

MultiSystem 5060



Universal Portable Measuring System Operating Instructions Manual

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Firmware Version 5.4a
TKZ L3160-00-70.00EN

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1 Safety

1.1 General Safety Advice and Warning Hints



- Never cut, damage or modify the connection cables of the power pack and do not place things on it.
- Never touch the power pack with wet or moist hands. Only connect the power pack to power supplies for which it is suited (see technical data).
- Unplug the mains cable during a thunderstorm, or if you determine smoke or smell, or if the mains cable is damaged.
- Assure sufficient grounding of your installations. Inadequate grounding may lead to measuring peaks.

1.2 Hints for the use of the MultiSystem



- Never expose the instrument to excessive heat or moisture; obtain the technical data.
- Do not store the instrument in humid or dusty locations or at temperatures below freezing point.
- Never dip the instrument into water or other liquids. Never let liquids come into the instrument.
- Never open the instrument and do not use it, after it fell down or the housing is damaged.
- Avoid strong magnetic fields. Keep distance of electric motors or other instruments that generate electro-magnetic fields. Strong magnetic fields may cause malfunctions and influence measuring values.
- Avoid the formation of condensed water. If condensed water has formed you should let the instrument acclimate before you switch it on. Otherwise it could be damaged.

1.3 Hints for the use of sensors and cables

- Protect the sensors from exceeding the allowed power range, mechanical overload and wrong pin assignment.
- Assure to 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 into the measuring instrument during switch-on procedure. If you connect new sensors, you will have to switch the instrument off and on.

1.4 Hints for the use of batteries



- Keep batteries away from heat sources and open fire.
- Never dip batteries into water.
- Never short-circuit the contacts of batteries.
- Never dismount, repair or modify batteries.
- Use only batteries that are mounted or delivered by Hydrotechnik.
- Load only the battery while it is mounted in the instrument.
- Used batteries are special waste. Cover the contacts with insulation tape.

1.5 Hints for the connection of printers



The measuring instrument supports printers with USB interface. Because of the great varieties of printers in the market, it is not possible to support all of them. Additionally, the basic USB specifications are not fulfilled and maintained completely by all manufacturers. This is why Hydrotechnik guarantees the full support of the printer "PIXMA iP 4200" of Canon Inc., only. Please ask our customer service, whether your printer is supported.

2 Introduction

Important

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



2.1 Range of validity

The manual on hand is valid for measuring instruments named "MultiSystem 5060". It addresses to the operator of this instrument, that means the person, who works with the instrument.

The manual is not a technical manual. Please contact our service staff for questions, that exceed the contents of this manual.

2.2 Copyright

The measuring instrument and this manual are protected on copyright. Manufacture without license will be prosecuted by law. All rights reserved on this manual, even the reproduction and/or duplication in any thinkable form, e.g. by photocopying, printing, on any data recording media or translated. Reproduction of this manual is only permitted with a written approval of Hydrotechnik GmbH.

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

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

2.3 Limitation of liability

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

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

We are not responsible for damages at installations and systems in the surroundings of the product, which are caused by a fault of the product or an error in this manual.

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

We are not liable for damages, which result from improper operation according to this manual. We are not liable for missed profit and for consecuting damages due to non regardance of safety advice and warning hints. We don't accept liability for damages which result from the use of accessoires which are not delivered and/or approved by Hydrotechnik GmbH.

The products of Hydrotechnik GmbH are designed for a long life. They represent the standard of technique and science and were checked on all functions individually before delivery. The electrical and mechanical construction corresponds to the current norms and regulations. Hydrotechnik GmbH is doing product and market research for the further development and permanent improvement of their products.

In case of faults and/or technical trouble please contact the Hydrotechnik GmbH service staff. We assure that suitable measures will be taken immediately. Hydrotechnik GmbH guarantee regulations are valid, which we will send to you on demand.

2.4 Use as agreed

The measuring instrument "MultiSystem 5060" is a mobile, hand-held instrument for the recording, storage and evaluation of measurement 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 as not agreed.

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 are pleased to help you.

2.5 Warranty regulations

In accordance to our warranty regulations we guarantee the condition without defects for this measuring instrument for a duration of six months. Wearing parts and storage batteries are excepted from this warranty. The warranty is spoiled if repair work or interventions are executed by unauthorized persons.

Within the warranty period we repair damage or defects which are caused by a manufacturing fault. We only accept warranty claims if they are reported to us immediately after their discovery, but latest six months after delivery. The warranty benefit is by our choice through repair of defective parts or replacement by intact parts.

Send your instrument with an invoice copy or delivery note copy to Hydrotechnik. The address is mentioned at the end of this manual.

2.6 Obligations to the customer

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

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

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

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

2.7 Authorized staff

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

Operator of the instrument

Persons are authorized if they are trained in the operation of the instrument and have read and understood this manual completely.

Personell for installation and maintenance

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

3 Description of the measuring instrument

3.1 Qualities of the MultiSystem 5060

The MultiSystem 5060 is a practice-oriented, user-friendly hand-held measuring instrument supporting the user in the daily measuring functions.

When using ISDS sensors, the MultiSystem automatically detects the connected sensors during initialisation and stores all parameters: measuring range, physical measurand, measuring unit, signal output and characteristic curve (linearisation). A confusion of the sensor and the entry of specific sensor data are things of the past.

You can connect sensors without ISDS designation to the MultiSystem 5060. The entry of the sensor parameters is then done in clear operation menus.

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

You can connect up to eight sensors and store all measured values. Calculations from the measured values as difference, sum and performance, and a first differentiation (e.g. speed from distance) are available as additional special channels for display and storage.

The buffering of extreme values of the minimum and maximum measurands is always active and can be displayed by a few key pressures.

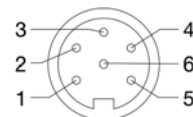
3.2 Connectors



- 1 Input Ch1 – analog input highspeed
- 2 Input Ch2 – analog input highspeed
- 3 Input Ch3 – analog input
- 4 Input Ch4 – analog input
- 5 Input Ch5 – analog input
- 6 Input Ch6 – analog input
- 7 Input Ch7 – frequency input
- 8 Input Ch8 – frequency input
- 9 USB – host interface
- 10 USB – device interface
- 11 Combi-jack CAN/Bootloader
- 12 Power supply – power pack
- 13 Digital input and output

3.2.1 Characteristics of highspeed analog inputs

Number	2 (Ch1, Ch2)
Signal input	switchable 0/4 ... 20 mA; 0/2 ... 10 V; ± 10 V; 0,5 ... 4,5 V; 1 ... 5 V
Resolution	13-bit analog/digital converter (12-bit + sign)
Measuring rate	0.1 ms = 10 kHz
Filter function	input filter 50 kHz (dynamic mode)
Hardware filter	switchable: 5 kHz (standard mode) / 50 Hz (damped mode)
Software filter	adjustable: mean value filter 1... 16 ms
Connector	6 pol. device plug
Prot. type	IP40



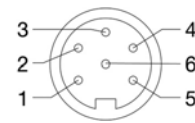
Pin assignment

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

Ub*: power supply during mains operation 24 V

3.2.2 Characteristics of analog inputs

Number	4 (Ch3, Ch4, Ch5, Ch6)
Signal input	switchable 0/4 ... 20 mA; 0/2 ... 10 V; ± 10 V; 0,5 ... 4,5 V; 1 ... 5 V
Resolution	13-bit analog/digital converter (12-bit + sign)
Measuring rate	10 kHz
Filter function	input filter 5 kHz (standard mode)
Hardware filter	switchable: 50 Hz (damped mode)
Software filter	adjustable: mean value filter 1... 16 ms
Connector	6 pole device plug
Prot. type	IP40



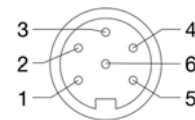
Pin assignment

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

Ub*: power supply during mains operation 24 V

3.2.3 Characteristics of frequency inputs

Number	2 (Ch7, Ch8) frequency/counter inputs with switchable direction detection
Signal input	5 – 30 VDC, 0.25Hz – 10 kHz
Filter function	adjustable period measurement for averaging
Connector	6 pole device plug
Prot. type	IP40



Pin assignment

Pin	Function	Ri.	Ci.	Limitation	Protection type
1	Frequency signal	4.75 kΩ	1 nF	33 V DC	VDR Transil diode
2	Ground				
3	Ub*			100 mA	PTC
4	Direction signal	4.75 kΩ	1 nF	33 V DC	VDR Transil diode
5	Shield				
6	ISDS				

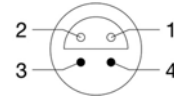
Ub*: power supply during mains operation 24 V

3.2.4 Characteristics of digital trigger input

Pins of the digital input/output; the trigger input is isolated.

Pin assignment

Pin	Function	Ri.	Ci.	Limitation	Protection type
3	Signal	4.75 kΩ	1 nF	33 V DC	VDR Transil diode
4	Ground				



Attention

Possible damage to the instrument!

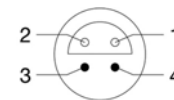
This input may not be connected directly to inductive loads (e.g. coil of a magnetic valve). Otherwise the instrument may be damaged.

3.2.5 Characteristics digital signal output

Jacks of the digital input/output.

Pin assignment

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

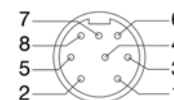


3.2.6 Characteristics combi-jack CAN/Bootloader

8-pin Mini-DIN

Pin assignment

Pin	Function
1	Ground
2	Ub* (power supply CAN sensor), max. 80 mA at mains operation
3	+5 V (for power supply of Bootload-Adaptor)
4	CAN_H
5	TXD for Bootloader
6	RTS for Bootloader
7	CAN_L
8	RXD for Bootloader



Ub*: power supply during mains operation 24 V



Attention

Possible damage to external devices!

A voltage of +5 Volt is present at pin 3. This is used to supply the Bootload-Adaptor of Hydrotechnik. Please consider this when doing individual wirings.

3.2.7 Characteristics USB interfaces

USB type A: host interface








Function	Designation	Remarks
Signal D+	green	twisted cable
Signal D-	white	twisted cable
VCC	red	5 V, max. 75 mA
Mass	black	–

USB type B: device interface

Function	Designation	Remarks
Signal D+	green	twisted cable
Signal D-	white	twisted cable
VCC	red	delivers max. 500 mA from host for terminal equipment power supply (not used by MS 5060)
Mass	black	–

3.3 Display



























The instrument is equipped with a color monitor where all information and measured values are displayed. Graphical presentations can be configured individually. Several information can be displayed as icons in the bottom line of the monitor:

	Storage indicator	indicates a running storage
	red indicator	pretrigger storage
	green indicator	trigger event not happened yet
	yellow indicator	storage
	Timer	timer triggering; the remaining time until the trigger event is displayed beside the icon
	Printer	printer detected at USB interface (host)
	Highspeed	hardware filter set for peak pressure measurements to 10 kHz (highspeed mode)
	USB	instrument is connected to a PC via the USB interface (device)
	Battery	loading state of the battery; when the icon turns red and start flashing, the batteries should be charged immediately
	Power pack	instrument power supply with external power pack; batteries are charged

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

3.4 Keyboard

The MS 5060 is equipped with a valuable membrane keyboard that is insensitive to humidity and dirt. The 26 keys are occupied as follows:

	Function key 1		Input 3 or DEF
	Function key 2		Input 4 or GHI
	Function key 3		Input 5 or JKL
	Function key 4		Input 6 or MNO
	Function key 5		Input 7 or PQRS
	Switch instrument on		Input 8 or TUV
	Switch instrument off		Input 9 or WXYZ
	Highlight upward		Input 0 or space*
	Cursor / page to the left		Input hyphen or point
	Cursor / page to the right		Open main menu; within a menu: switches to the second occupation of the function keys
	Highlight downward		Cancel input without storing
	Input 1		Store input
	Input 2 or ABC		Delete single digit

*: use the key "0" to enter special digits, e.g. () * / @ ° ...



3.5 Evaluation software

The evaluation software **HYDRocom** is part of the delivery. After transmitting the measuring data to a PC, you can use this software to evaluate, process and present the data graphically.

3.6 Technical data

Casing	ABS plastic
Weight	1.1 kg
Protection type	IP40
CE-conformity	EN 50 081-1 and EN 50082-1 – RoHS
Internal power supply	NiMh-batteries, 14.4V / 2,150 mAh
External power supply	24 V DC / 630 mA
Dimensions	270 x 137 x 67 mm (L x W x H)
Interfaces	USB 2.0, CAN
Ambient temperature	-10 °C – 50 °C
Relative humidity	0 – 85% (not condensing)
Storage temperature	-20 °C – 60 °C
Measured value display	5-digit
Trigger	2 channels as start/stop, or with the connections AND or OR; time trigger
Scan rate	selectable between 100 µsec and 10 min
Measuring rate	Analog inputs 0.1 ms (10 kHz) Frequency inputs 0.25 Hz to 10 kHz
Measured value memory	SD-card 128 MB, max. 200 series of measurements, max. 8MB per series of measurements (2 million values)
Error limits	analog ± 0.15% of final value digital ± 0.02 % of measured value (resolution 20 ns)

4 Startup

4.1 Check delivery

The measuring instrument is delivered by Hydrotechnik and transported by suited shipping companies. At the time of delivery 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 demands against the shipping company you should document all possible transportation damage (e.g. by taking photos and signing a written protocol), before you put the instrument into operation.

Hydrotechnik is not responsible for transportation damage and will take no liability.

4.2 Range of delivery

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

- Measuring instrument MultiSystem 5060, 3160-00-70.00
- CD with software **HYDROcom**, 8874-16-00.01
- Power pack, 230 VAC / 24 VDC, 625 mAh, 8812-20-02.00
- USB data transmission cable, 8824-F8-01.50

Check the range of delivery in accordance to the delivery note and the order documents. Report differences instantly to Hydrotechnik. Later claims on incomplete delivery cannot be accepted.

4.3 Charge batteries



Attention

Battery performance endangered!

