HYDAC INTERNATIONAL

FCU 1000 Series FluidControl Unit

Operating and Maintenance Instructions

English (translation of original instructions)

Valid from firmware versions V 2.00 up

Document no.: 3371346d

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All details are subject to technical modifications.

Technical specifications are subject to change without notice.

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Contents

What's New — Document History

The index is featured on the cover sheet of the operating and maintenance manual and in the lower left corner of each page after the part number.

Index "a" - from firmware version V 1.10

- Change to the items delivered
- Change of Bluetooth device name to "FCU1310"

Index "b" — from firmware version V 2.00

- Change to the items delivered
- "USB connection" chapter added
- Additions made to user interface chapters
- Additions made to "BatteryPack" chapter

Index "c"

- Index adapted

Index "d"

- Restrictions on use of fluid with flash point < 55°C added
- Spare parts list adapted
- "Transporting FCU“ updated
- Filling the hose lines before measuring is no longer necessary.

Preface

For you, as the owner of a product manufactured by us, we have produced this manual, comprising the most important instructions for its **operation** and **maintenance.**

It is intended to help you become acquainted with the ins and outs of the product and use it properly.

You should keep it in the vicinity of the product so it is always at your fingertips.

Sometimes the information contained in the documentation cannot always keep up with changes made to the product as we attach considerable importance to keeping our products cutting-edge. Consequently, there might be deviations in technical details, illustrations and dimensions.

If you discover errors while reading the documentation or have suggestions or other useful information, please don't hesitate to contact us:

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We look forward to receiving your input.

Our motto: "Putting experience into practice"

Technical Support

If you have any questions, suggestions, or encounter any problems of a technical nature, please don't hesitate to contact us. When contacting us, please always include the model/type designation and article no. of the product:

Fax: ++49 (0) 6897 / 509 - 846

E-mail: filtersystems@hydac.com

Modifications to the Product

We would like to point out that changes to the product (e.g. purchasing options, etc.) may result in the information in the operating instructions no longer being completely accurate or sufficient.

When making modifications or performing repair work to components affecting the safety of the product, the product may not be put back into operation until it has been examined and released by a HYDAC representative.

Please notify us immediately of any modifications made to the product whether by you or a third party.

Warranty

For the warranty provided by us, please refer to the General Terms of Sale and Delivery of HYDAC FILTER SYSTEMS GMBH.

Refer to these at www.hydac.com ð General terms and conditions.

Using the Documentation

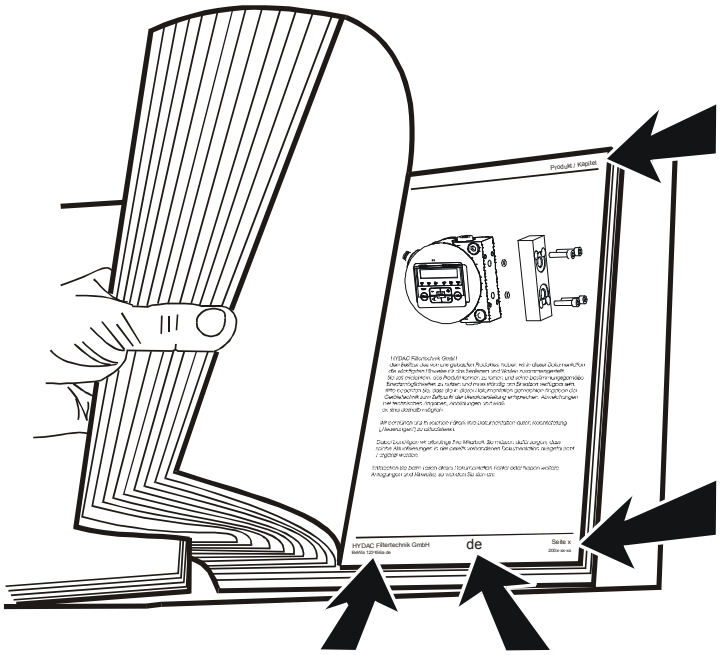
Please note that the method described above of locating specific information does not release you from your responsibility for carefully reading the entire manual prior to starting the unit up for the first time and carefully rereading the manual at regular intervals later on.

WHAT do I want to know?

I determine which topic I am looking for.

WHERE can I find the information I'm looking for?

The document has a table of contents at the beginning. I select the chapter I'm looking for and the corresponding page number.



The documentation number with its index enables you to order another copy of the operating and maintenance instructions.The index is incremented every time the manual is revised or changed.

Safety Information and Instructions

These operating instructions contain the key instructions for properly and safely operating the FCU.

Obligations and Liability

The basic prerequisite for the safe and proper handling and operation of the FCU is knowledge of the safety instructions and warnings.

These operating instructions in general, and the safety precautions in particular, are to be adhered by all those who work with the FCU.

Adherence is to be maintained to pertinent accident prevention regulations applicable at the site where the product is used.

The safety precautions listed here are limited solely to using the FCU.

The FCU has been designed and constructed in accordance with the current state of the art and recognized safety regulations. Nevertheless, hazards may be posed to the life and limb of the individual using the product or to third parties. Risk of damage may be posed to the product or other equipment and property.

The FCU is only to be used as follows:

- Only for proper or designated use.
- Only when in safe, perfect condition.

Immediately remedy any malfunctions that might impair safety.

Our General Terms and Conditions apply. They are made available to the owner upon concluding purchase of the unit at the latest. Any and all warranty and liability claims for personal injuries and damage to property shall be excluded in the event they are attributable to one or more of the following causes.

Explanation of Symbols and Warnings, etc.

The following designations and symbols are used in this manual to designate hazards, etc.:

DANGER denotes situations which can lead to death if safety precautions are not observed.

WARNING denotes situations which can lead to death if safety precautions are not observed.

CAUTION denotes situations which can lead to severe injuries if safety precautions are not observed.

NOTICE denotes situations which can lead to property damage if instructions are not followed.

Proper/Designated Use

The fluid control unit, FCU, was developed to intermittently monitor solid particle contamination, temperature und % saturation level in hydraulic systems.

Analyzing the size and quantity of contamination enables quality standards to be verified and documented and the requisite optimization measures to be implemented.

Any other use shall be deemed to be improper and not in keeping with the product's designated use.

Proper or designated use of the product extends to the following:

- Typical application: Short-time measurement of system cleanliness
- Maintaining adherence to all the instructions contained herein.
- Performing requisite inspection and maintenance work.

Improper Use or Use Deviating from Intended Use

Improper use may result in hazards like the following:

- Use of the FCU 1000 for permanent monitoring (i.e. continuous operation)
- Improper connection of the FCU pressure or return hoses.
- It is not permitted to operate the FCU1000 on a measurement point where the pressure exceeds 345 bar.
- Operation of the FCU on board networks without central "Load Dump" fuse.

Informal Safety Precautions

Always keep the operating and maintenance instructions near the measurement device.

In addition to the manual, the general and local regulations concerning accident prevention and protection of the environment should be available and observed.

Ensure that all information relating to safety and potential hazards of the FCU are kept in a legible condition. Replace them if necessary.

Check the hoses and connectors for leaks on a daily basis.

The product is to be checked once a day for visible external damage and for the proper functioning of the safety devices.

WARNING

Hydraulic systems are under pressure

Danger of bodily injury

► Depressurize the system before performing any work on it.

What to Do in Case of Emergency

In the event of an emergency, disconnect the FCU from the power supply and from the hydraulic system.

Training and Instruction of Personnel

The owner is obliged to only let persons work on the FCU, who:

- are familiar with the fundamental occupational safety and accident prevention regulations and have been properly instructed in the use of the FCU.
- have read and understood these operating instructions.

Only properly trained and instructed personnel may work with the FCU.

The areas of responsibility of your staff must be established in a clear-cut manner.

Staff who are still being trained may only work on the FCU when supervised by a suitably experienced person.

Activity	Individuals	Individuals undergoing training	Individuals with technical training/ engineering background	Electrician	Supervisor with the appropriate authority
Packing Transportation		X	X		X
Start up			X	X	X
Operation		X	X	X	X
Troubleshooting/ locating the source of malfunction			X	X	X
Remedying of mechanical faults			X		X
Remedying of electrical faults				X	X
Maintenance		X	X	X	X
Repair work					X
Decommissioning/storage		X	X	X	X

Transporting the FCU

Transport the FCU only when it is closed position; carry it flat or by the handle.

Storing the FCU

Drain and rinse the FCU completely before putting it into storage. See page 72 for details on rinsing the FCU.

