Seite 91

Convert and Export **Extras** > **Convert and Export**
⇨ **Convert and Export** auf Seite 113

CANopen Tool **Extras** > **CANopen Tool**
⇨ **Reprogram CAN parameters** auf Seite 136

HOLD Only permissible as softkey.
"Freezes" the measured values display.

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Softkeys: Symbols/text

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

⇨ See **User-defined softkeys** auf Seite 26.

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.

	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.

Icon	Name	Description
ALL	**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	Measured values display, Graphic presentation: Displays scaling instead of the current measurement values.
	VALUE	Measured values display, Graphic presentation: Displays the current measurement values instead of scaling.
	OK	Confirms input/saves change.
	INFO	Displays information about the selected object. Displays a preview for saved screenshots. ⇨ **Display information on selected file** auf Seite 34
	DISPLAY	Displays the selected measurement.

	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

DEU

> ⚠ **Vorsicht**
>
> **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.

> ⚠ **Vorsicht**
>
> **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 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 recalibrated regularly. If the instrument is in frequent use, we recommend recalibrating it every 2 years.

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:

Special applications
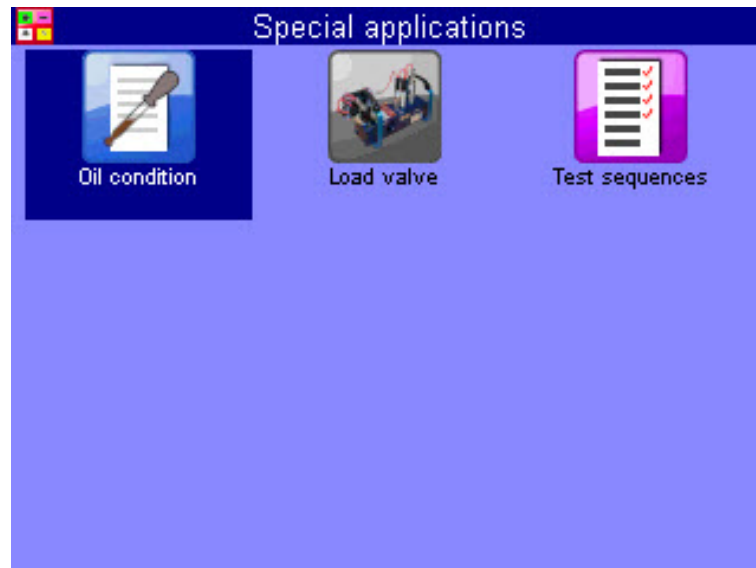
This submenu contains several functions which enhance the functionality of the MS 4070 or which are required for the operation of external devices.

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