Charge the instrument batteries for 14 to 16 hours before you put the instrument into operation. Otherwise there is the danger of excessive discharge, which would influence the battery performance negatively.



Note

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

The instrument is equipped with an internal battery. This is pre-charged by Hydrotechnik and must be charged for at least 14 to 16 hours, before the instrument can be used.

Hints for the treatment of the batteries

The life cycle of NiMH cells can be very long, but it depends on the conditions of use. Avoid a complete discharge, continuous charging and immediate re-charging after every use. This triggers the memory effect with a minimization of the battery capacity and possible remanent damage. You can regenerate the battery by several discharge and charge cycles.

In case of low battery power a hint "Load batteries" will be displayed. In this case you should maintain a 16 hour charging time. In case of longer periods without use you should discharge and charge the batteries monthly.

5 Operation

In this section you get all information on the daily use of the measuring instrument. The following operations are explained:

- Switch the instrument on and off
- Select operation language
- Connect sensors
- Program sensor parameters
- Collect measurement data
- Connect a PC
- Delete measurement data
- Reset instrument

At the end of this chapter you will find a complete description of the instrument software with a chronological explanation of all menus.



Note

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



Note

If keys of the measuring instrument are mentioned in the text of the following sections, they will be printed in [square] brackets. [Menu] therefor means the menu key.

5.1 Switch the instrument on and off



Important

Assure before switching on that the desired sensors are connected appropriately (see section 0 on page 14).

Switch on:

ON (> 2 sec.)

Wait until measured value display appears after initialisation

Use instrument

Switch off:

OFF (> 2 sec.)

p1	1.2	0.1 5.4
p2	2.0	0.2 3.2
p3	0.0	0.0 0.0
p4	3.1	1.0 4.4
p5	-1.5	-2.5 0.3
p6	-0.8	-1.5 -0.5

09:31
MEAS.V DELETED HOLD



Note

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

5.2 Select operation language

Display function:

Menu ▾ ▾ ▾ ENT ENT

Do selection:

△ ▾

Confirm selection:

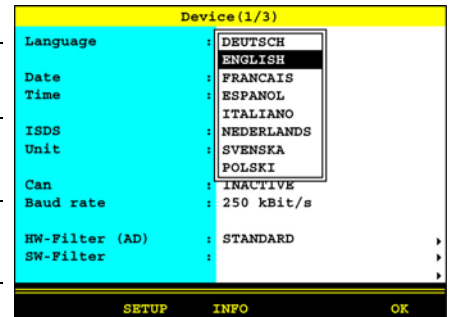
ENT

Store changes:

F5

Return to measuring value display:

ESC



5.3 Set date and time

Display function:

Menu ▾ ▾ ▾ ENT ▾ ENT

Enter date:

2 ABC 6 MNO ENT 0 LJ 6 MNO ENT 2 ABC 0 LJ 0 LJ 6 MNO ENT

Change to time entry:

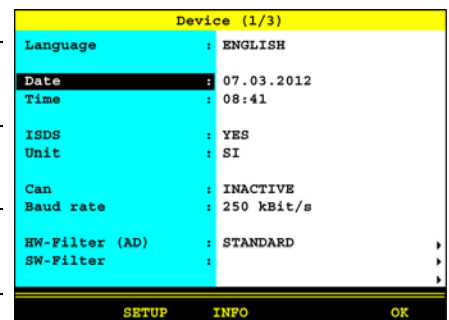
▾ ENT

Enter time:

1 3 DEF ENT 2 ABC 2 ABC ENT

Save changes:

F5



5.4 Connect sensors

1. Switch the instrument off.
2. Connect the desired sensors to the inputs (see section 3.2 on page 7).
3. Switch the instrument on.

5.5 Enter sensor parameters



Note

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.



Note

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 of the calibration protocol of your sensor.

Open channel menu:

Highlight channel:

Start programming:



Highlight menu item:

Select menu item:



Highlight setting:

or enter value, e.g. 12.5:

Confirm setting or value:



Save changes:



Channels (1/2)			
K1:	p1	0/20mA	0/200
K2:	p2	0/20mA	0/200
K3:	p3	0/20mA	0/600
K4:	p4	0/20mA	0/600
K5:	p5	0/20mA	0/600
K6:	p6	0/20mA	0/600
K7:	Q1	m.R.	1000
K8:	n1	o.R.	60
K9:	Trigger input		
K10:	Trigger output		
K11:	dpl K1-K2		
K12:	-		

Channel 1	
Measurand	: p (bar)
Index variable	: 1
Name	:
Signal type	: 0/20 mA
Meas. range	: 0.000 600.0
Zero point	: 0.0
Linearisation	: NO

HELP LOAD SAVE OK

Available measurands

The instrument is able to process ~ 40 different measurands like pressure, volume flow rate, temperature and rotational speed. Assure to select the measurand and unit in accordance to the sensor.

Index variable

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

Name

You can assign an individual name to each channel.

Signal types

Select between „0/20 mA“ – „4/20 mA“ – „0/10 V“ – „± 10 V“ – „0,5/4,5 V“ – „1/5 V“ – „2/10 V“.

Measuring range

Enter the beginning and end of the measuring range and confirm with .

Zero point

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

Linearisation

If a calibration table is available for the connected sensor, you can enter it here, after selecting "YES" at the menu item "Linearisation". Please see section 7.1 on page 44 for more information.

Help

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

Load

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

Save

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

5.6 Collect measuring data

Data are collected in series of measurements that can be configured in the memory menu.

Select function:

Menu **ENT**

Do selection:

ENT

Confirm selection:

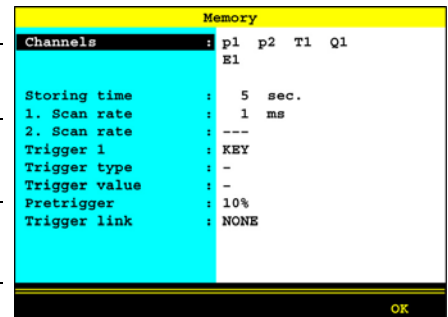
ENT

Store changes:

F5

Return to main menu:

ESC



Channels

Activate the channels where the measurement data shall be stored.

Storing time

Enter how long the measurement data shall be stored. Select the desired time unit.

1st scan rate

Define how often the measurement data shall be stored. Select the desired time unit.



Note
Storing time and scan rate define, how often and how long measurement data shall be stored. Be aware that if you store too many measurement data, the later evaluation and presentation will become more difficult.

2nd scan rate

If you want to record certain channels with a reduced scan rate (e.g. temperature), you can enter a multiple of the 1st scan rate here. Then you can assign the 2nd scan rate to these channels in the channel selection list.

Trigger 1

A trigger is a condition that has to happen to make the storing of measurement data start or stop. In this case, no trigger is defined. Please see section 6.3.3 on page 22 for further information on how to use the trigger function.

5.7 Connect PC and transfer measurement data



Note

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

1. Switch on measuring instrument and PC.
2. Plug the USB cable into the connector at the side of the measuring instrument.
3. Plug the USB cable into a USB plug at your PC.
4. Wait until the measuring instrument has been detected by the PC.
5. Execute the data transfer like described in the software manual.

5.8 Delete measurement data

Select function:

Menu **F3**

Delete single or all series of measurements:

△ ▽ **ENT**

Select series of measurements (only when "Delete single"):

△ ▽ **ENT**

Trigger deletion:

F5

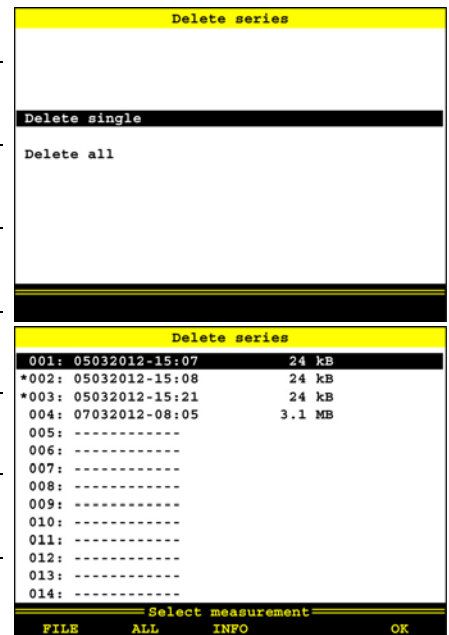
Confirm deletion:

F2

Return to main menu:

ESC

In the shown example, the series of measurement 004 and 005 has been selected for deletion already, a (*) is displayed beside of them. Pressing **F3** displays information on the highlighted series of measurement.



5.9 Print measurement data



Note

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

Open presentation menu:

Menu **F2**

Select series of measurement:

ENT **△** **▽** **ENT**

Select presentation type (output):

▽ **ENT** **△** **▽** **ENT**

Select channels:

▽ **ENT** **△** **▽** **ENT**

Select size:

▽ **ENT** **△** **▽** **ENT**

at size "Clipping":

enter time limits "From" and "To"

Start printing:

F1

Presentation	
Meas. series	: 060706-124 1
Output	: TABLE
Channels	: plp2p5Q1E1
Size	: CLIPPING
from	: 2.000 [sec]
to	: 12.50

PRINT SHOW INFO SETUP OK

5.10 Reset instrument



Important

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

Switch instrument off:

OFF (> 2 sec.)

Switch instrument on:

ON (> 2 sec.)

Wait until the beginning of the initialisation is displayed; then press:

1 **2** **3**
ABC DEF

Confirm resetting:

F2

A green message window will be displayed where the data storage is confirmed.

6 Operation software

The software will be explained chronologically on the following pages.

6.1 Display of the measured values

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

You can choose from two different displays of the measured values:

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

p1	1.2	0.1 5.4
p2	2.0	0.2 3.2
p3	0.0	0.0 0.0
p4	3.1	1.0 4.4
p5	-1.5	-2.5 0.3
p6	-0.8	-1.5 -0.5

09:31
MEAS.V DELETE HOLD

6.1.1 Measured values with MinMax

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

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

p1	1.2	bar
p2	2.0	bar
p3	0.0	bar
p4	3.1	Nm
p5	1.5	Nm
p6	-0.8	bar

09:32
MINMAX HOLD

6.1.2 Measured values with their units

Rechts neben jeder Messwertanzeige wird die Maßeinheit angezeigt.

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



Hint

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

6.2 Menu

- Menu** opens the menu; all functions of the MS 5060 are controlled starting here

6.2.1 Available submenus

Channels	configuration of measuring channels
Display	settings of the measured values display
Memory	configuration of several memory parameters
Device	basic configurations of the instrument
Projects	management of complete sets of device settings
Special Applications	functions for the operation of optional features (e.g. CAN, automatic test sequences, particle counter, load valve, ...)

Menu			
Channels			
Display			
Memory			
Device			
Projects			
Special Applications			
Memory			
START	SHOW	DELETE	USTICK

Press **△▽** to select the desired submenu and then press **ENT**.

6.2.2 Available functions

- F1** START: starts the recording of measurement data; the configurations from the memory menu (channel selection, storage time, scan rate, a.s.o.) are applied
- F2** SHOW: opens the submenu for the presentation and printing of measurement data
- F3** DELETE: opens the submenu to delete measurement data
- F4** USTICK: opens the submenu with the USB stick functions

Start a recording

After initiating the recording by pressing F1 a dialog will be displayed, where the defined recording parameters (selected channels, recording time, trigger, ...) are shown. The device proposes the current date and time as name of the measurement series.

- Meas. series x name of the measurement series; press ENT to overwrite the proposal
- File name here you may enter a (different) name for the measurement series data file
- Mode choose from:
 - SINGLE the defined recording 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 F4 (TRIG) is pressed

Press F1 if you want to assign a comment to the recording. Start the recording with F5.

Open presentation menu

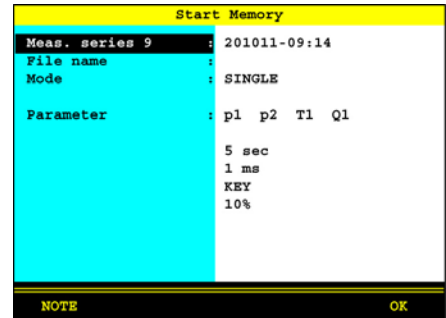
See the explanations in section 6.9 on page 37.

Use delete function

See the explanations in section 6.10 on page 41.

Use an USB stick

See the explanations in section 6.11 on page 42.

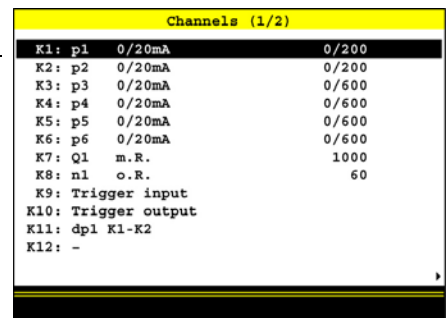


6.3 Submenu "Channels"

The MultiSystem 5060 offers 24 channels:

- Ch1 ... Ch8 measuring channels; sensor connectors at the rear side of the device
- Ch9 trigger input
- Ch10 trigger output
- Ch11 ... Ch24 special channels

Press $\Delta \nabla$ to highlight a channel. Press $\leftarrow \rightarrow$ to switch between the two pages of the submenu. The second page contains channels 13 to 24.