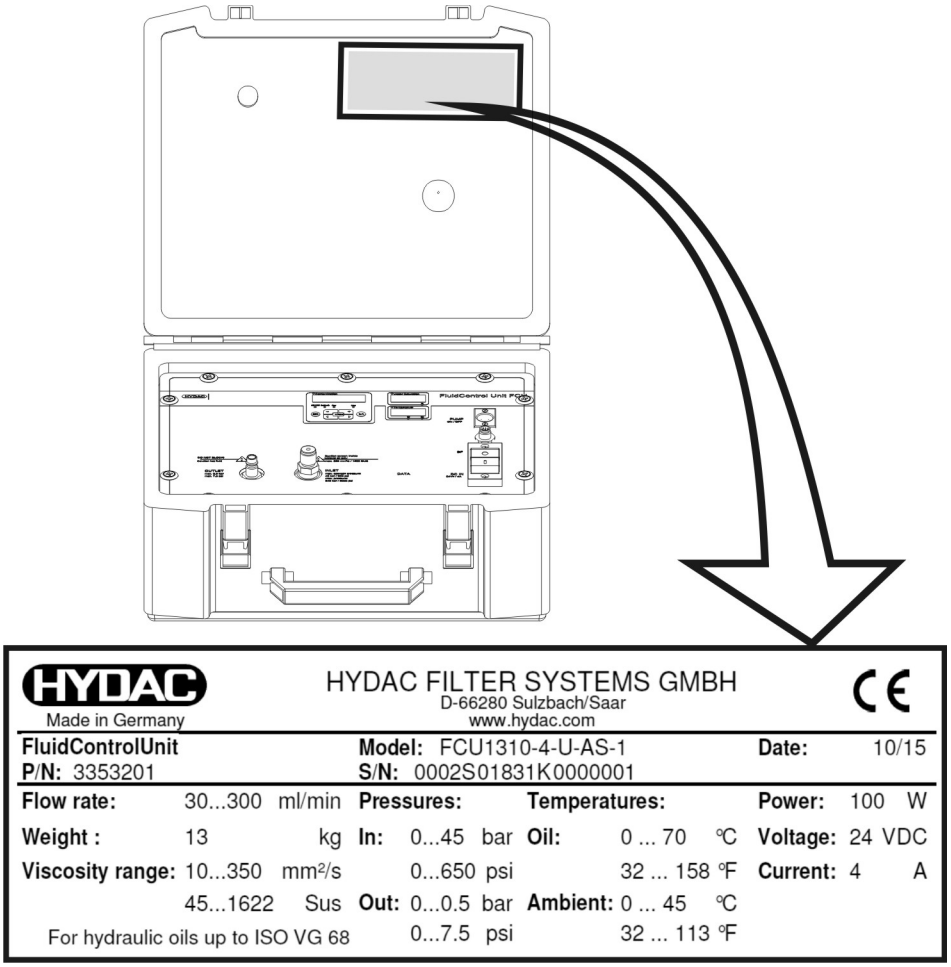
Observe the following storage conditions:

Storage temperature:	-40 … +80°C / -40 … +176°F
Relative humidity:	max. 90%, non-condensing

Store the FCU closed and in a horizontal position in a dry, clean place. If stored in an vertical position, the FCU must not be exposed to any shaking or vibration.

Decoding the model code label

For identification of the FluidControl Unit, see the type label. The label shows product ID and major technical application data.



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CE

FluidControlUnit			**Model:** FCU1310-4-U-AS-1			**Date:**	10/15	
P/N: 3353201			**S/N:** 0002S01831K0000001					
Flow rate:	30...300	ml/min	**Pressures:**			**Temperatures:**		
Weight :	13	kg	**In:**	0...45	bar	**Oil:**	0 ... 70	°C
Viscosity range:	10...350	mm²/s		0...650	psi		32 ... 158	°F
	45...1622	Sus	**Out:**	0...0.5	bar	**Ambient:**	0 ... 45	°C
For hydraulic oils up to ISO VG 68				0...7.5	psi		32 ... 113	°F

Power:	100	W
Voltage:	24	VDC
Current:	4	A

See page 98.for more details on the model code.

Checking the scope of delivery

The FluidControl Unit FCU comes packed and ready for operation. Before commissioning the FCU, check the contents of the consignment to make sure everything is present.

The following items are supplied:

Item	Qty	Description
1	1	FluidControl Unit FCU 1000 Series, including attachable bag for cables and hoses
2	1	Power supply, primary: 90-240 V AC / secondary: 24 V DC, 5 A
3	4	Connection cable (Europe, USA/Canada, UK, Australia, Japan)
4	1	INLET suction hose, open end, clear-transparent, L = 0.3 m (11.81 inch)
5	1	INLET high pressure hose with test connector type 1620, color: clear-transparent, length = 2 m
6	1	High pressure adaptor
7	1	OUTLET return hose, transparent, L = 2 m
8	1	Operating and maintenance instructions
9	1	Certificate of calibration
10	1	CD-ROM with FluMoS Software
11	1	Pocket for documents
12	1	USB stick with operating and maintenance instructions (PDF file) in additional languages
-	1	"Getting started" guide

A Bluetooth adapter is a free gift and is not part of the delivery.

What the FCU 1000 can do

The FCU 1000 is a portable service unit for hydraulic systems for intermittent measurement of the particulate contamination, the moisture content in % saturation and the temperature of the fluid.

The integral pump and hoses supplied can be used on:

- Control circuits
- Pressure circuits
- non-pressurized tanks

Applications for the FCU include the servicing and repair of mobile hydraulic systems.

The internal data memory enables measurements to be recorded together with a time-stamp.

The USB interface can be used to copy all measurements to a USB memory stick, for subsequent evaluation on a PC using Excel or the fluid monitoring software FluMoS Light.

Additional features include:

- Optical measurement of the degree of solid particle contamination
- Capacitive measurement of the relative humidity in % saturation.
- Resistive measurement of the temperature
- Applicable for hydraulic fluids (up to ISO VG 68) 10 … 350 mm^2/s / 16 … 1622 Sus
- Automatic measurement and display of cleanliness ratings in accordance with:
  - ISO 4406:1987; NAS 1638
  - ISO 4406:1999; SAE AS 4059 (D)
- Measurement accuracy +/- ½ ISO code in the calibrated range
- Supply voltage of 24 V DC / 4 A for operation on mobile machine on-board power supplies
- Network adapter 90 - 240 V AC / 24 V DC 5 A included in the scope of delivery
- Operating pressure without high-pressure adapter max. 45 bar / max. 650 psi, Operating pressure with high-pressure adapter max. 345 bar / max. 5000 psi
- Integrated pump for the automatic control of oil flow

Restrictions on the use of the FCU 1000

NOTICE

Impermissible operating conditions

The FCU will be destroyed

- ► Use the FCU with mineral oils or mineral oil-based raffinates whose flash point is higher than 55°C/131°F.
- ► Observe the permissible viscosity range (up to ISO VG 68):
  10 ... 350 mm²/s or 46 ... 1622 SUS
- ► Only operate the FCU 1000 for brief periods of time (S4 to DIN EN 60034 / VDE 0530).
- ► When the pump has been operating for 30 minutes, shut off the FCU 1000 for at least 10 minutes to cool down.

NOTICE

Connection of the FCU to board networks

The FCU will be destroyed

- ► Use the FCU only on board networks which have a central "Load Dump" fuse.
  The Load Dump with a maximum of 30 V DC must be installed and effective.

Counting particles in the FCU 1000

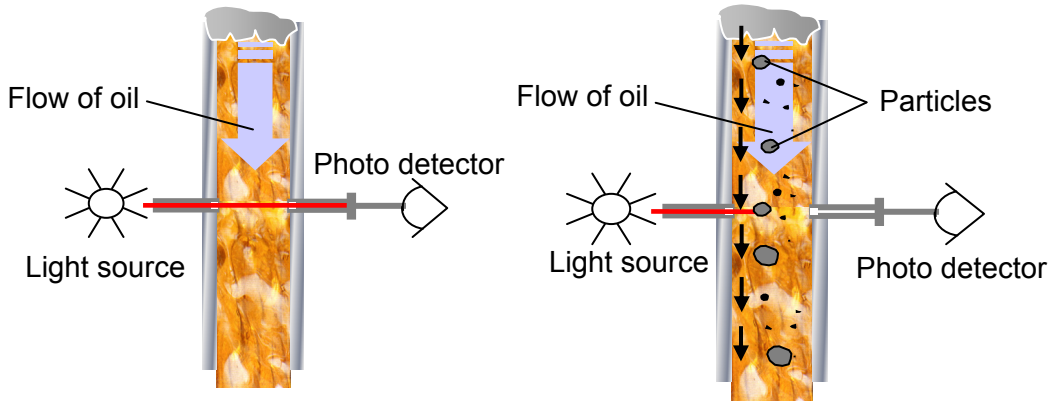
The measuring principle of the light blocade procedure is shown in simplified form in the following sketch.

The light source transmits monochromatic light through the flow of oil to a photo detector, which produces a particular electrical signal. If a particle gets between the light source and the photo detector, then a shadow will be cast on the photo detector.

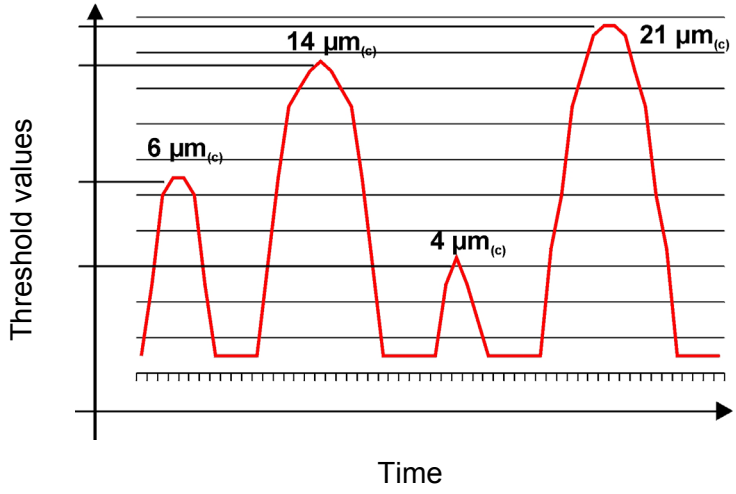
This shadow causes a change in the electrical signal generated by the photo detector. This change makes it possible to determine the size of the shadow cast by the particle and thus to gauge the size of the particle itself.

This procedure makes it possible to determine the cleanliness class according to ISO 4406:1987, ISO 4406:1999, NAS 1638 and SAE AS 4059.