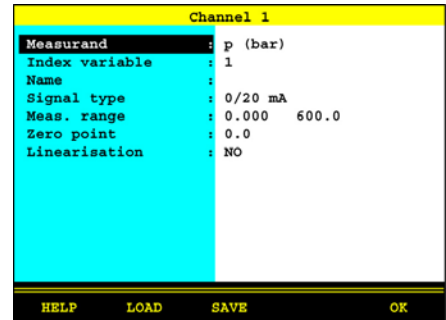
6.3.1 Configure measuring channels (Ch1 ... Ch 8)



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

You may configure several parameters for a measuring channel:

Measurand	selection of measurand and unit; select between 18 different measurands and up to five units per measurand
Index Variable	if manual channel numeration is activated in the setup menu (see section 6.6.14 on page 31), you can enter the index number of the channel here; if automatic channel numeration is activated, this function will not be displayed
Name	you may enter an individual name for each channel
Signal type	sensor specific; select between (0/20 mA), (4/20 mA), (0/10 V), (± 10 V) and (0,5/4,5 V); the signal type is given on the type plate of the sensor or in its manual; for frequency sensors (channels 7 and 8) you will have to select between "n.D." (no direction) and "w.D." (with direction)
Measuring range	enter the smallest and biggest measured value you expect (for analog sensors, only)
Calibration value	enter the factor for the calculation of the measuring values from the frequency signals (for frequency sensors, only)
Zero point	manual zero point equalisation of the sensor (see further below)



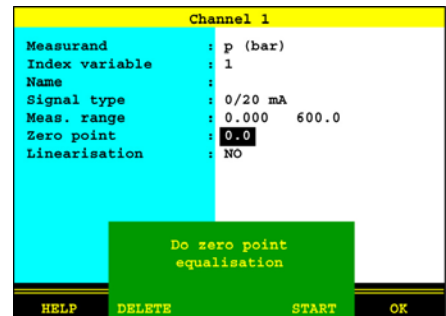
You may enter or select a linearisation table for the connected sensor. This may increase measuring accuracy. Please see section 7.1 on page 44 for more information.

Do zero point equalisation

After selecting the function ($\nabla \nabla \nabla$ **ENT**) the shown display will appear. Press **F4** to execute the zero point equalisation. It will be executed fully automatic, the determined value will be displayed after a few seconds. Press **F5** to accept the value.

Additional functions

- F1** opens a help screen with information on the channel specifications and the pin assignment
- F2** loads stored sensor parameters from the database
- F3** stores the current sensor parameters in the database
- F5** saves the channel settings and leaves the submenu



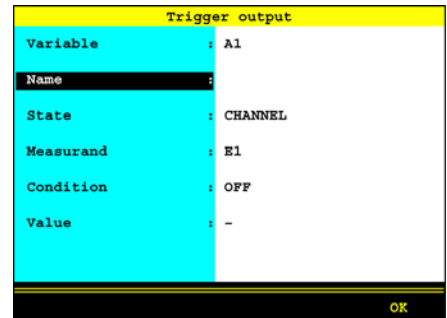
6.3.2 Configure trigger input (Ch9)

You can only assign a name to the trigger input. Please obtain the technical data (see page 11) for allowed input signals.

6.3.3 Configure trigger output (Ch10)

You can manage an external control dependant on incidents with the trigger output. You have to define five parameters:

- Variable shows the internal measurand of the trigger channel
- Name you may assign an individual name
- State source of the trigger event; INACTIVE: trigger off, CHANNEL: meas. channel is supervised for the trigger event; MEM-TRIG: trigger is switched if triggering was detected during storing [allows to synchronise several instruments: master: storing trigger event X (e.g. p1 > 200) – trigger output: SP_TRIG; slaves: storing trigger event E1], MANUAL: trigger output is switched manually by pressing a key
- Variable select which measuring channel shall bring the trigger event
- Condition for trigger input ON/OFF, for measuring channels GREATER/LOWER
- Value for measuring channels, e.g. 200



6.3.4 Configure special channels (Ch11 ... 24)

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

- Calculation choose between the different occupations of the channel (see further below)
- Variable is entered automatically when using pre-programmed formulas and cannot be edited; for individual formulas and occupation with CAN or RS232 you may define the variable here that is provided on this channel
- Index variable is manual indexing is set in the setup menu (see section 6.6.14 on page 31), 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, CAN, or RS232 occupation
- Name you can enter an individual name for the channel
- Align.Diff this functions automatically determines the measured value difference between the selected channels and use it as offset
- Formula enter the desired formula here (only displayed if "Calculation" is set to FORMULA, see below)

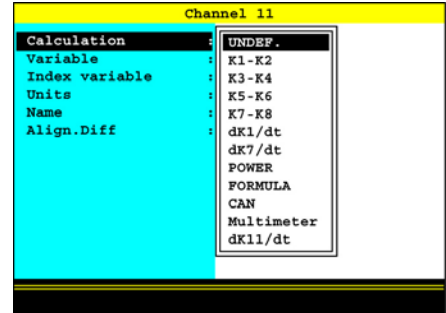


Additional functions

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

Possible occupations of the special channels

UNDEF	channel is not in use
K1–K2	calculates the difference of the measured values from the channels 1 (K1) and 2 (K2); both channels must be occupied with the same measurand and unit, the resulting measurand and unit will be determined automatically; the same is valid for the occupations “K3–K4”, “K5–K6” and “K7–K8”
dK1/dt	calculated the first differentiation of the measured values from channel 1; you can also use the differentiations of the channels 7 (dK7/dt) and 11 (dK11/dt)
POWER	uses the formula “K1 x K7 / 600” to calculate the hydraulic power; the pressure in bar is measured on channel 1 (K1), the volume flow rate in l/min on channel 7 (K7)
FORMULA	definition of an individual formula (see below)
CAN	please see the hints in section 7.2 on page 44
RS232	if you have connected an external measuring device (e.g. a multimeter) to the RS232 interface, you can assign the measurements to a channel; further information is contained in section 7.8 on page 52



Calculations with formulas

You may execute any calculation and use the measured values from all channels in your formula. You may use all basic arithmetics and the functions cos(), sin(), sqrt(), abs(), tan(), log(), ln() and exp(). Do not enter space characters.

Example of a formula: K13/600*(K1-K5)

Important: values from special channels can only be used, if the ordinal number of the used channel is lower. Possible formula on channel 14: K12+K1; impossible formula on channel 14: K15+K1.

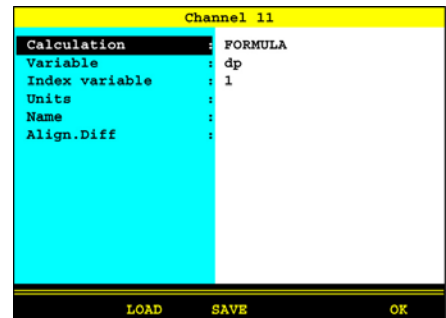
Press **5** once to enter a “K” (= channel) or twice to enter a “5”. With the other numeric keys you can only enter the respective number and all special digits by pressing **↔** repeatedly. Confirm the formula by pressing **ENT**.

The measuring instrument will not execute a plausibility check on the entered formula.

Example of a consumption measurement in [l/min]

Some measuring channels are absolutely required for this example. They are printed in bold letters:

- **Channel 7:** measurement of volume V1 in liter
- **Channel 8:** measurement of volume V2 in liter
- Channel 11: calculation $K7 - K8 = dV1$ in liter
- Channel 12: calculation $dK11/dt \cdot Q1$ in liter per second
- Channel 13: calculation $K12 \cdot 60 = Q2$ in liter per minute



6.4 Submenu "Display"

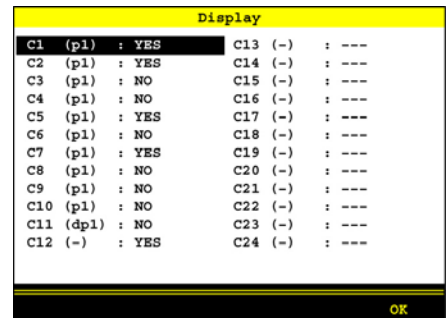
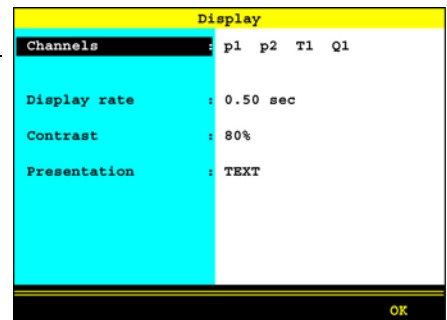
You can select the channels displayed in the display of measured values and do some basic configurations.

Channels select the channels to be shown in the display of measured values (lower image); all channels with the word "YES" will be displayed; highlight a channel and press **ENT** to toggle between "YES" and "NO"

Display rate indicates how often the display is updated; select one of five possible settings

Contrast defines the light intensity of the display; select one of ten possible percentages

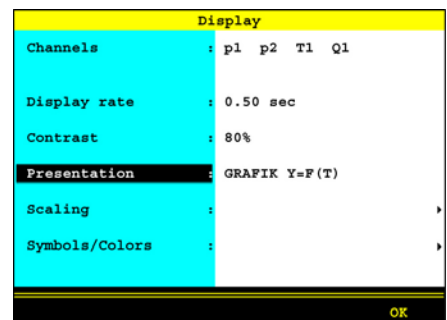
Presentation select between "TEXT" (numerical display of measured values) and "GRAPH" (measured values shown in a diagram); see below for further information



Configure graphical presentation

After selecting the presentation type "GRAPH", two more options are displayed:

You can scale each channel and assign a symbol and/or color to make the graphical presentation as clear as possible.

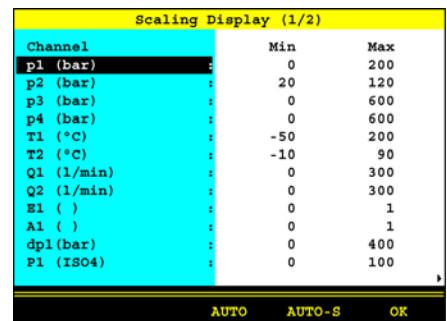


Configure scaling

You have defined the measuring range of a channel in the submenu "Channels" (see section 6.3.1 on page 20). If desired you can now define a part of the measuring range to be displayed in the graphical presentation.

1. ▾ **ENT** select desired channel.
2. Enter lower limit of display range – **ENT**.
3. Enter upper limit of display range – **ENT**.
4. Repeat steps 1 to 3 for all desired channels.
5. Confirm entries – **F5**.

Press **F4** to do an automatic scaling for the selected channel; the device detects the highest and lowest measured value of this channel and uses them as limit values of the scaling. Press **F3** to use the set measuring range of each channel as scaling ranges.



Assign symbols and colors

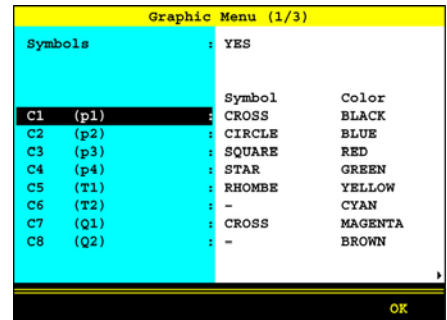
First select at the function "Symbols":

YES symbols and colors shall be used

NO only colors shall be used

You can assign symbols and colors after this basic setting:

1. Highlight a channel – **ENT**.
2. Select a symbol – **ENT**.
3. Select a color – **ENT**.
4. Repeat steps 1 to 3 for all desired channels.
5. Confirm entries – **F5**.



6.5 Submenu „Memory“

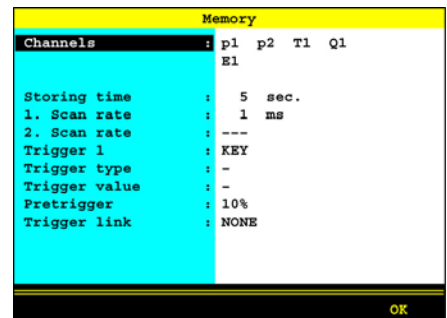
You can select channels in the memory menu that you want to store in series of measurements and set basic memory options.

Channels select the channels that shall be stored in series of measurements; all channels will be displayed after opening the function; highlight a channel and press **ENT** to toggle between "YES" (channel shall be stored) and "NO" (channel shall not be stored)

Storing time storing duration; **ENT** enter time value **ENT** – **△▽** highlight time interval unit **ENT**

1st scan rate time distance between two measurements in a series; **ENT** enter time value **ENT** – **△▽** highlight time unit **ENT**

2nd scan rate if you want to record certain channels with reduced scan rate (e.g. temperature), you may enter a multiple of the 1st scan rate here; this 2nd scan rate may be assigned to one or several channels (a factor 500 results for a 1st scan rate = 1 ms in a 2nd scan rate of 500 ms = 0.5 seconds)



Note

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



Note

Scan rates < 1 ms are selectable, when the measuring instrument works in the dynamic mode (hardware filter). Otherwise this option is blocked. At scan rates < 100 ms, the hardware filters should not be dynamic. This is possible but increases the risk of malfunctions.

Assign 2nd scan rate

1. Highlight the line „Channels“ and press **ENT**.
2. Highlight the channels that shall be recorded with the 2nd scan rate.
3. If „NO“ is displayed right of the channel, press **ENT** to select the channel for recording „YES“.
4. Press **F2** until „SLOW“ is displayed.
5. Press **ENT** again to assign the 2nd scan rate. A “*” will be displayed beside the “YES” (see channels C5 and C6 in the screenshot).
6. Press **F5** to save the settings.

Memory			
C1 (p1) :	YES	C13 (-) :	---
C2 (p2) :	YES	C14 (-) :	---
C3 (p3) :	NO	C15 (-) :	---
C4 (p4) :	NO	C16 (-) :	---
C5 (T1) :	*YES	C17 (-) :	---
C6 (T2) :	NO	C18 (-) :	---
C7 (Q1) :	YES	C19 (-) :	---
C8 (Q2) :	NO	C20 (-) :	---
C9 (E1) :	NO	C21 (-) :	---
C10 (A1) :	NO	C22 (-) :	---
C11 (dp1) :	NO	C23 (-) :	---
C12 (-) :	---	C24 (-) :	---

FAST **OK**

Trigger function

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

Triggers are defined events that can start or stop a storing. You can defined any channel as trigger, e.g. "if measured value at channel 2 is higher than 10", use a timer function, or use a manual key pressure.

You can link two triggers logically, e.g. " if measured value at channel 2 is higher than 10 OR measured value at channel 6 is smaller than 10". The trigger will be started by the first of the two events.

1. Highlight the function "Trigger 1" – **ENT**.
2. Select a measuring channel, KEY (trigger is started by key pressure) or TIMER (storing starts at a certain time) – **ENT**.

Memory			
Channels	:	p1 p2 T1 Q1	
	:	E1	
Storing time	:	5 sec.	
1. Scan rate	:	1 ms	
2. Scan rate	:	*250 (250ms)	
Trigger 1	:	p1	
Trigger type	:	LOWER	
Trigger value	:	12.50	
Pretrigger	:	20%	
Trigger link	:	AND	
Trigger 2	:	p3	
Trigger type	:	RISING	
Trigger value	:	165.0	

OK

Definition of a measuring channel as trigger

3. Open the function "Type trigger" and highlight the desired option – **ENT**:
 - Greater: actuation when trigger value is exceeded
 - Lower: actuation when trigger value is fallen below
 - Rising: actuation when trigger value is fallen below for more than 5% and then exceeded, "rising edge"
 - Falling: actuation when trigger value is exceeded for more than 5% and then fallen below, "falling edge"
4. **ENT** enter trigger value **ENT**.

Definition of a trigger time

3. Enter the date of the trigger time – **ENT**.
4. Enter the time value of the trigger time – **ENT**.

Define pretrigger

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

5. Select the percentage of the pretrigger – **ENT**.

Trigger link

You can link trigger 1 with a second trigger:

6. Highlight the function "Trigger link" – **ENT**:
 - NONE: trigger 2 is disabled
 - AND: trigger 1 and trigger 2 must happen
 - OR: trigger 1 or trigger 2 must happen
 - START/STOP: trigger 1 starts the storing, trigger 2 stops it
7. Define trigger type and trigger value of trigger 2 like described in the items 3. and 4.

Memory			
Channels	:	p1 p2 T1 Q1	
	:	E1	
Storing time	:	5 sec.	
1. Scan rate	:	1 ms	
2. Scan rate	:	*250 (250ms)	
Trigger 1	:	p1	
Trigger type	:	LOWER	
Trigger value	:	12.50	
Pretrigger	:	20%	
Trigger link	:	AND	
Trigger 2	:	p3	
Trigger type	:	RISING	
Trigger value	:	165.0	

OK

Example of a trigger recording

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

Required parameters

Storing time : 2 min
 Trigger 1 : p2
 Trigger type : LOWER
 Trigger value : 50.00
 Pretrigger : 50 %
 Trigger link : AND
 Trigger 2 : T1
 Trigger type : HIGHER
 Trigger value : 30

6.6 Submenu "Device"

Configuration of the instrument is done with the device menu:

- Language : operation language
- Date : current date
- Time : current time
- ISDS : automatic sensor detection
- Unit : select the unit system
- CAN : enable/disable CAN bus
- Baud rate : set transmission speed for CAN data
- HW-Filter : hardware filter selection for each measuring channel
- SW-Filter : software filter definition for each measuring channel

Press **▶** to display the 2nd page with device parameters:

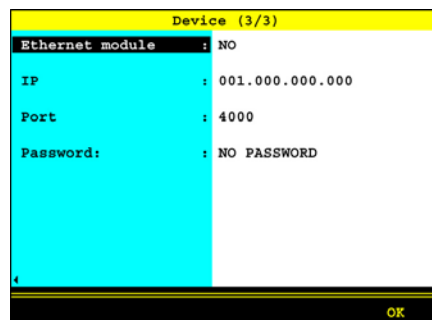
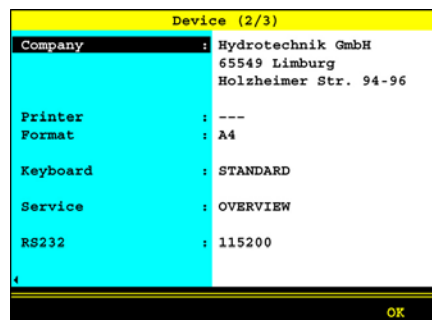
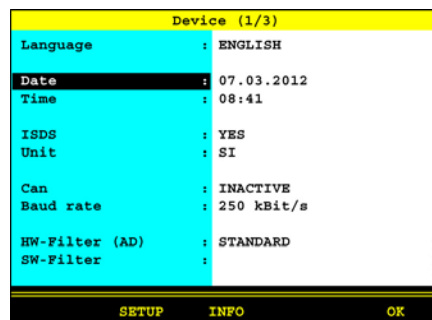
- Company : enter your company's name for the print-outs
- Printer : printer selection
- Format : print format selection
- Keyboard : selection between STANDARD and COMFORT
- Service : print a service report
- RS232 : select the speed of the RS 232 interface

Press **▶** to display the 3rd page with device parameters:

- Ethernet m. : select whether the optional ethernet module is connected with the device
- IP : enter the IP-address in the ethernet network
- Port : this is fix and displayed for information, only
- Passwort : enter the password for the ethernet network

Additional functions

- F2** : Setup: trouble-shooting informationen
- F3** : Info: information on the software of the measuring instrument
- F5** : OK: confirm and save changes

















6.6.1 Select operation language

1. Open function: **Menu** **▽** **▽** **▽** **ENT** **ENT**
2. Select language: **△** **▽** **ENT**
3. Confirm changes and leave function: **F5**

6.6.2 Enter date















1. Open function: **Menu** **▽** **▽** **▽** **ENT** **▽** **ENT**
2. Enter day: **2** **4** **ENT**
3. Enter month: **1** **0** **ENT**
4. Enter year: **2** **0** **0** **6** **ENT**
5. Confirm changes and leave function: **F5**

6.6.3 Enter time

1. Open function:       
2. Enter hour:   
3. Enter minutes:   
4. Confirm changes and leave function: 














6.6.4 ISDS configuration

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

1. Open function:       
2. Enable functionality "YES": 
3. Switch to the unit:  
4. Select desired unit:   
5. Confirm changes and leave function: 

6.6.5 CAN configuration

You can define special channels as CAN channels (see section 7.2 on page 44). To enable this you have to activate the CAN bus here and set the data transmission rate.

1. Open function:     5 x  
2. Activate CAN bus "ACTIVE": 
3. Switch to baud rate selection:  
4. Select desired baud rate:   
5. Confirm changes and leave function: 

6.6.6 Set hardware filter

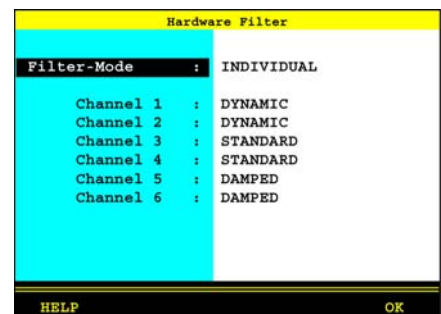


Note

















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

You can execute several special measurements by applying filters. Choose from three hardware filters:

- | | |
|------------|---|
| Dynamic | no hardware filter; peak pressure measurements up to 10 kHz possible on Ch1 and Ch2, on Ch3 ... 6 up to 2 kHz |
| Standard | a 5 kHz hardware filter is switched to Ch1 and Ch2; peak pressure measurement up to 2 kHz possible on Ch1 ... 6 |
| Damped | a 50 Hz hardware filter is switched for Ch1 ... 6; peak pressures are suppressed; ideal for static measurements or slow processes |
| Individual | each channel can be defined individually (dynamic / standard / damped) |



























This is how to set the desired hardware filter:

1. Open function:      7 x  
2. Select filter mode:   
 - For "Individual" highlight channel:  
 - Select filter mode for the channel:   
3. Confirm changes and leave function: 

6.6.7 Set software filter

The analog inputs are scanned with 0.1 ms (10 kHz). By using the software filter, you can equalise the measured values by averaging 10 to 160 measured values. Frequencies are measured down to 0.25 Hz. This frequency will be detected and displayed after a period of 1 s. During storage, the recording between the last measured frequency and the drop-down to zero will always be displayed with a delay of 1 s. Frequencies < 1 Hz will be displayed as zero. By changing the parameter "Min.Frequency" you can set the measuring range between 0.25 Hz and 10 kHz. Frequency inputs are equalised by the gate time. The longer the gate time, the more will the signal be equalised.

Software Filter	
AD-channels	
Channel 1	: 1 ms
Channel 2	: 1 ms
Channel 3	: 4 ms
Channel 4	: 4 ms
Channel 5	: 1 ms
Channel 6	: 1 ms
f-channels	
Gate time f1	: 002 (20.0 ms)
Min.frequency	: 100 Hz
Gate time f2	: 001 (10.0 ms)
Min.frequency	: 1 Hz

1. Open function:      8 x  
2. Select AD channel:   
3. Select equalisation filter:   
4. Repeat steps 2. and 3. for all desired AD channels.
5. Select gate time f1:  
6. Enter desired gate time (x 10 ms) e.g. 100 ms:   
7. Select min. frequency:  
8. Select desired frequency:   
9. Repeat steps 5. to 8. for gate time f2.
10. Confirm changes and leave function: 















Note

Do not use software filters when measuring peak pressures.

6.6.8 Enter company










You can enter an individual text that will be shown on the print-outs and in the stored protocols.

1. Open function:       
2. Enter text:   ...  – use  to toggle between capital and small letters.
3. Confirm changes and leave function: 

Device (2/3)	
Company	: Hydrotechnik GmbH 65549 Limburg Holzheimer Str. 94-96
Printer	: ---
Format	: A4
Keyboard	: STANDARD
Service	: OVERVIEW
RS232	: 115200













6.6.9 Select printer and format

The printer will be detected automatically and must not be selected. The format can be chosen between DIN A4 and US Letter:

1. Open function:       
2. Select format: 
3. Confirm changes and leave function: 













6.6.10 Select keyboard


Here you can select whether the short-cut method for the menu operation (COMFORT) shall be activated. Then you do not need to highlight functions with the arrow keys and select them with Enter, but can press the assigned number key. E.g. if you press 4 in the main menu, the device menu will be opened instantly.

1. Open function:          
2. Select keyboard function: 
3. Confirm changes and leave function: 

6.6.11 Set service function

Here you can set the amount of information that shall be contained in the service report of the instrument. "OVERVIEW" contains the most important settings and parameters, "DETAIL" contains additional information for the service case.

1. Open function:          
2. Select report type: 
3. Confirm changes and leave function: 

During the item "Service" is highlightes, you can press  to print the service information.












6.6.12 Set RS232 interface speed

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

1. Select function:          
2. Select speed:   
3. Confirm changes and leave function: 

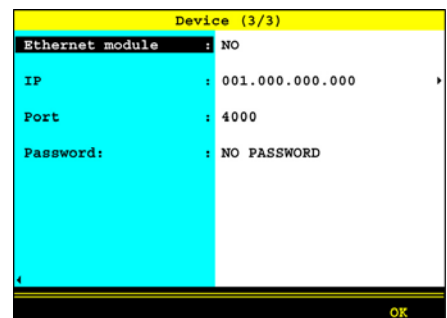
6.6.13 Set Ethernet functionality

If you want to use an Ethernet network module connected to the RS232 port, you can define the required settings here:

1. Display the Ethernet options:      
2. Select the option to be set:   
3. Select the desired setting or enter the required information.
4. Confirm the setting/entry: 
5. Confirm changes and leave function: 

These options can be set:

- Module select whether an Ethernetmodule is connected (YES) or not
- IP enter the IP-address that the MultiSystem 5060 shall have in the Ethernet network
- Port enter the communication port of your Ethernet network
- Password enter the password for the Ethernet network, if a password is required



6.6.14 Setup menu












Attention


Possible loss of data!





You can format the internal data cartridge in the setup menu. This deletes all contained data and cannot be undone.

Here you can define some basic functions:

1. Open setup:     
2. Select function:   
3. Confirm changes and leave function: 


Use USB stick for firmware update

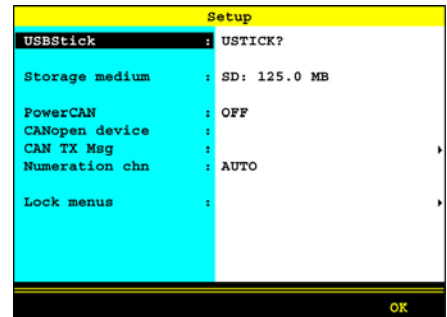
If an USB stick had been detected at the instrument, its name is displayed in the first line. Press  to read the data from the USB stick. Then you may update the firmware:

1. Highlight the desired firmware version:  
2. Select the desired firmware version: 
3. Start the firmware update: 

Please see section 7.6 on page 49 for more information.

Select storage medium


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






Hint

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


Format SD card

When the menu item "Storage medium" is highlighted and the SD card is selected as storage medium, you can press  to format the internal SD card. Stored measured values will be lost, formatting cannot be undone.

Function „Power-CAN“

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

Function „CANopen device“

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

Function "CAN Tx Msg"

This function is now contained in the menu "Special Applications". See section 6.8.4 "Load valve" on page 36.

Hint

These functions are contained due to compatibility reasons. Please use the corresponding functions in the submenu "Special Applications".

Function „Channel numeration“

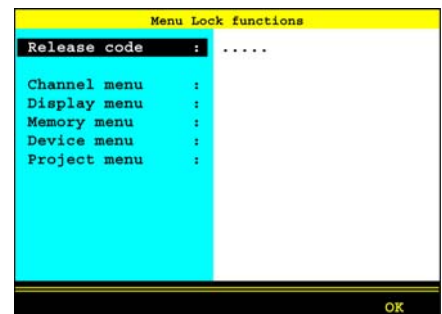
As a standard, the MS 5060 numerates all channels with a letter and an index number. If three pressure sensors are connected, the channels will be numerated as p1, p2 and p3 automatically. If you now connect e.g. a temperature sensors instead of p1, this channel will be numerated as t1. The two other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

By setting the function "Numeration ch." from "AUTO" to "MANUAL", you can assign fixed index numbers to the channels (see section 6.3.1 on page 20). These will remain even after the channel occupation has changed. In the example shown above the three channels would be numerated as t1, p2 and p3. Highlight the function with $\Delta \nabla$ and press ENT to toggle between AUTO and MANUAL.