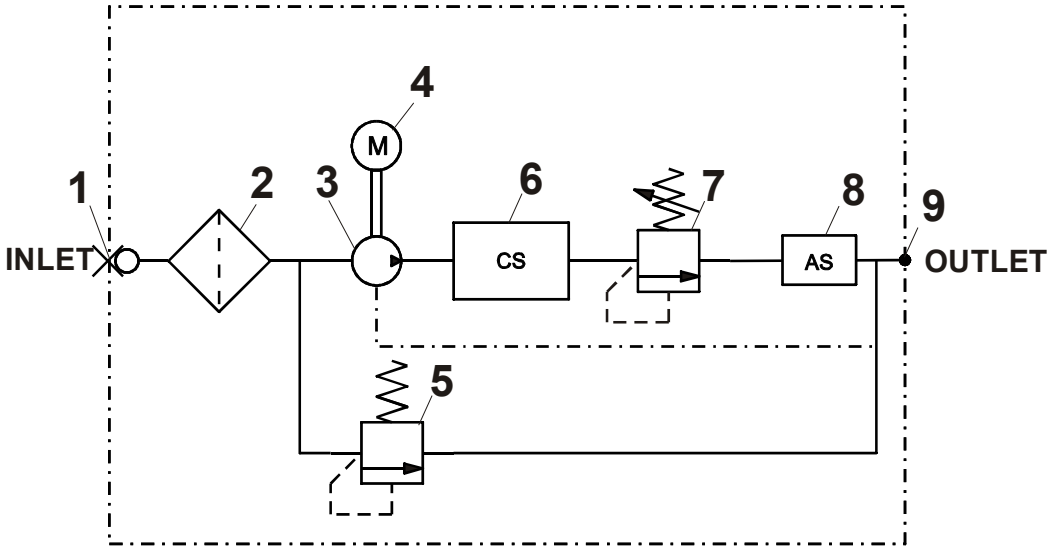
The disruption factors of this measurement principle are foreign fluids and small gas bubbles that lead to refractions, thus causing them to be counted as particles as well.



Each of the signal peaks corresponds to the shadow cast by one particle. The signal height or amplitude reflects the particle size. Thresholds are used to classify the particle sizes >2, >5, >15, >25 µm or >4, >6, >14, >21 $\mu m_{(c)}$.



How the FCU 1000 functions



From the oil source (either a pressure port or a bottle sample), a continuous oil current is established through the INLET (1) connector by an electrically controlled gear pump (3).

A suction screen (2) protects the pump from coarse contamination.

The oil current to be analyzed flows through an optical sensor (6). The contaminant particles contained in the oil current cause the light beam to be darkened in a pulse-like manner. An electronic evaluation module classifies and counts these measurement signals according to particle diameter. The evaluation module continuously computes the SAE or ISO cleanliness classes. It computes for the reference volume of 100 ml based on the measurement signals of the optical sensor.

A defined pressure is generated in the oil flow via a counter balance valve (7). This serves to minimize air bubbles in the system, which could skew the measurement results.

The pressure relief valve (5) protects the pump and the measuring cell from excessive pressure.

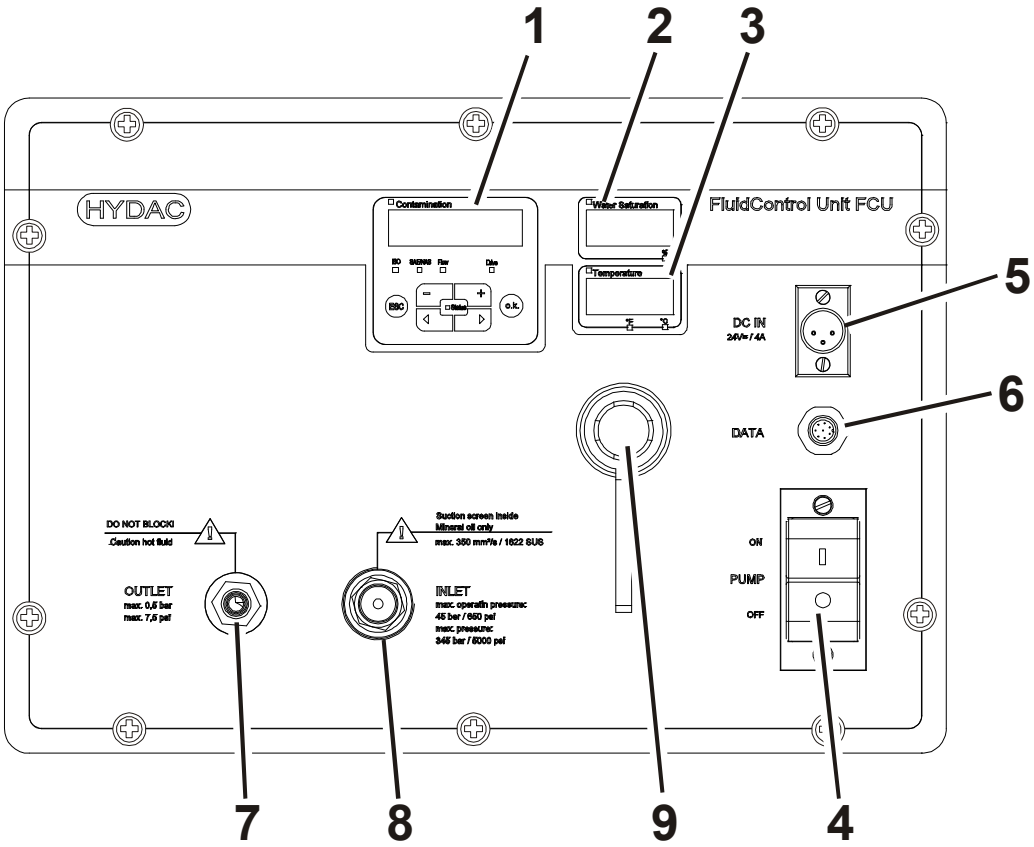
The oil current leaves the OUTLET (9) connector and must be routed by the return-flow hose to a non-pressurized tank.

The electronic evaluation module monitors:

- the functioning of the particle sensor
- the oil flow
- the power supply voltage
- the functioning of the AquaSensor

When a malfunction occurs, an error message automatically appears in the display and interrupts the measurement. The evaluation module will recognize when the cause of error has been corrected, and the unit will reset automatically and resume the measurement operation.

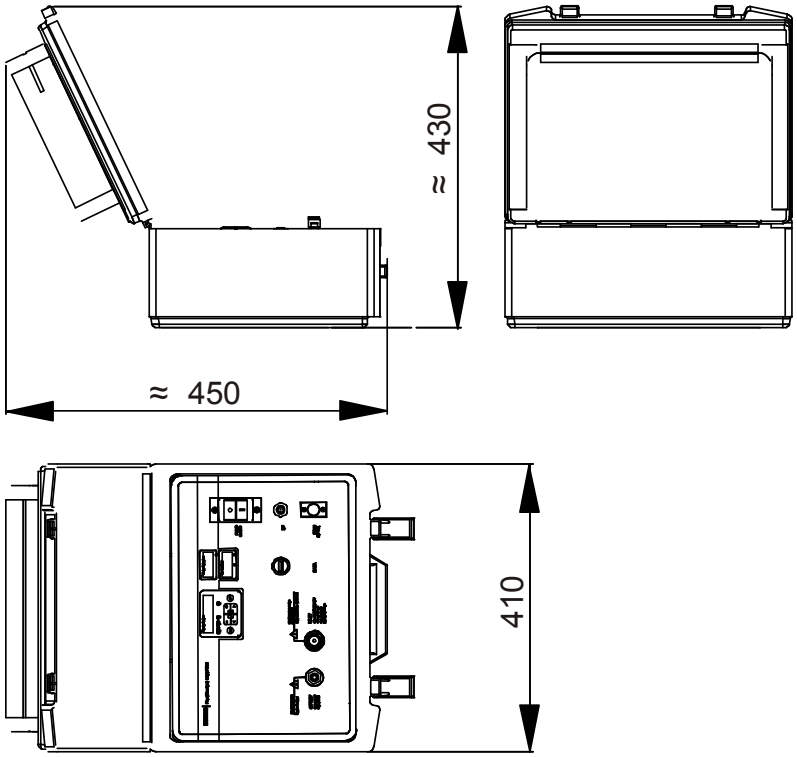
User interface of the FCU 1000



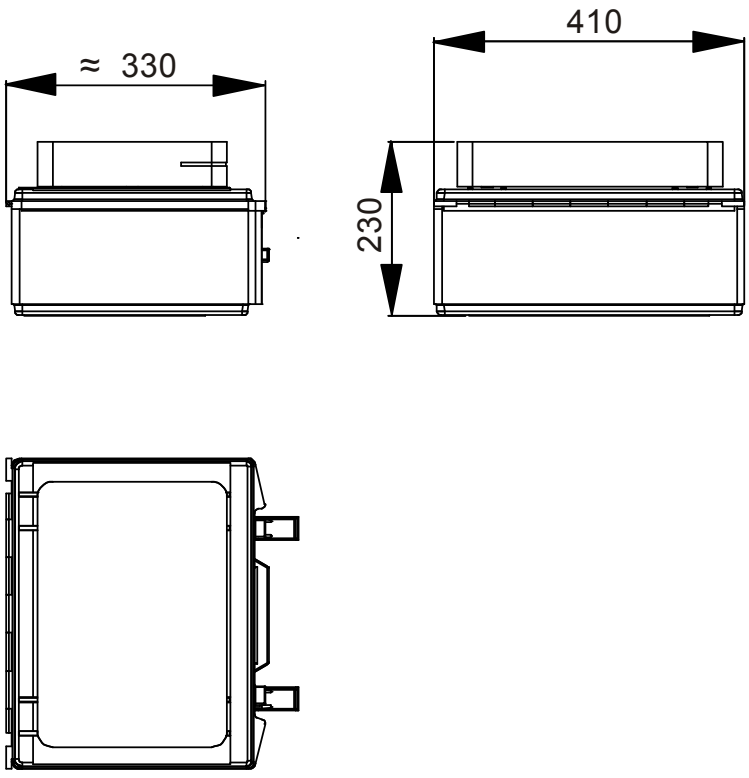
Item	Description
1	Display of “ISO, SAE/NAS, Flow, Drive” with keypad
2	Display of the percentage "water saturation"
3	"Fluid temperature" display
4	ON / OFF switch for the internal pump
5	Supply voltage 24 V DC
6	Data interface (DATA)
7	OUTLET port
8	INLET connection, Type 1604
9	USB interface with cover
-	Bluetooth interface