Submenu "Lock menus"

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

1. Start release code definition: ENT
2. Enter release code; you can use the function keys:
 - F1 HELP: opens a help screen for the alphanumeric entry
 - F2 abcd: toggles between the entry of capital and small letters
 - F3 DEL: deletes the last entered digit
 - F4 INSERT: inserts a digit in front of the flashing digit
 - F5 DELETE: deletes all digits of the release code
3. Confirm release code: ENT
4. Use $\Delta \nabla$ to highlight the displayed menus.
5. Press ENT to toggle between "-" (menu released) and "LOCKED"; the entry of the release code is required to open locked menus.
6. Press F5 to confirm the entries and leave the submenu.

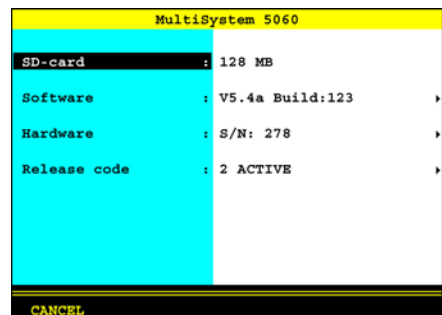


6.6.15 Display software information

When calling the Hydrotechnik customer service department, you should have the required information available. These are contained on the information screen:

1. Display information: $\text{Menu} \nabla \nabla \nabla \nabla \text{ENT} \text{F3}$
2. Display desired information: $\Delta \nabla \text{ENT}$
3. Leave function: ESC

When you highlight the item "Revision", additional information is displayed after a short period of time.



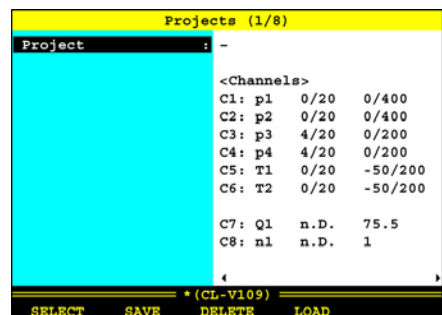
6.7 Submenu „Projects“

Use this menu to save complete parameter sets of the instrument (= projects). You may save up to five different projects and load them at any time.










Save a new project

1. Open project menu: $\text{Menu} \nabla \nabla \nabla \nabla \text{ENT}$
2. Start saving: ENT
3. Enter project name: $\text{4} \text{4} \dots \text{ENT}$ – use F2 to toggle between capital and small letters.
4. Save project: F2
5. Leave function: ESC











Load the saved project if you want to use it.



Load a saved project

1. Open project menu:     
2. Start project selection: 
3. Highlight project and load it:  
4. Leave function: 

Delete a saved project



1. Open project menu:     
2. Start project selection: 
3. Highlight project and load it:  
4. Delete project: 
5. Leave function: 

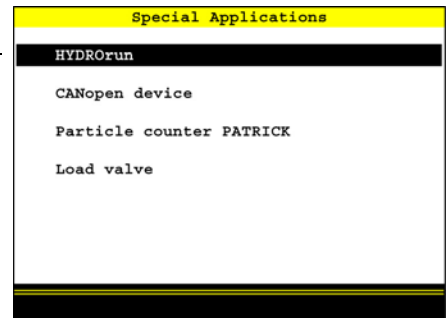
No confirmation will be displayed, the project will be deleted instantly.

6.8 Submenu “Special Applications”

This submenu contains several functions expanding the possibilities of your MS 5060, or required for the operation of external devices:

- HYDRORun execution of pre-defined test sequences
- CANopen here you may start/stop a connected CAN device
- PATRICK display and save the data of the particle counter
- Load valve display and save the data from the Hydrotechnik load valve HySense® PR 326

Use  to highlight the desired submenu and then press .



6.8.1 HYDRORun







Use the **HYDRORun** menu to select, setup, start and evaluate pre-defined test procedures. The instrument is delivered with some example test procedures that open a small view on the nearly unlimited possibilities of the software package **HYDROgen/HYDRORun**.





License required





You need a valid license for your measuring instrument to use the **HYDRORun** functionality. With the license you receive a release code that can be entered in the **HYDRORun** setup menu (see below). Please contact your Hydrotechnik partner for more information.

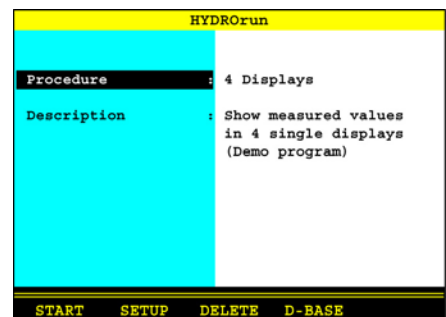
Open the menu

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











- Procedure opens and loads a test procedure
- Description shows the description of the loaded test procedure

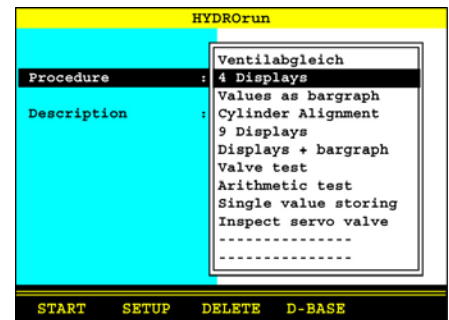
The functions  and  are only shown, if a test procedure is loaded:

-  **START**: starts the loaded test procedure
-  **SETUP**: opens a submenu with important **HYDRORun** settings
-  **DELETE**: deletes the loaded test procedure
-  **D-BASEK**: results of test procedures can be saved in databases; with this function you can select and display these databases




Select test procedure

1. Open the **HYDROrun** menu:      
2. Start the selection of a test procedure: 
3. Highlight and select a test procedure:   

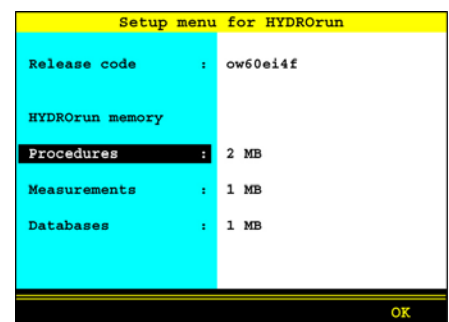


HYDROrun Setup








After pressing  in the **HYDROrun** menu, a screen will be displayed, where you may enter the **HYDROrun** release code and configure the memory reserved for **HYDROrun**. If no release code has been entered yet, the memory configuration is not visible. If a release code has been entered, this cannot be selected and modified.

You may decide, how many space shall be reserved for **HYDROrun** on the SD card:

Test proc.	memory that shall be reserved for test procedure files
Measurements	memory that shall be reserved for temporary measurement files that may be created during the execution of test procedures
Databases	memory that shall be reserved for databases that may be created for intermediate or end results of test procedures



This is how to configure the **HYDROrun** memory:

1. Highlight the desired memory:   
2. Select the desired memory size:   
3. Repeat steps 1. and 2. for the other memory types.
4. Confirm the setting with .

Delivered test procedures

Valve compensation (German)

Setup procedure for valves. These valves have to realize an exactly defined flow under a certain pressure. After entering operator name and the serial number of the valve, the test run starts. The setting is displayed optically with bargraphs. A wrong setting will be displayed together with possible error causes.

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

Values as bargraph (English) – Presentation of the measurands p1, p2, T1 and Q1 as bargraphs.

Cylinder alignment (English) – Synchrony test of two lifting cylinders of a bulldozer. Additionally it will be checked, whether suited sensors are connected to the instrument. This avoids faulty measurements due to wrong sensors. With a bargraph the cylinder pressures p1 and p2, and the pressure difference are displayed. The test is OK, if both pressure values are 145 bar (± 5 bar) at the final stop and the pressure difference is smaller than 5 bar.

Nine displays (English) – Presentation of the measurands p1, p2, p3, p4, T1, T2, Q1 and Q2 on nine large-scaled display sections.

Displays + bargraph (English) – Presentation of the measurands p1 and p2 on two large-scaled display sections and of Q1 as a bargraph.

Valve test (English) – Serial testing of valves. It is checked whether the valves open at a defined pressure. Pressure will be measured when a flow rate > 0.2 l/min is detected. The valve must open at a pressure of 1.5 bar (± 0.2 bar). The test result is stored in a database that can be evaluated in the instrument and transferred to a PC.

Arithmetic test (English) – Graphical presentation of measured and calculated variables with **HYDROgen/HYDROrun**.

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

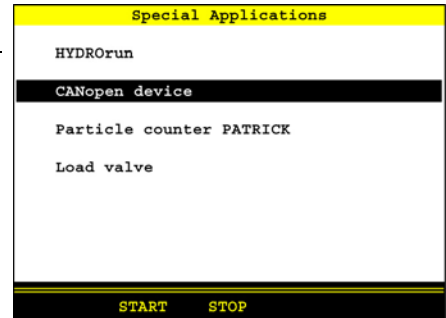
Inspect. servo valves (English) – Test of servo valves. The control voltage of the valve, pressure p1 and flow rate are measured. The connected sensors are checked prior to the test run. The user will be informed about errors. For the test the control voltage must be set to 0 V. Within five seconds the control voltage must be increased to 10 V. After the end of the test, the user may choose from different presentations of the test results.

6.8.2 CANopen device

If one or more CANopen devices are connected to the MultiSystem 5060, you may use this function to start and stop them. These commands will be transmitted:

- Start ID = 0, DLC = 2, data: 0x01 – 0x00
- Stop ID = 0, DLC = 2, data: 0x80 – 0x00; pre-operational mode

Information on how to configure the MS 5060 for a CANopen device are contained in sections 6.6.5 on page 28 and 7.2 on page 44.



6.8.3 Patrick the Particle Counter

You may use the MS 5060 to configure the optical particle monitor Patrick and read its measuring values. Highlight the item “Particle counter Patrick” and **F1** will be occupied with the function CONFIG.

Configure the MS 5060

If you now press this key, the channels required to display the measuring values coming from the particle counter will be programmed appropriately; the prior configuration of these channels will be overwritten without further notice.

Configure the Particle Counter

Highlight “Particle counter Patrick” in the submenu “Special Applications” and press **ENT**. The first configuration page is displayed:

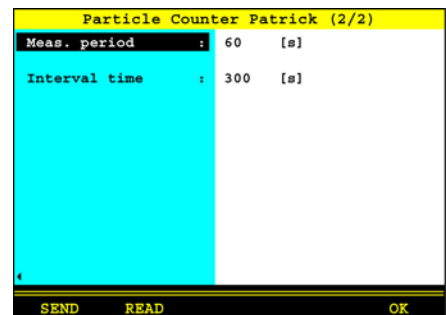
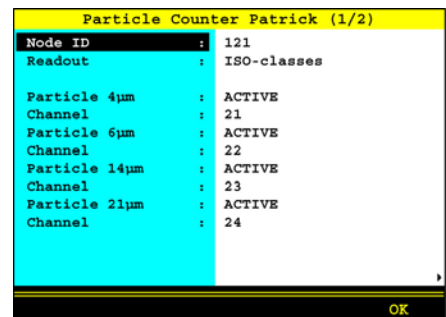
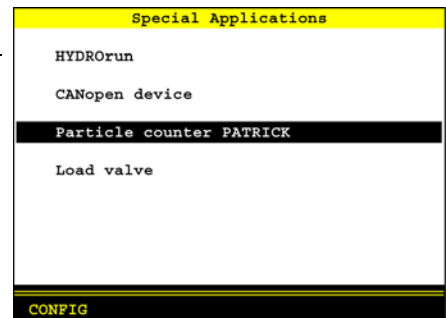
- Node ID enter the number of the particle counter you want to configure; see the type plate
- Readout select whether the purity classes according to ISO or SAE shall be displayed
- Particle xµm activate the purity classes that shall be displayed
- Channel assign a special channel of the MS 5060 to each activated purity class

Press **▷** to display the 2nd configuration page.

First press **F2** to read the current measuring and interval time from the particle counter. Then reprogram the values, if desired:

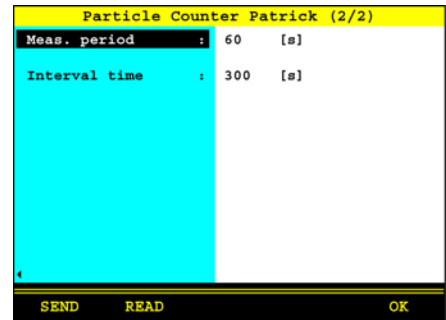
- Meas. period duration of a particle counting
- Interval time idle time between two measurements

After modifying the values you have to press **F1** to transmit the values to the particle counter. Press **F5** to terminate the configuration.



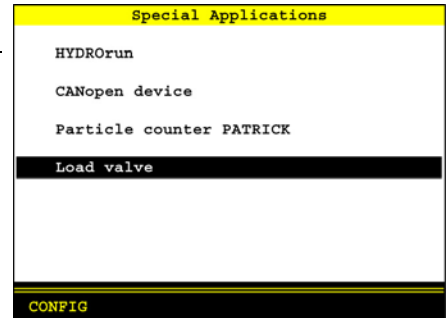
Display of the measured purity classes

This is an example how the measuring values from the particle counter are displayed at the MS 5060. You may also enable the display of other channels together with these.



6.8.4 Load valve HySense® QL 326

You may use the MS 5060 to configure and read-out the electronically controlled load valve HySense® QL 326. This is done with one function and one submenu. Highlight the item "Load valve" and **F1** will be occupied with the function CONFIG.

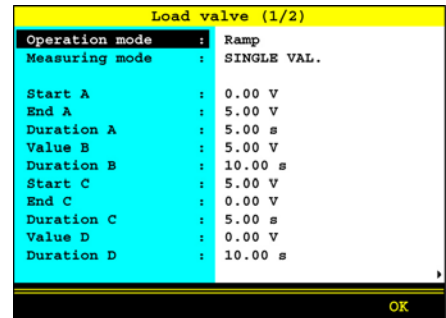


Configure the MS 5060

If you now press this key, the channels required to display the measuring values coming from the load valve will be programmed appropriately; the prior configuration of these channels will be overwritten without further notice.

Configure load valve

Highlight "Load valve" in the submenu "Special Applications" and press **ENT**. The first configuration page is displayed:

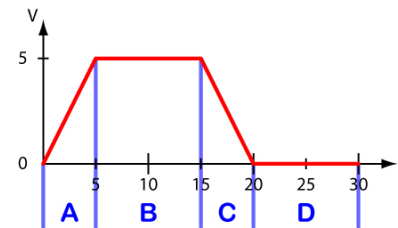


- Operation mode select the desired operation mode:
 - Ramp the valve follows the curve of a defined ramp
 - Sine the valve follows a sine curve
 - Inactive the load valve is switched off
 - Manual the valve is controlled with the keys **F3** and **F4**
- Measuring mode select between:
 - Cyclic ramp/sine is repeated until the stop command is triggered
 - Single val. ramp/sine is executed once

Operation mode "Ramp"

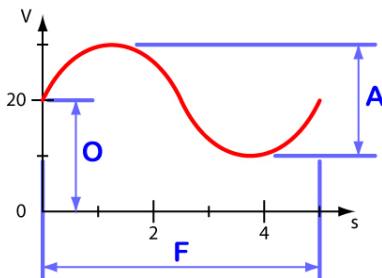
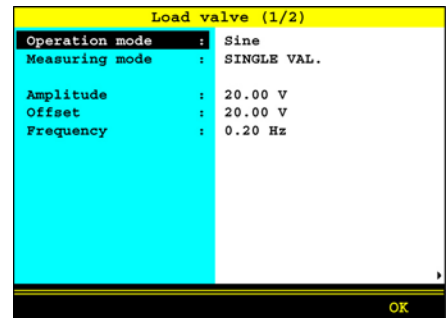
The load valve follows the curve of a ramp that can be defined with four sections. The values shown in the screenshot result in this ramp:

Highlight the ramp values, press **ENT** and enter the desired values. The volt values are entered as multiples of 10 mV and time values as multiples of 10 ms. 500 results in 5.00 V or 5.00 s. Press **ENT** to confirm the entry.



Operation mode "Sine"

The load valve follows a sine curve that can be defined with three parameters. The values entered in the screenshot result in the shown curve:



- A Amplitude of the curve
- O Offset between zero and the center line of the curve
- F Frequency ("duration" of the curve)

Highlight the curve values, press **ENT** and enter the desired values. The volt values are entered as multiples of 10 mV and frequency values as multiples of 10 mHz. 2000 results in 20.00 V and 20 results in 0.20 Hz. Press **ENT** to confirm the entry.

Press **▷** to display the 2nd configuration page.

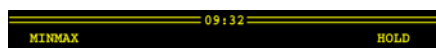
Program channels

Three channels are required to display the measuring values coming from the load valve. Highlight the desired measurand, press **ENT** and enter the desired special channel. Confirm the entry with **ENT** and leave the submenu by pressing **F5**.

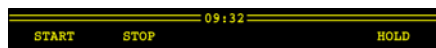
Operation of the load valve

After programming you should return to the main menu, highlight "Load valve" and press **F1** CONFIG to transmit the settings to the load valve. Return to the measuring value display, the channels programmed for the load valve will be shown there.

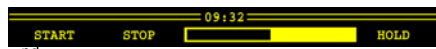
Now the function bar at the lower screen edge has multiple occupations. Press **△▽** to toggle the occupations:



Standard function bar



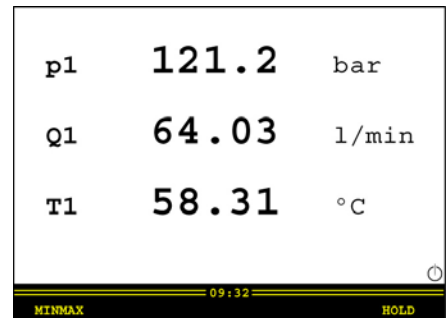
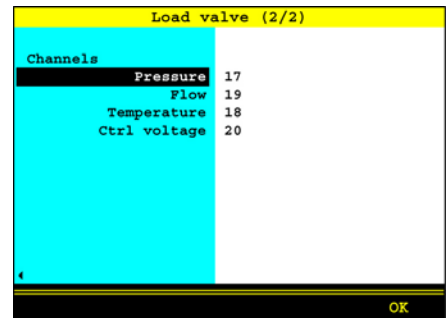
2nd function bar during operation mode "Ramp" or "Sine"



2nd function bar during operation mode "Manual"; the bargraph indicates how the valve is opened/closed (here: ~50% open)

The special function bars contain these functions:

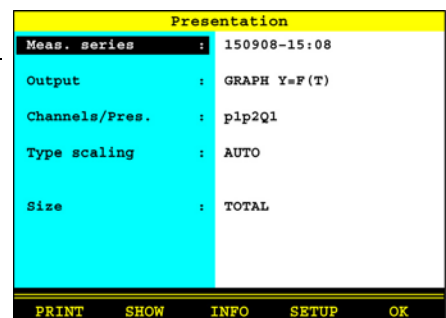
- F1** START: starts the load valve
- F2** STOP: stops the load valve, valve will be closed
- F3** closes the valve (operation mode "Manual", only)
- F4** opens the valve (operation mode "Manual", only)
- F5** "freezes" the measuring value display



6.9 Submenu "Show" (function bar)

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

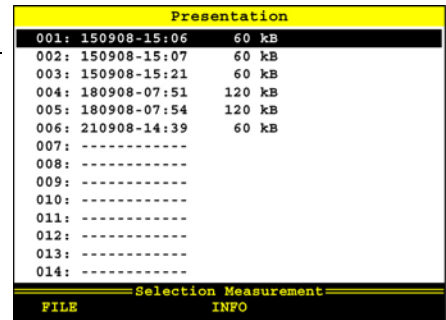
1. Open submenu "Show": **Menu F2**
2. Select series of measurements: **ENT △▽ ENT**
3. Select output format: **▽ ENT △▽ ENT**
4. Set further options (see below).
5. Present series of measurements: **F2**



6.9.1 Select series of measurements

1. Open show menu: **Menu** **F2**
2. Select a series of measurements: **ENT** **△** **▽** **ENT**

You may press **F1** to display the name of the measurement file instead of the recording time. Press **F3** during a series of measurements is highlighted to display some information about it. Date and time of the measurement, storing time and scanning rate, and possible trigger settings will be displayed. Additionally you can enter an individual comment on a second page.



6.9.2 Select output format

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

- Table: presentation of alle measured values of each channel in a table
- Statistics: presentation of the minimum, maximum and average values of each channel
- Graph: two different graphical presentations; one depending on time, the other depending on a selected variable

The images are examples for the different types of presentations:

[ms]	p1	T1
0.00	2.293	15.80
0.60	2.296	15.81
1.20	0.388	22.83
1.80	4.218	16.42
2.40	2.223	19.87
3.00	1.514	20.84
3.60	5.413	15.10
4.20	1.165	22.88
4.80	1.327	22.44
5.40	4.198	20.88
6.00	5.768	15.01

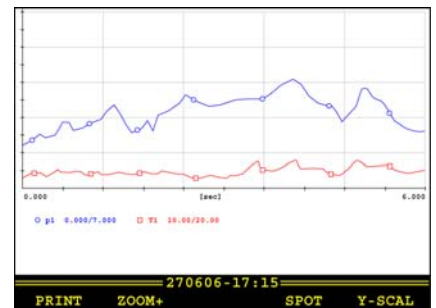
270606-17:15
PRINT DETAIL

Table

	Min	Max	Mean
p1	0.000	6.218	2.526
T1	13.77	22.88	19.24

270606-17:15

Statistics



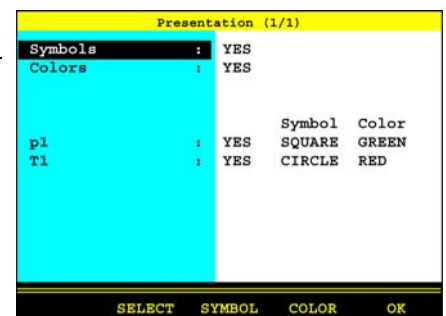
Graph

See further below for more informaton on the different types of presentation.

6.9.3 Select channels

You can select which channels of a series of measurement shall be presented and assign colors and symbols to each channel.

- Symbols select whether symbols shall be used in the graphic for the different channels
- Colors select whether colors shall be used for the different channels
- p1 the "YES" means that this channel shall be presented; the assigned symbol and color are displayed to the right
- T1 like p1



Assign symbols and colors

1. Highlight channel: **△** **▽**
2. Enable/disable channel presentation: **ENT** **△** **▽** **ENT**
3. Select symbol: **F3** **△** **▽** **ENT**
4. Select color: **F4** **△** **▽** **ENT**
5. End channel configuration: **F5**

6.9.4 Define scaling

As a standard, the complete measuring range of a variable is used as scaling. If you want to limit the presentation to a certain part of the measuring range, you may enable the manual scaling:

1. Select „Type scaling“: $\Delta \nabla$ ENT
2. Select „MANUAL“: $\Delta \nabla$ ENT
3. Select „Scaling“: ∇ ENT

Here you may set the minimal and maximal values of the measured values to be presented. Here for “p1” and “Q1” tie complete measuring range (0 – 200 bar, resp. 0 – 300 l/min) shall be presented, For “p2” only measured values shall be presented that are between 40 and 100 bar. This is how to change the scaling of a variable:

1. Select variable: $\Delta \nabla$ ENT
2. Enter minimal value, e.g.: 4 0 ENT
3. Enter maximal value, e.g.: 1 0 0 ENT
4. Save scaling and close the screen: F5

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

- F2** loads the measuring ranges of the variables and shows them as scaling
- F3** checks the measured values of all variables and shows the used measuring ranges as scaling
- F4** checks the measured values of the highlighted variable and shows the used measuring range as scaling

Presentation	
Meas. series	: 150908-15:08
Output	: GRAPH Y=F(T)
Channels/Pres.	: plp2Q1
Type scaling	: MANUAL
Scaling	:
Size	: TOTAL

PRINT SHOW INFO SETUP OK

Scaling Presentation		
Channel	Min	Max
p1 (bar)	: 0	200
p2 (bar)	: 50	100
Q1 (l/min)	: 0	300

LOAD AUTO AUTO-S OK

6.9.5 Define size

As a standard, series of measurement are presented completely. But you may limit the range of presented values by entering a start and end time. In the shown example, the range between 2.5 and 5.0 seconds will be presented, only. This is how to set the range of presentation:

1. Select „Size“: $\Delta \nabla$ ENT
2. Select „Clipping“: ∇ ENT
3. Enter start time “From”, e.g.: ∇ ENT 2 .-+ 5 ENT
4. Enter end time “To”, e.g.: ∇ ENT 5 .-+ 0 ENT

Presentation	
Meas. series	: 150908-15:08
Output	: GRAPH Y=F(T)
Channels/Pres.	: plp2Q1
Type scaling	: MANUAL
Scaling	:
Size	: CLIPPING
From	: 2.500 [sec]
To	: 5.000

PRINT SHOW INFO SETUP OK

6.9.6 Presentation type table

Independant of the recording time, a table will always contain eleven lines. Start and end value, together with nine intermediate values. You may “zoom” into the table to display intermediate values between two displayed values:

1. Press **F2**.
2. Use $\Delta \nabla$ to highlight the line beneath that you want to display intermediate values.
3. Press **ENT**; the highlighted value becomes the start and the next the end value, between that nine intermediate values are displayed.

Now you may repeat these steps to show more detailed values, or press **F3** to undo the “zooming” step-by-step.

[ms]	p1	T1
0.00	2.293	15.80
0.60	2.296	15.81
1.20	0.388	22.83
1.80	4.218	16.42
2.40	2.223	19.87
3.00	1.514	20.84
3.60	5.413	15.10
4.20	1.165	22.88
4.80	1.327	22.44
5.40	4.198	20.88
6.00	5.768	15.01

270606-17:15
PRINT DETAIL

6.9.7 Presentation type graph

The selected channels are displayed with the assigned symbols and colors. You can use the zoom function to enlarge certain areas of the graph:

1. Enable zoom function: **F2**

A yellow rectangle indicates the area that will be enlarged. You can move and scale the rectangle:

2. Move rectangle: **F1** <> Δ ▽
3. Scale rectangle: **F2** <> Δ ▽
4. Display yellow area (apply zooming): **ENT**

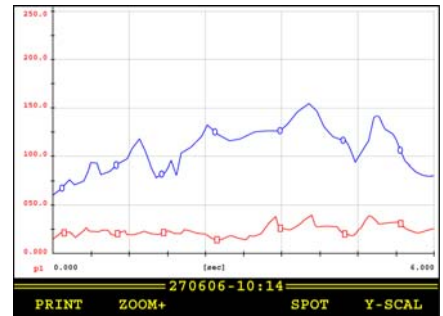
You can use the zoom function repeatedly to show the desired area of the graph in an optimised way. Then you have the following possibilities:

- F1** print graph
 - F2** continue zooming in
 - F3** zoom out in steps
 - F4** use spot function (see further below)
 - F5** toggle scaling position
5. End graph presentation: **ESC**

Change y-scaling

The upper image shows the presentation with y-scaling "GLOSS" that means the scaling of the displayed channels is shown beneath the graph beside the channels. This gives more room for the graph.

The y-scaling "Y-AXIS" (lower image) shows the scaling of one channel at the y axis. Press **F5** to toggle between the scaling of all displayed channels. The channel of which the scaling is currently displayed is shown beneath the y axis.