Dimensions of the FCU 1000

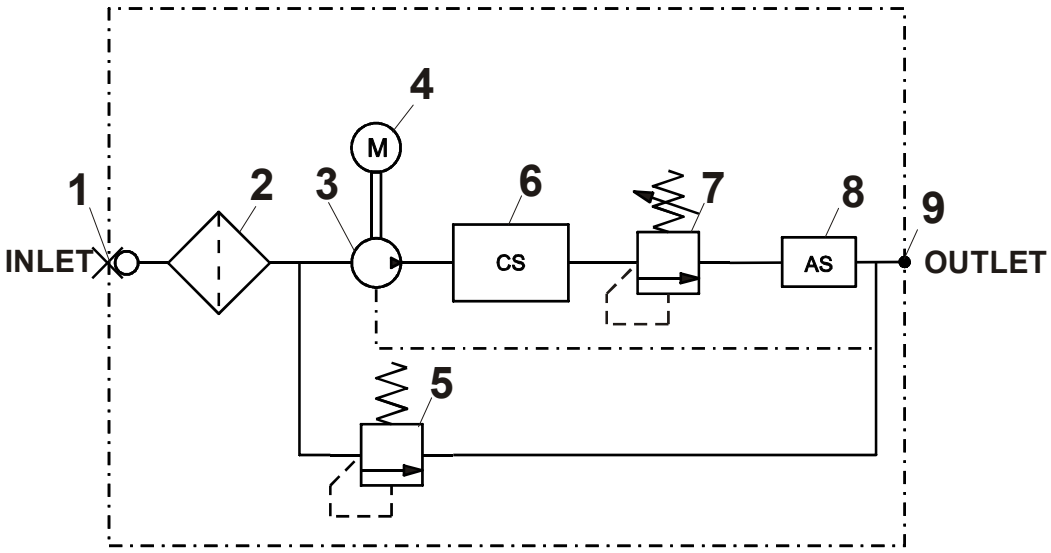
FCU open:



FCU closed:



Hydraulic diagram



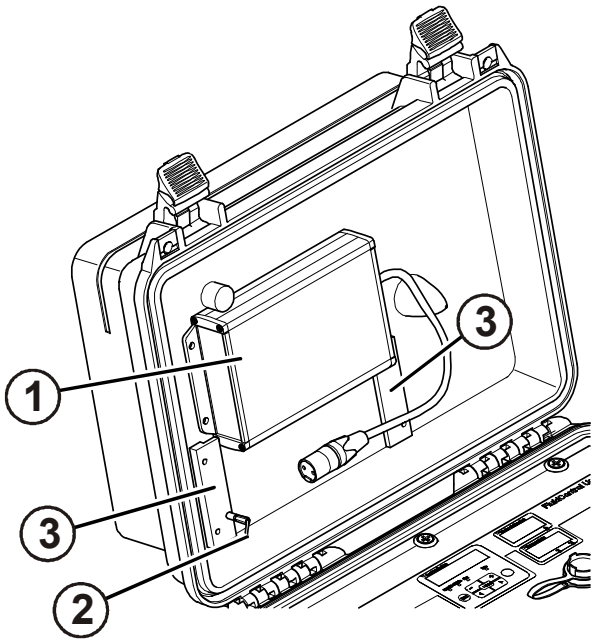
Item	Description
1	INLET, test connector type 1604
2	Suction screen, 400 µm
3	Gear pump
4	Electric motor
5	Pressure control valve
6	ContaminationSensor Unit
7	Counter balance valve
8	AquaSensor AS 1000
9	OUTLET, DN7 Quick coupling nipple

Using the BatteryPack (accessory)

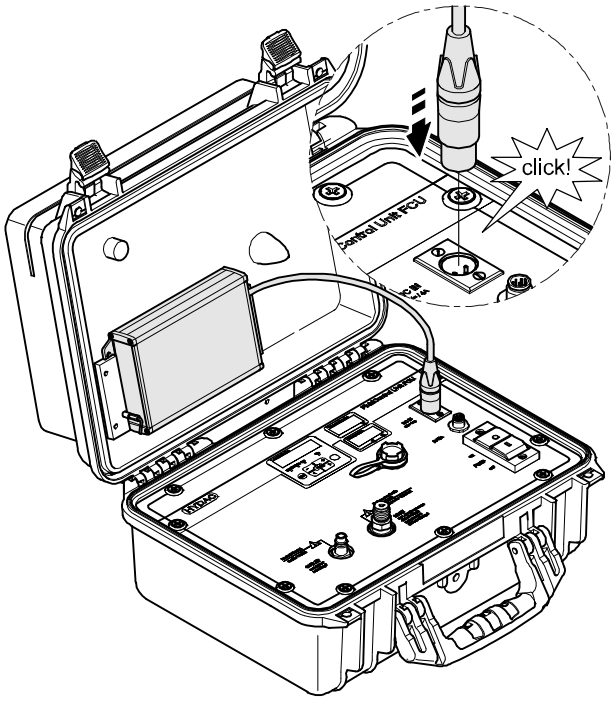
With the BatteryPack, which is available as an accessory, you can make the FCU independent of the electrical supply network.

For technical details on the BatteryPack, see its instruction brochure.

With the locking pin (2), the BatteryPack (1) is held securely in the mounting rails (3) during transport.

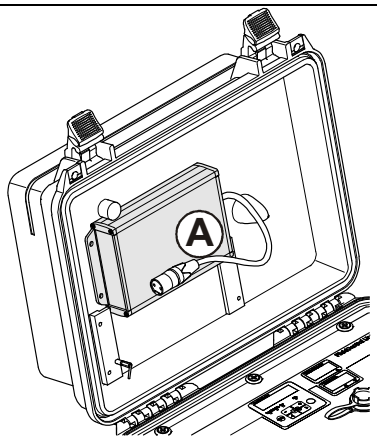


For operation with the BatteryPack, fit the connector into the FCU socket labeled "DC IN".

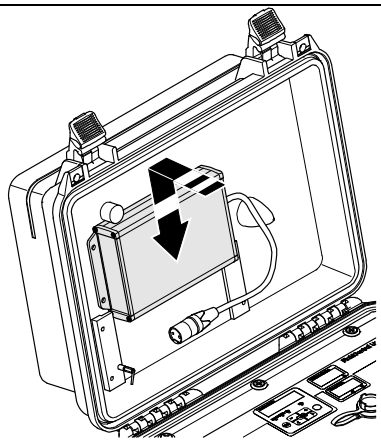


To fit the BatteryPack into its holder, proceed as follows:

1. Remove the connector (A) from the socket on the BatteryPack.



2. Slide the BatteryPack into the mounting rails from above.

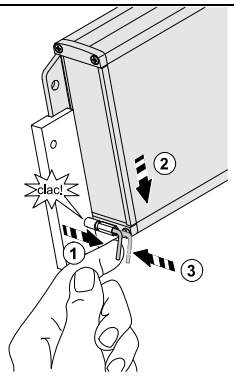


3. Pull the locking pin (1)

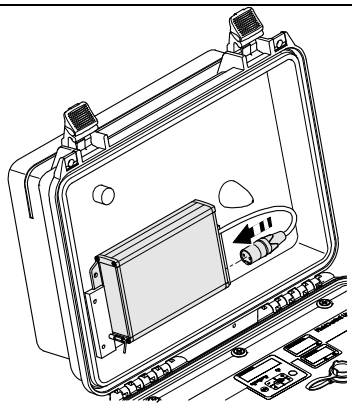
   Slide the BatteryPack down until it touches the lower stop in the guide rails (2)

   Release the locking pin (3). A spring will return the locking pin to its original position, thus securing the BatteryPack.

   Check that the BatteryPack is firmly seated.

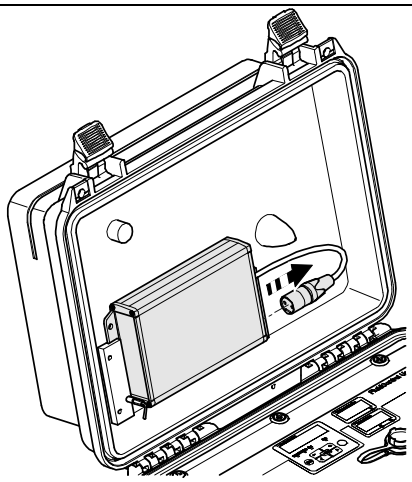


4. Insert the connector into the socket on the BatteryPack.



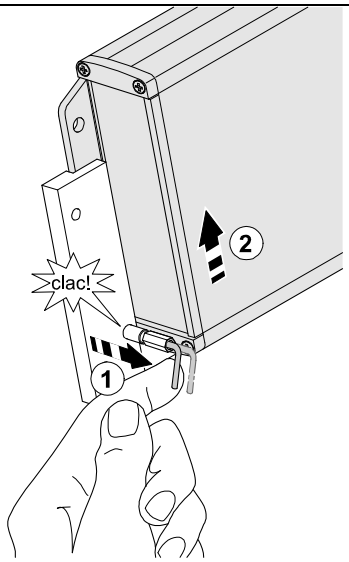
To remove it, proceed as follows:

1. Remove the connector from the socket.



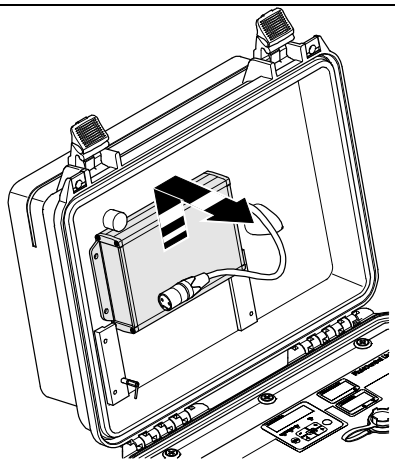
2. Pull the locking pin out to release the BatteryPack (1).