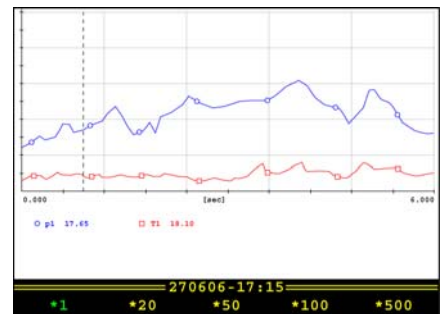


Spot function

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

1. Activate spot function: **F5**
2. Choose move factor: **F1** **F2** **F3** **F4** **F5**
3. Move spot line: <>
4. Read measured values.
5. End spot function: **ESC**

Press the key **Menu** during the spot function to select different move factors.



Delta-spot function

If you press the key **Menu** during the graphic is displayed, two new occupations of the function keys will be displayed:

- F4** use d-spot function
- F5** print screen

In the delta-spot function, two spot lines are displayed. The difference between the two values marked on the curves by the spot lines is shown in a rectangle in the upper right corner. Like in the spot function, you can now choose move factors with the keys **F1** **F2** **F3** and toggle between the different calculation methods pressing **F4**.

6.9.8 Show menu setup

You can edit basic settings of graph presentation in the setup sub-menu.

1. Open setup: **F4**
2. Highlight function: **△ ▽ ENT**
3. Select setting: **△ ▽ ENT**
4. Leave setup: **F5**

Grid number of grid lines in the diagram (none, 5, 10, zero line)

Channel selection choose between:

AUTO when choosing another series of measurement, all channels are selected automatically

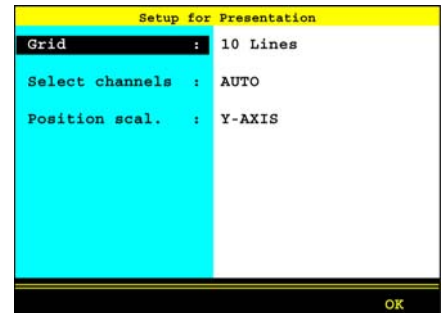
MANUAL the last channel selection remains active for the presentation of the next series

Scaling position defines how the scaling is displayed:

GLOSS the scaling will be displayed below the graph

Y-AXIS the scaling of a single channel is displayed at the y axis

Press **F3** to toggle the scaling of the available channels.



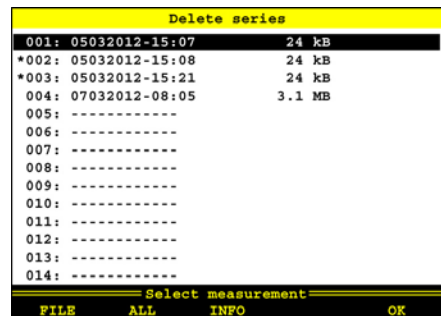
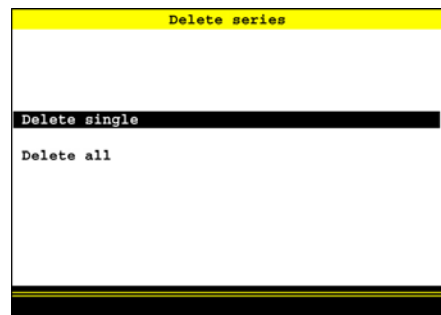
6.10 Submenu "Delete"

Use the functions of this menu to delete stored series of measurements.

1. Open delete menu: **Menu F3**
2. Select "Delete single" or "Delete all": **△ ▽ ENT**. For "Delete all" continue with step 6.
3. For "Delete single" select desired series of measurements: **△ ▽ ENT**. A "*" will be displayed beside the series of measurements. Press **F3** to display information on the highlighted series of measurements.
4. Repeat step 3. until all desired series of measurements are selected.
5. Start deletion: **F5**.
6. Confirm deletion with **F2**, or cancel with **F4**.

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

The deletion cannot be undone.



6.11 Submenu „UStick“



Compatibility requirements

Please obtain the requirements to the USB stick as described in section 7.5 on page 48.

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

1. Open USB stick menu: **Menu** **F4**
2. Select mode: **△** **▽** **ENT**
3. Select file type: **▽** **ENT** **△** **▽** **ENT**
4. Select files (see below).
5. Define default name (see below).
6. Start copying: **F5**.

Mode select between „Save“ (transfer of data from instrument to USB stick) and „Load“ (transfer of data from USB stick to instrument)

Data type select the type of data you want to transfer:

- measurements (mwf files)
- project data (prj files)
- sensor databases (sdb files)
- CAN parameter databases (cdb files)

Select files

1. Highlight „Selected“: **△** **▽**
2. Open selection submenu: **ENT**
3. Select desired file(s): **△** **▽** **ENT**; selected files are marked with a „*“ left of the line.
4. End selection: **F5**.

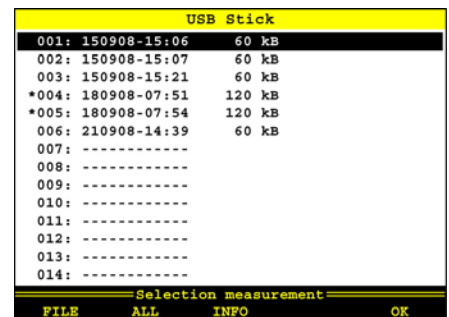
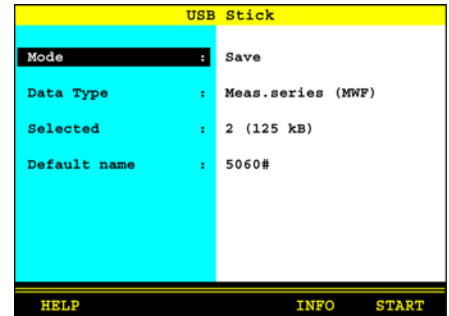
You may use three functions to ease the file selection:

- F1** shows the names of the files
- F2** selects all files
- F3** displays additional information on the selected file

Define default name

When copying files to the USB stick, only the 8.3 name convention is supported. Therefore all files will be renamed. Here you may define a header for the new file names. Since the name may only have eight characters, you should leave enough space for a consecutive numbering of the files.

1. Highlight „default name“: **△** **▽**
2. Start definition: **ENT**
3. Enter desired header; you may use all alphanumeric characters.
4. Confirm header: **ENT**.



Display information on the USB stick



Waiting time up to four minutes

If information shall be displayed on the USB stick, the memory capacity of the stick is tested. This may last up to four minutes, dependant on the capacity of the stick.

You may display information on the detected USB stick by pressing **F4** while the USB stick menu is displayed. Then the memory capacity of the stick is tested, what may last up to four minutes. Then the screen shown here will be displayed (example).

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

USB Stick	
Memory size	: 1032.912 kB
Free memory	: 965.044 kB
** Root directory **	
Number of files	: 62
MWF-files	: 44 (3.908 kB)
PRJ-files	: 1 (18 kB)
SDB-files	: 0 (0 kB)
CDB-files	: 0 (0 kB)
BIN-files	: 1 (1.818 kB)
PAD-files	: 0 (0 kB)
other files	: 16 (62.124 kB)

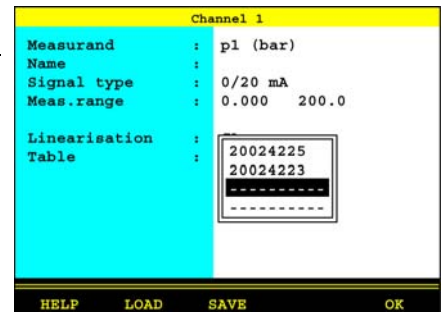
7 Special functions

Special functions of the instrument are explained in this section, where you have been referred to in the prior sections.

7.1 Linearisation table

The linearisation table can be entered to compensate inaccuracies of a sensor. With the calibration of a sensor you receive this table. You can enter five different linearisation tables with ten values for each measuring channel.

1. Select the option "YES" at the menu item "Linearisation" – **ENT**.
2. Highlight "Table" – **ENT**.
3. Either highlight a stored table, or an empty line if you want to enter a new table – **ENT**.
4. Highlight the item "ID-Number" – **ENT**.
5. Enter a name for the new table – **ENT**.
6. Highlight "Ref.-Point 1" – **ENT**.
7. Enter the first must value – **ENT**.
8. Enter the first is value – **ENT**.
9. Repeat steps 7. and 8. for all required lines of the table.
10. Terminate the entry of must and is values – **ESC**.
11. Confirm the table with **F5**. The new table is selected as active.



Linearisation

ID.-Number	Must	Is
200225		
Ref.-Point 1	0.0	0.1
Ref.-Point 2	1.0	1.0
Ref.-Point 3	2.0	1.98
Ref.-Point 4	5.0	5.04
Ref.-Point 5	10.0	9.99
Ref.-Point 6	15.0	15.2
Ref.-Point 7	20.0	20.7
Ref.-Point 8	50.0	51.4
Ref.-Point 9	100.0	104.7
Ref.-Point 10	200.0	209.1

Channel 1 (Tab.1)
DELETE OK

7.2 Define CAN channel



Note

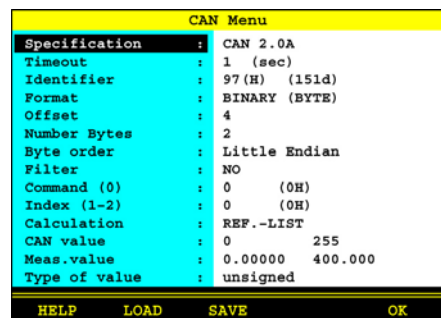
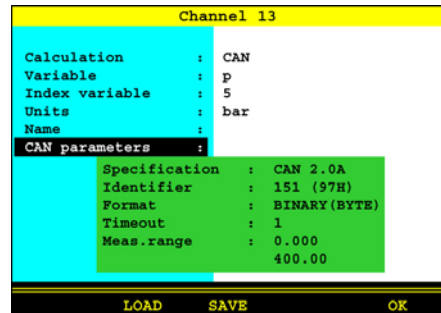
The CAN bus must be activated in the submenu "Device" (see section 6.6.5 on page 28) to enable the use of a CAN channel.

After setting a special channel to "CAN", you can enter variable and unit freely. Then you have to define the CAN parameters. Please have the documentation of the CAN sensor or the CAN adaptor box available, all required information is contained there.

1. Highlight "CAN-Parameter" – **ENT**.
2. (Lower image) Select the CAN specifications – **ENT**.
3. Enter the timeout – **ENT**.
4. Enter the identifier as a decimal number; the corresponding value in hexa-decimal numbers is displayed in brackets – **ENT**.
5. Select the data format – **ENT**. Due to the selected format further input options are displayed.

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

1. **F3**.
2. **ENT** – enter a name, use **F2** to toggle between the entry of capital and small letters – **ENT**.
3. **F5** – store parameters and entered name.



CAN Format "Original"

When entering the CAN specifications you may select the Format "Original". Then the CAN data will not be interpreted by the measuring instrument, but saved digitally in the measurement file. During the data evaluation with HYDROcom 6 these data can be interpreted.

This allows the recording of so called "Multichannels". These are channels containing data from several sources, e.g. switch positions (max. 32 switches in one channel) or different sensor signals.

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

Display of Multichannel data

If you include a Multichannel into the measuring display, no measured values but a hexa-decimal 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.

Examples



Here you save all 32 bits of a Multichannel.



Here you save data bits 8 to 15.



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

1st channel: Bit-Offset = 6, Data-Bits = 2; 2nd channel: Bit-Offset = 14, Data-Bits = 2; 3rd channel: Bit-Offset = 24, Data-Bits = 8



Here the signal of a temperature (bits 0 to 7) and a pressure sensor (bits 8 to 15) are coming on one Multichannel. With the shown specifications, you record the measured values of both channels, but they cannot be displayed at the measuring instrument. The decoding will later be done using HYDROcom 6.

You need two special channels to display the measured values at the MS 5060. At the first you define for the temperature sensor: Format = BINARY, Bit-Offset = 0, Data-Bits = 8. The second for the pressure sensor: Format = BINARY, Bit-Offset = 8, Data-Bits = 8.

CAN specifications

Format: ORIGINAL

Bit-Offset: 0

Data-Bits: 32

Format: ORIGINAL

Bit-Offset: 8

Data-Bits: 8

Format: ORIGINAL

Bit-Offset: 6

Data-Bits: 26

Format: ORIGINAL

Bit-Offset: 0

Data-Bits: 16

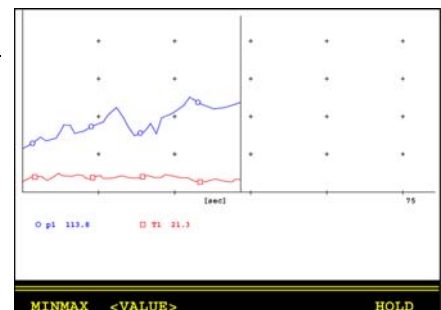
7.3 Graphic presentation in display menu

After configuring the graphic presentation in the display menu (see section 6.4 on page 24), the display might look like this:

- channel p1 is displayed as blue line with circles
- channel T1 is displayed as red line with squares
- the current measured values are displayed beneath the graph
- the vertical black line in the center of the graph indicates the current measuring position

You can use the following functions:

- F1** switches to the graphical presentation of MinMax values
- F2** displays scaling information instead of measured values
- F5** stops the actualisation of the measured values ("freezes" the display)



7.4 Coupling of several measuring instruments

You can couple several MultiSystem 5060 measuring instruments and increase the number of available input channels with nearly no limitations. But please be aware of that:

- series of measurements with more than 24 input channels cannot be processed by the evaluation software HYDROcomsys
- the parameters scan rate, storage time and pretrigger must be programmed identically at all coupled measuring instruments (see further below)

7.4.1 Electrical connection



Attention

Malfunctions possible!

Only use the connection cables available from Hydrotechnik to connect the instruments. Otherwise there is the risk of malfunctions.