   Slide the BatteryPack upwards (2).



3. Pull the BatteryPack up and out of the mounting rails.

   Then insert the connector back into the socket on the BatteryPack.



Preparing the FCU for measurement

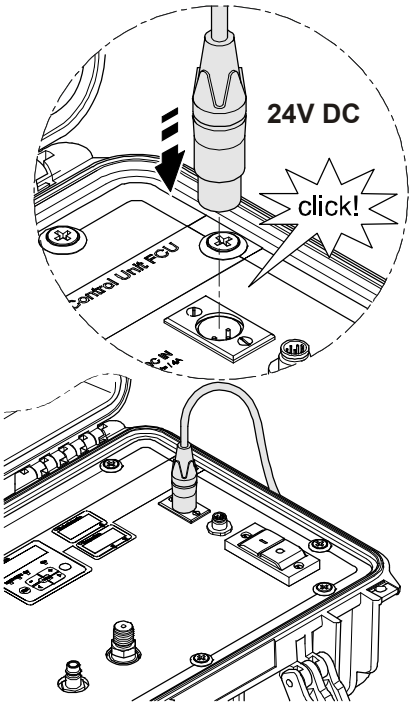
Before operation, the FCU must first be hydraulically and electrically connected, as described below.

Connecting/disconnecting the FCU electrically

The FCU has a 3-way plug to connect to a 24 VDC power supply. Insert the 3-pole connector from the power supply (included in the FCU delivery) into this. Plug the power supply into the main electricity supply.

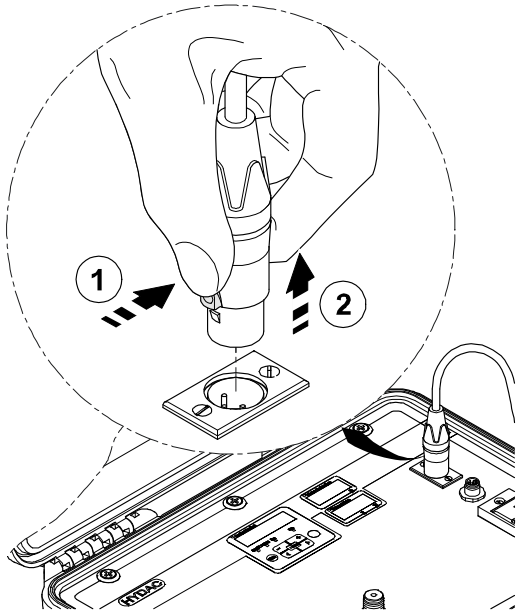
1. After the unit is plugged in, HYDAC FCU 1### appears in moving letters, followed by the firmware version, which appears for 2 seconds.
2. The internal sensors will then be checked.
   The display will show 2 SENS OK. as well as the sensor firmware.
3. The self-test with countdown follows: WAIT 99 to WAIT 0.
3. The FCU is now ready.
4. As long as the pump is not running and no fluid is being pumped, the status LED will flash red, and the display will show CHECK.
   This means that there is no oil flow.

To insert the connector



Insert the connector into the socket until it audibly snaps in.

To remove the connector



Press the catch on the connector (1) and then pull the connector out (2).

Connecting/disconnecting the OUTLET hose

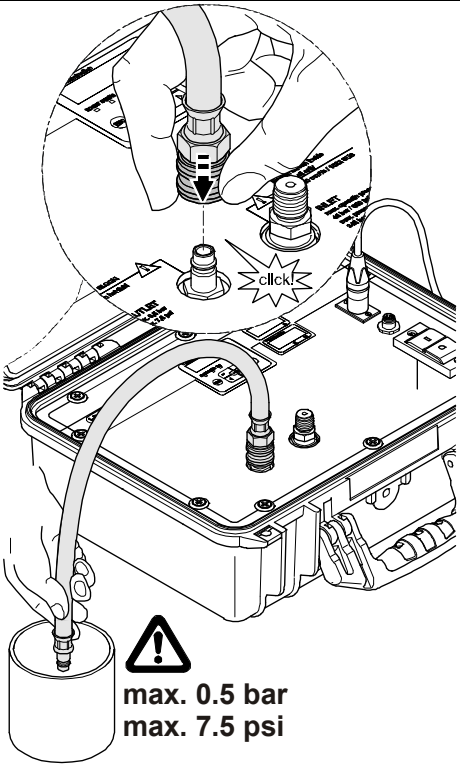
NOTICE

If the OUTLET connection is closed or blocked

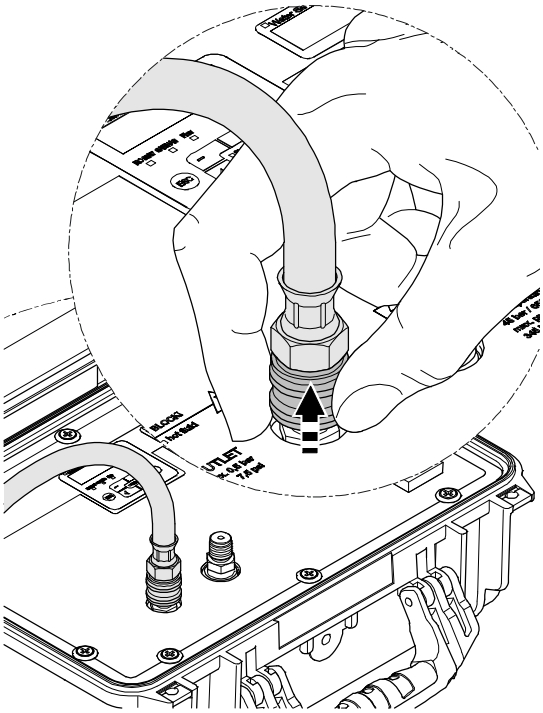
The FCU will be damaged.

► Never seal the OUTLET connection.

► Put the free end of the OUTLET return hose into an unpressurized container.



Plug in return hose



Take off return hose

Fit the quick-action coupling on the OUTLET return hose to the nipple. Make sure that the coupling audibly snaps into place. Make sure that the quick-action coupling is firmly seated.

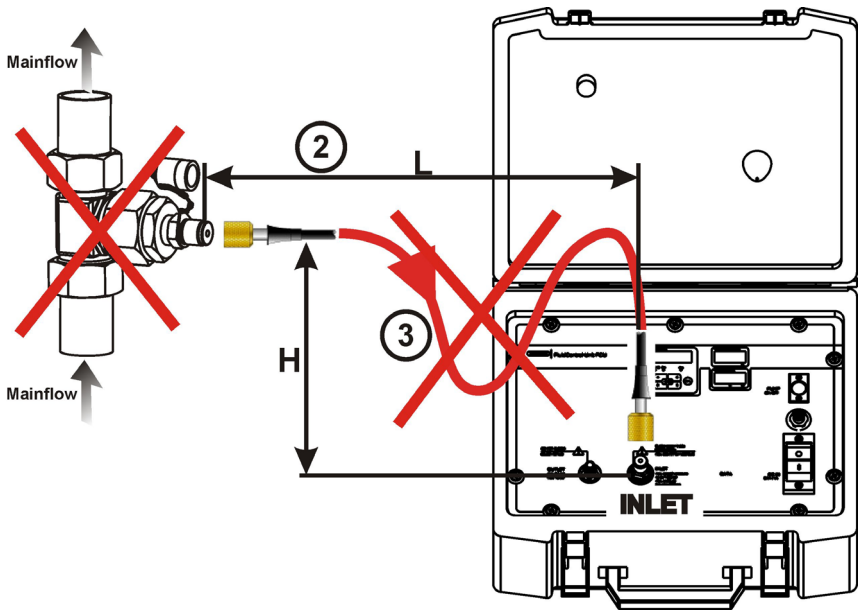
Put the other end of the OUTLET return hose into an unpressurized container.

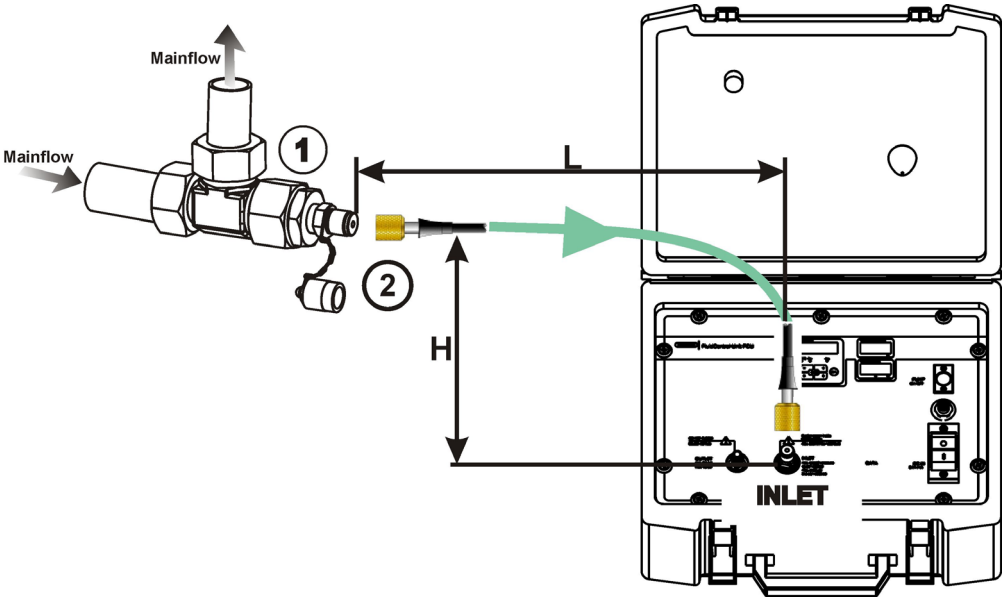
Selecting the measurement point

① Select the measurement location so that the sample measured comes from a turbulent location, with a good flow. For example on a pipe bend. This ensures that a typical sample is analyzed.

② If the FCU is installed in near the measurement point, avoid delayed measurement results and sedimentation (particle deposits in the line).

③ While installing the INLET hose, make sure that no siphon results.





Select the measurement method according to the pressure involved

After you have selected the measurement location according to the above-mentioned criteria, determine what the operating pressure is at that location.

Select the measurement method that is suitable for the pressure at the measurement point.

Pressure at the measurement site.	Measurement method	Details are on page
0 bar / 0 psi	Measuring from unpressurized containers	38
1 … 45 bar / 14 … 650 psi	Measuring up to max. 45 bar / 650 psi	32
15 … 345 bar / 217 … 5000 psi	Measuring in the range 5 to 345 bar / 217 to 5000 psi	35

Measuring up to max. 45 bar / 650 psi

WARNING

Hydraulic systems are under pressure

Danger of bodily injury

- ► The system must be depressurized before starting work on it.
- ► If the pressurized connection is connected to the hydraulic system, oil will flow through the FCU.
- ► Make sure that the specified sequence is followed.

NOTICE

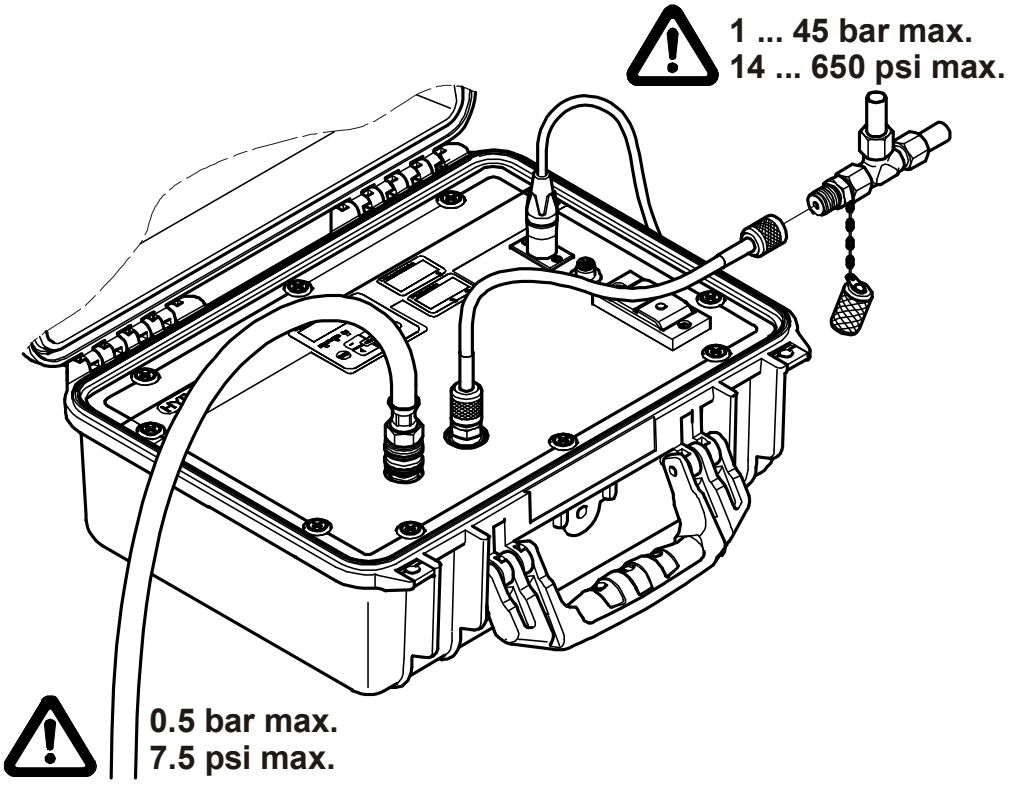
If the operating pressure exceeds 45 bar / 650 psi

The excess pressure will be discharged via the OUTLET connection.

- ► Never seal the OUTLET connection.
- ► Put the free end of the OUTLET return hose into an unpressurized container.
- ► When operating the FCU, always observe the permissible operating pressure.
- ► The FCU 1000 can withstand pressures up to 345 bar / 5000 psi.

Required hoses

- OUTLET return hose
- High-pressure hose

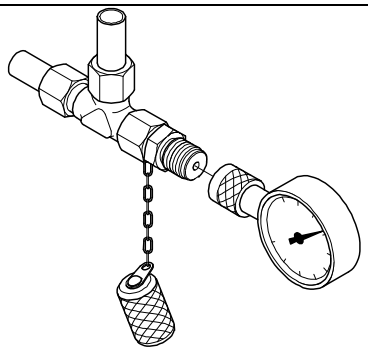


Make sure to follow the sequence specified here:Make sure to follow the sequence specified here:

1. Go through the steps in chapter "FCU für die Messung vorbereiten“ on pages 28 to 31.

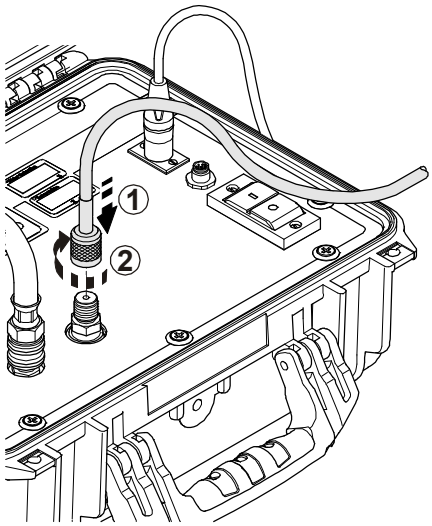
2. Check the pressure at the measurement point. The pressure there must be in the range of 1 to 45 bar / 14 to 650 psi.

   If the pressure exceeds 45 bar / 650 psi, use the high-pressure adapter (see page 35).

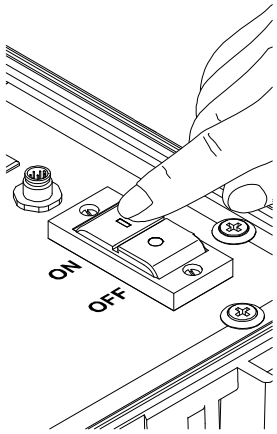


3. Connect the INLET pressure hose (black) to the INLET port (1) of the FCU.

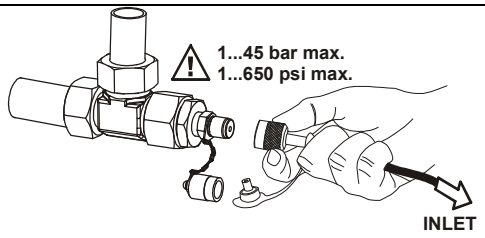
   Screw the measurement coupling clockwise (2) onto the connection and screw it finger tight.



4. Switch on the internal pump.



5. Conclude by connecting the other end of the INLET pressure hose to the measurement port of the system.



6. The hydraulic installation of the FCU is now complete.

7. The FCU will start with the measurement.

Measuring in the range 5 to 345 bar / 217 to 5000 psi

WARNING

Hydraulic systems are under pressure

Danger of bodily injury

- ► The system must be depressurized before starting work on it.
- ► If the pressurized connection is connected to the hydraulic system, oil will flow through the FCU.
- ► Make sure that the specified sequence is followed.

NOTICE

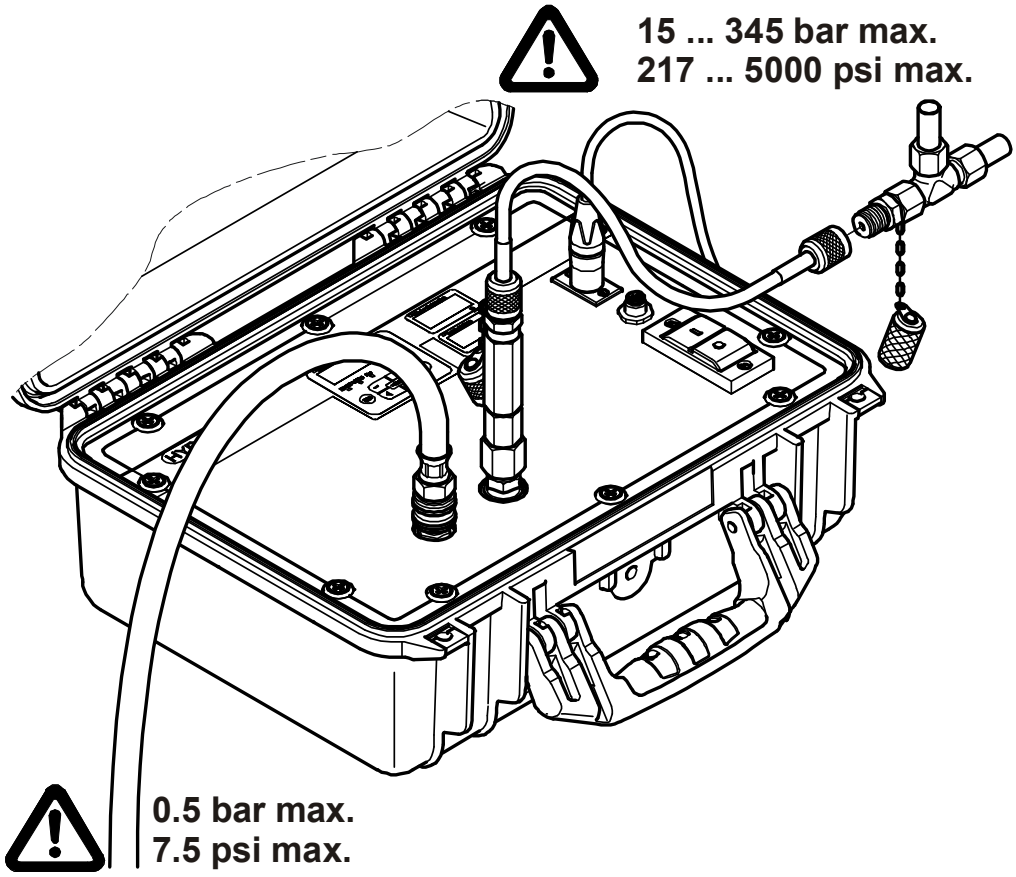
If the operating pressure exceeds 345 bar / 5000 psi

The excess pressure will be discharged via the OUTLET connection.