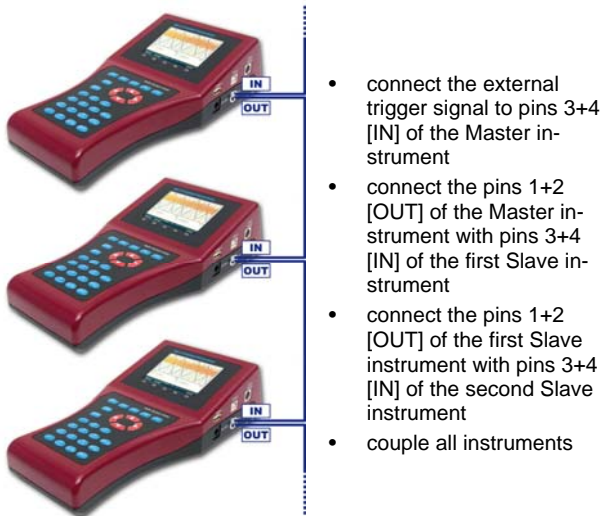
Couple two instruments

Use the connection cable TKZ 8842-F2-00.50 and connect the jacks „Digital input/output“.

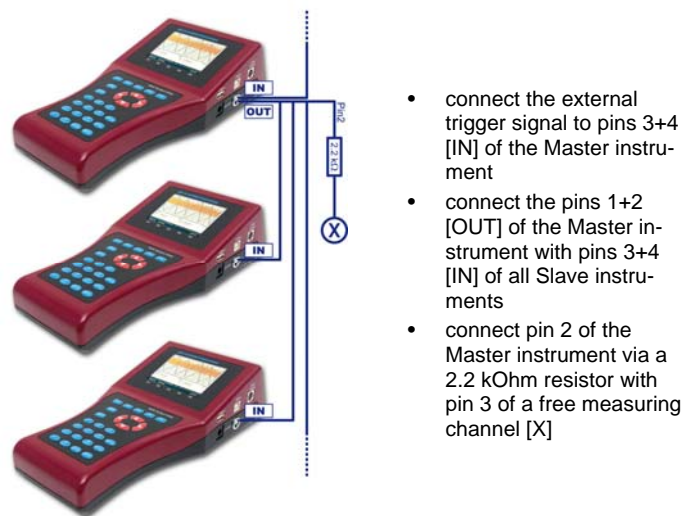
Couple several instruments

Use the connection cable for external trigger TKZ 8842-D8-04.00 and couple the instruments serial or parallel:

Serial coupling



Parallel coupling



Restrictions of the serial coupling

You will see synchronisation delays with the serial coupling:

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

If you operate the coupled instruments in the “dynamic mode” (see section 6.6.6 on page 28) (Hardware filter switched off), all channels can be scanned with up to 10 kHz. Then the synchronisation delay is reduced to 0.1 ms.

Use of the trigger box

For the coupling of more than two instruments we recommend the use of the trigger box (TKZ 3160-00-00.45). This eases the coupling and allows the use of the standard connection cables (TKZ 8842-F2-00.50).

Restrictions of the parallel coupling

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

7.4.2 Program instruments

Program Master instrument

1. Program the memory channels as desired.
2. Program scan rate, storage time and pretrigger as desired.
3. Program the storage start by a trigger (absolutely required, trigger type can be chosen freely).
4. Program the trigger output „ACTIVE“ and set it to „SP_TRIG“ (forwarding of the trigger signal to the Slaves).

Program Slave instruments

1. Program the memory channels as desired.
2. **Program scan rate, storage time and pretrigger identic like at the Master instrument.**
3. Program the storage start by a trigger. Program the trigger input E1 „ON“ for trigger 1.
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.

7.4.3 Start recording

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

- the trigger incident may not happen at the Master instrument, before all Slave instruments have been activated
- there must be sufficient time between the activation of the storage and the happening of the trigger incident to allow all instruments to store the set pretrigger; otherwise the measuring data cannot be synchronised
Example: the pretrigger is 10 sec (20% pretrigger at a storage time of 50 sec) and the trigger incident happens 5 sec after the storage activation at the last instrument; this results in a different number of measured values at the coupled instruments
- the storage may not be stopped at any of the coupled instruments, otherwise a synchronisation becomes impossible
- avoid cyclic storage due to a possible triggering ahead of the desired time

7.4.4 Transfer and evaluate measured values

Transfer the measured values from all instruments to a PC. Use the function „Combine“ of the Hydrotechnik software **HYDROcom**, to combine the series of measurement.

7.5 How to use the USB stick



Hint

USB sticks are supported by firmware version 4.3 and later. If your MS 5060 has an older firmware version, you may do an update free of charge. Please contact our service department or your local Hydrotechnik partner.

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

- USB sticks may only have one partition
- USB sticks must be formatted in the FAT file format
- bootable USB sticks are not supported (no indication „U3smart“ on the stick)
- at the moment, only the 8.3 name convention is supported
- only the root directory is supported on the USB stick; subdirectories are not recognized, data cannot be read or written there

7.6 Firmware update using the USB Stick



Attention

Malfunctions and loss of data possible!

Please ask Hydrotechnik whether your instrument is suited for the planned firmware update. Possibly it is not possible to update an early version to the latest directly. Save all data from the SD card before starting the update.

You can use the USB stick to execute firmware updates of the Multi-System 5060 in a fast and easy way:

1. Copy the new firmware version on the USB stick. The file must be located on the top file system level, not in a directory.
2. Switch on the MultiSystem 5060 and wait until the measured values are displayed.
3. Plug the USB stick into the USB connector.
4. Open the device menu.
5. Open the setup menu with **F2**.
6. Highlight the function „USB stick“ and press **ENT**.
7. The message „Read directory“ will be displayed and after a short time, the data contained on the stick are displayed.
8. Highlight the file „60_00.BIN“ and press **ENT**.
9. Confirm the update with **F5** (OK).
10. The new firmware version will be loaded what takes about 3 minutes.



Attention

Malfunctions and loss of data possible!

Do not switch off the instrument and do not unplug the USB stick during the new firmware version is loaded. Otherwise there could be malfunctions and loss of data.

11. After loading the firmware, the message „Update Firmware“ will be displayed.
12. Confirm the update with **F2** (yes).
13. The update will be executed, then the instrument will be switched off automatically.
14. Unplug the USB stick.
15. Switch the instrument on. The current firmware version number and the message „Execute reset“ will be displayed.
16. Confirm the reset with **F2** (yes).
17. Confirm the operation languages with **ENT**.
18. Wait until the initialization has been executed completely.
19. Format the SD card.

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

7.7 Connect MultiXtend A and T

















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

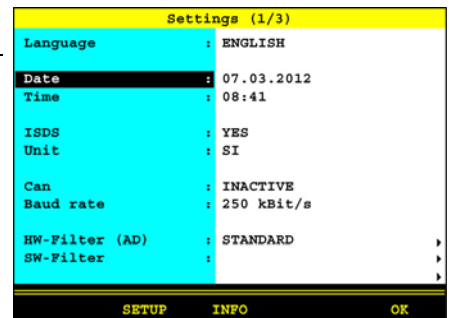
The following steps are required to use the MultiXtend A or T at the MS 5060:

- activate CAN bus
- program CAN channels
- activate power supply of the MultiXtend
- start the MultiXtend

7.7.1 Activate CAN bus

At first you will have to activate the CAN bus in the device menu:

1. Open device menu:     
2. Select function CAN: 5 x  
3. Set function to „ACTIVE“:   
4. Select the Baud rate function:  
5. Select desired Baud rate:   
6. Confirm changes and leave function: 



Attention

Malfunctions possible!

Check whether the MultiXtend is set to the desired Baud rate. Please see the operating instructions of the MultiXtend.

7.7.2 Program CAN channels

Please see the hints in section 7.2 on page 44.

In the following example we show an occupation of a MultiXtend 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

You may program three input channels at the MS 5060 as follows:

Measuring channel 13

Calculation	CAN
Variable	p
Unit	bar
Specification	CAN 2.0A
Timeout (sec)	1 (recommended)
Identifier	enter the sum of 384 plus the address programmed at the MultiXtend (see item 2. of the short operating instructions); e.g. address 064 results in identifier (384 + 64 =) 448
Format	binary
Offset	0 (since the sensor is connected to input 1)
No. data bytes	2

Order	Little Endian
CAN value	0 / 20,000 (for sensor 0 to 20 mA; 4,000 / 20,000 for sensor 4 to 20 mA)
Measured value	0.000 / 600.0 (sensor measuring range)
Value type	unsigned

Measuring channel 14

Calculation	CAN
Variable	p
Unit	bar
Specification	CAN 2.0A
Timeout (sec)	1 (recommended)
Identifier	enter the sum of 384 plus the address programmed at the MultiXtend (see item 2. of the short operating instructions); e.g. address 064 results in identifier (384 + 64 =) 448
Format	binary
Offset	2 (since the sensor is connected to input 2)
No. data bytes	2
Order	Little Endian
CAN value	0 / 20,000 (for sensor 0 to 20 mA; 4,000 / 20,000 for sensor 4 to 20 mA)
Measured value	0.000 / 200.0 (sensor measuring range)
Value type	unsigned

Measuring channel 15

Calculation	CAN
Variable	t
Unit	°C
Specification	CAN 2.0A
Timeout (sec)	1 (recommended)
Identifier	enter the sum of 384 plus the address programmed at the MultiXtend (see item 2. of the short operating instructions); e.g. address 064 results in identifier (384 + 64 =) 448
Format	binary
Offset	4 (since the sensor is connected to input 3)
No. data bytes	2
Order	Little Endian
CAN value	0 / 20,000 (for sensor 0 to 20 mA; 4,000 / 20,000 for sensor 4 to 20 mA)
Measured value	0.000 / 60.00 (sensor measuring range)
Value type	unsigned

7.7.3 Activate MultiXtend power supply

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

1. Open the device menu.
2. Press **F2** to open the setup menu.
3. Highlight the function „Power CAN“.
4. Press **ENT** to set the function to „ON“.
5. Press **F5** to confirm the changes and leave the setup menu.

7.7.4 Start the MultiXtend

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

1. Open the device menu.
2. Press **F2** to open the setup menu.
3. Highlight the function „CANopen device“.
4. Press **F3** „Start“.



Important

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

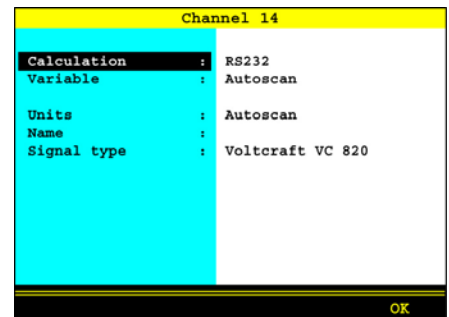
7.8 Connection of external measuring devices

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

Configuration in the channel menu

You can assign the output signal of the external device to any special channel. Open the parameters of the desired channel in the channel menu (see section 6.3.4 on page 22) and set the parameter “Calculation” to “RS232”.

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



8 Cleaning and maintenance

8.1 Cleaning



Attention

Damage to the instrument is possible!

Switch the instrument off and cut-off the power supply **BEFORE** starting to clean. This prevents the risk of a short-circuit, and thereby possible damage to the device.



Attention

Damage to the instrument is possible!

Do **NOT** use any aggressive cleaning materials, solvents, benzol or similar chemicals when cleaning the device. This prevents the risk of damage to the casing and/or dulling the display.

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

8.2 Maintenance

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

Hydrotechnik has an efficient calibration laboratory, please contact:

Hydrotechnik GmbH

Holzheimer Straße 94-96 • D-65549 Limburg
Tel.: +49 (0) 6431 – 4004 0 • Fax: +49 (0) 6431 – 45308
E-Mail: info@hydrotechnik.com • Internet: www.hydrotechnik.com

8.3 SD card replacement

Series of measurement, test runs, databases and projects are stored on the SD card. It can be replaced as follows:



Attention

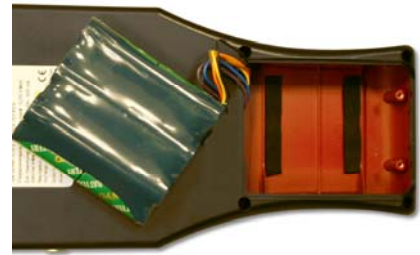
Compatibility problems with different firmware versions!

If you want to use a SD card with data of the MS 5060, these data must be created with an instrument with the identical firmware version like your MS 5060. Otherwise the data cannot be read. The SD card would have to be formatted what deletes all data.

1. Loosen the two holding screws of the battery cover.



2. Take out the battery. Be careful not to damage the connection wires.



3. Press slightly on the edge of the SD card. This releases the card, it will come out of the card slot a little.



4. Take out the SD card carefully.



5. Insert the SD card into the slot and press on it to lock it. The card may not stick out of the edge of the slot.
6. Insert the battery and screw in the holding screws of the battery cover. Be careful not to damage or clamp the connection wires.



Hint

A new SD card must be formatted before you can use it. Please see section 6.6.14 on page 31.

8.4 Repair

In the need of a repair, please contact our Customer Service Dept.. Please have the following information ready when you contact us. If you return the equipment, it would also help if this information was attached:

- Company
- Department
- Contact person
- Address
- Telephone and fax number
- E-Mail address
- Faulty part (equipment, sensor, cable, power pack)
- Used PC (CPU type)
- PC operation system (Windows 95/98/SE/2000/NT/XP, others)
- HydroComsys Software Version
- Service menu print out, setting DETAIL
- Description of fault (please leave the settings on your equipment exactly as they appeared at the time of the fault/error; and please briefly describe the use of equipment, the connection of the sensors, the equipment set-up etc.)

Customer Service Address

Please contact the Hydrotechnik Customer Service Department:

Hydrotechnik GmbH

Holzheimer Straße 94-96 • D-65549 Limburg

Tel.: +49 (0) 6431 – 4004 0 • Fax: +49 (0) 6431 – 45308

E-Mail: info@hydrotechnik.com • Internet: www.hydrotechnik.com