- ► Never seal the OUTLET connection.
- ► Put the free end of the OUTLET return hose into an unpressurized container.
- ► When operating the FCU, always observe the permissible operating pressure.
- ► The FCU 1000 can withstand pressures up to 345 bar / 5000 psi.

Required hoses / adapters:

- OUTLET return hose
- High pressure adaptor
- High-pressure hose

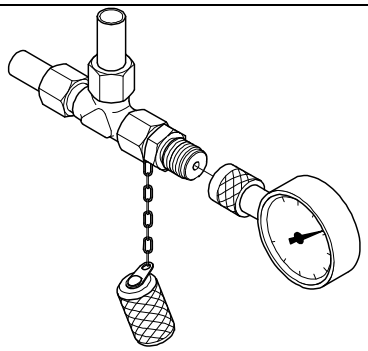


Make sure to follow the sequence specified here:Make sure to follow the sequence specified here:

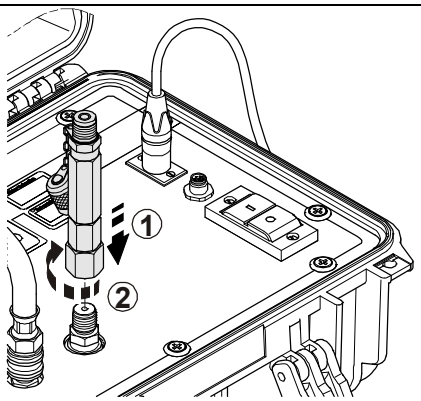
1. Go through the steps in chapter "Preparing the FCU for measurement“ on pages 28 to 31.

2. Check the pressure at the measurement site. The pressure there must be in the range from 15 ... 345 bar / 217 ... 5000 psi.

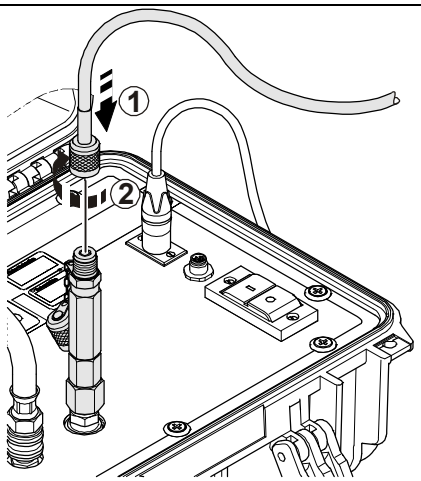
    If the pressure exceeds 345 bar, you may not use the FCU 1000. Use some other measurement point.



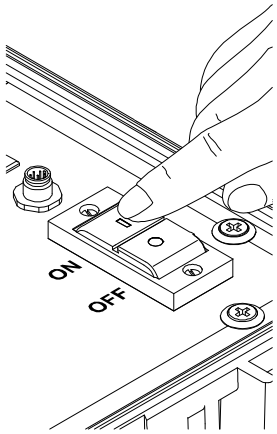
3. Screw the high pressure adaptor onto the FCU's INLET connection.



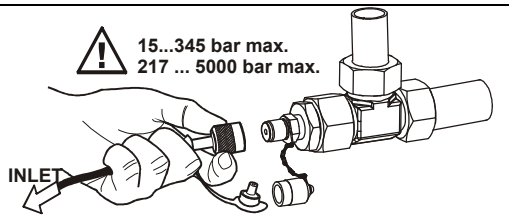
4. Connect the high pressure hose to the high pressure adaptor.



5. Switch on the internal pump, using the switch.



6. Connect the other end of the high pressure hose to the measurement point of the hydraulic system.

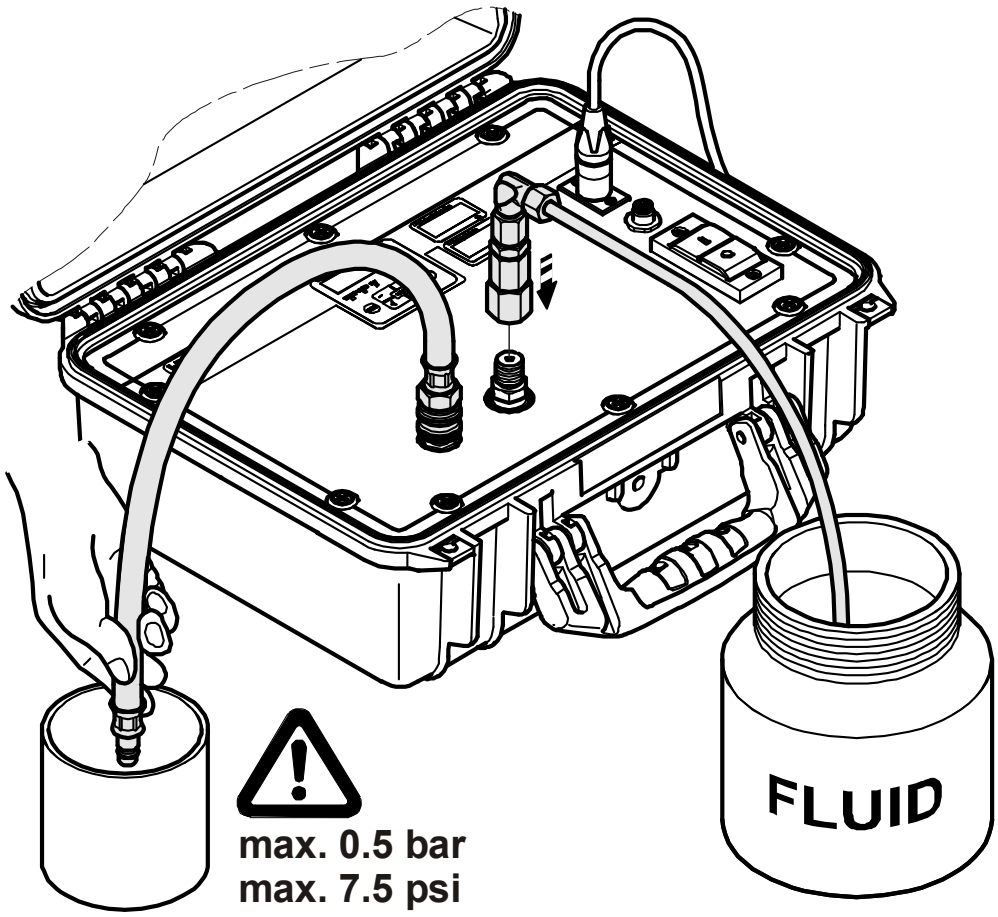


7. The hydraulic installation of the FCU is now complete.
8. The FCU will start with the measurement.

Measuring from unpressurized containers

Required hoses

- OUTLET return hose
- Suction hose



To guarantee valid and direct measurements, the FCU must be primed. To do this, you need approximately 120 ml of oil to completely fill the hydraulic circuit inside the FCU and INLET hose.

If the FCU is not primed, an air-oil mixture will flow through the FCU at the start of measurement. The sensor will interpret this air-oil mixture as particulate soiling and will thus falsify the measurement result.

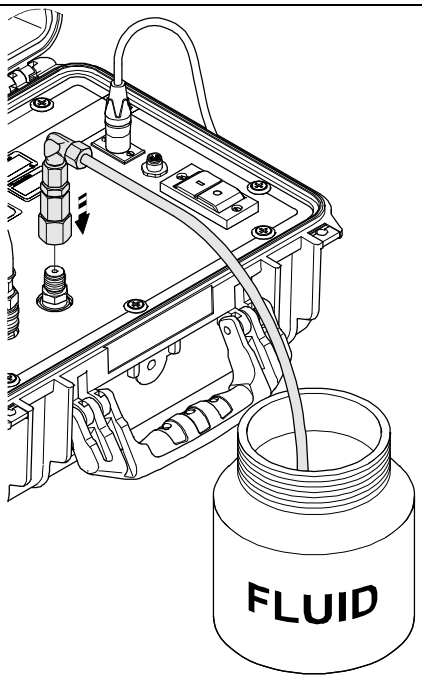
For an initial test without priming the FCU and hoses, you need at least 300 ml of fluid.

Make sure that the following sequence is observed:

1. Go through the steps in chapter "FCU für die Messung vorbereiten“ on pages 28 to 31.

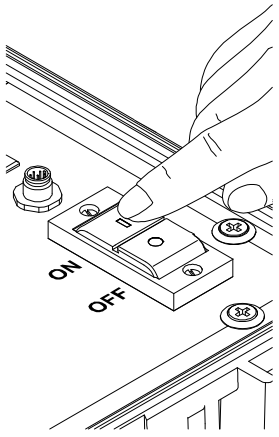
2. Connect the suction hose (transparent) to the FCU INLET.

   Put the other end of the transparent suction hose into an unpressurized container.



3. The hydraulic installation of the FCU is complete.

4. Switch on the internal pump.



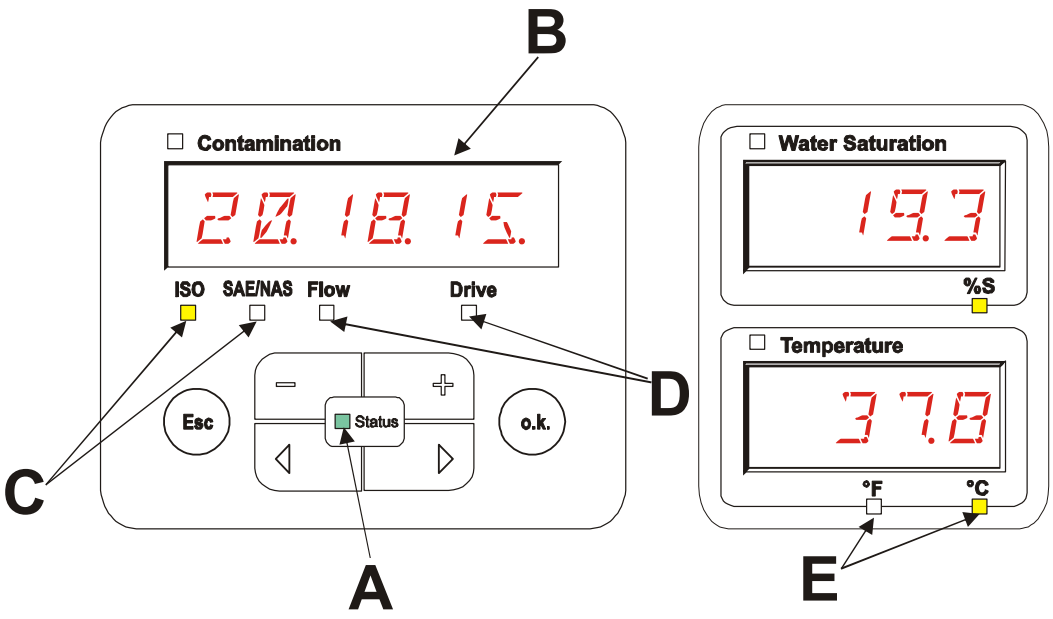
5. The FCU will start with the measurement.

Operating the FCU

If the FCU is powered up, then it can be used and parameters can be set.

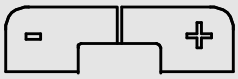
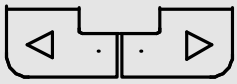
In the following, the individual controls and their use are described.

Display and keypad elements

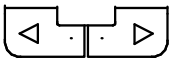


Item	LED	Description
A	Status	Status display (see page 81 for details).
B	Display	Consists of a 6-digit display and shows the selected measured values.
C	Measured variable	This indicates which measurement is currently being shown in the display e.g. **ISO / SAE/NAS.**
D	Additional variable	Indicates which of the other variables are shown in the display e.g. **Flow / Drive.**
E	Unit (of measurement)	The units of the fluid temperature display can be set to °C or °F

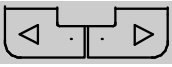
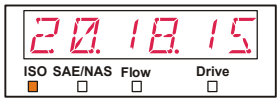
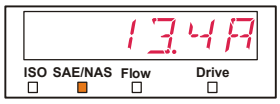
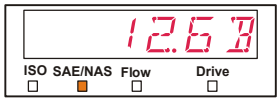
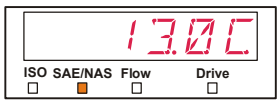
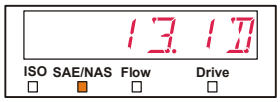
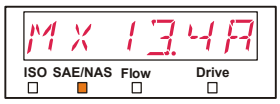
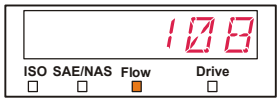
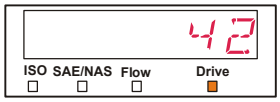
The keyboard consists of six buttons. These buttons are used to operate the FCU and to navigate through the menus (hierarchically structured).

Keyboard	Description
o.k.	- one level down - confirm changed value (lowest level) - confirm when changes are to be saved or canceled (top level)
Esc	- one level up - no value change
	- Change values at the lowest levels (if you are at the lowest menu level, the display will flash)
	- scroll through display - scroll through menu - select digit

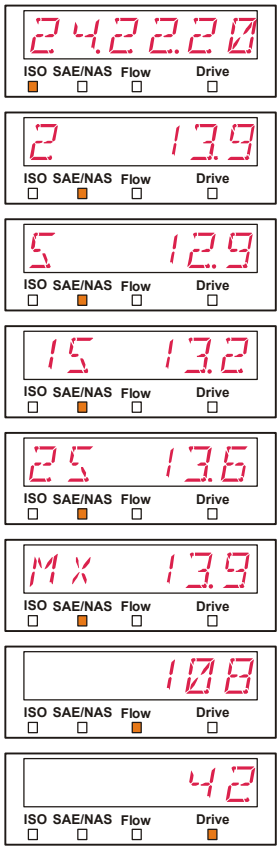
Clicking through the display

According to the calibration type (CAL 3) in the power up menu, the following displays can be clicked through with the  buttons.

ISO.SAE display

	Display	Description
		3-digit ISO code
		SAE class A
		SAE class B
		SAE class C
		SAE class D
		SAE Max.
		Flow rate in ml/min
		LED current in %

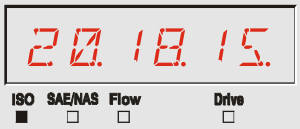
ISO.SAE display

	Display	Description
		3-digit ISO code 2-5 µm channel NAS 5-15 µm channel NAS 15-25 µm channel NAS > 25 µm channel NAS NAS Max. Flow rate in ml/min LED current in %

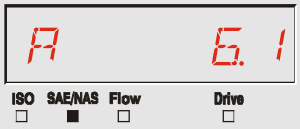
Measured variables

The measurements provide you with information about the purity of the oil in the system concerned. The measurement variables are calibrated. They indicate a measured value with an accuracy of +/- 1/2 ISO codes.

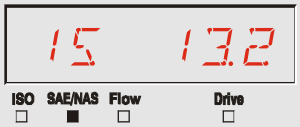
Measured variable "ISO"

Display	Description
	The measured value is updated depending on the set measuring time. Display of the 3-digit ISO code. Example: ISO code 20.18.15

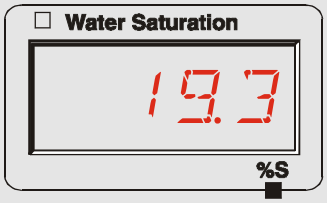
Measured variable "SAE"

Display	Description
	The measured value is updated depending on the set measuring time. Display of a channel in the SAE class. Example: SAE class, channel A = 6.1

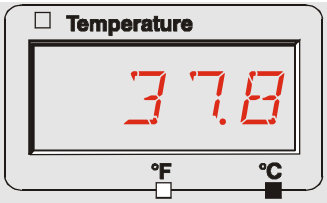
Measured variable "NAS"

Display	Description
	The measured value is updated depending on the set measuring time. Display of a channel in the NAS class. Example: NAS class, channel 15-25 = 13.2 µm

Measured variable "Water saturation"

Display	Description
	The integrated AquaSensor continuously measures the saturation. The measurement is shown on the display as the relative water content of the fluid, expressed as percentage saturation. Example: 19.3% relative humidity

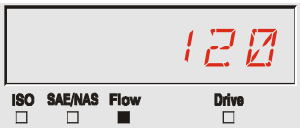
Measured variable "Temperature"

Display	Description
	The integrated AquaSensor continuously measures the fluid temperature. The output as Celsius °C or Fahrenheit °F can be selected under TP.UNIT on page 55. Example: Temperature = 37.8°C

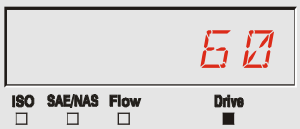
Service variables

These values give you information about the determined flow and the light source power within the FCU. The service variables are not calibrated.

Service variables "Flow"

Display	Description
	Here, you can see the averaged flow through the contamination sensor unit. Example: Flow rate = 120 ml/min

Service variables "Drive"

Display	Description
	Display of the light source efficiency (1-100%) with which the ContaminationSensor unit currently works. Example: Light source efficiency = 60%

FCU configuration menus

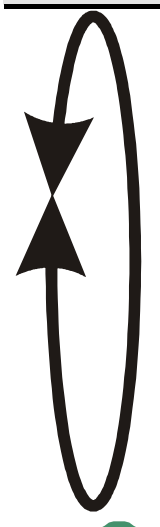
The sensor has two operating levels with corresponding menus.

Menus	Description	Details are on page
Power Up Menu	The basic settings for the FCU	46
Measuring Menu	Settings for the recording and storing of the measurements and naming the measurement points.	51

Power Up Menu

In this menu, the basic settings for the operation of the FCU are made.

Selection	To do
Start the power up menu.	Press any button and hold it down while switching on the supply voltage
Exit the power up menu without saving.	Scroll to CANCEL and press o.k., or the option will be selected automatically after 30 seconds
Exit the power up menu after saving.	Scroll to SAVE and press o.k.



Power Up	Description	For details, see page:
DAT.TIM	Set the system date	47
ADRESS	Set bus address	47
DELMEM	Delete the records	48
MTIME	Set measuring time	48
CALIB	Select the calibration	49
DFAULT	Reset to factory defaults	49
CANCEL	Discard changes and exit	50
SAVE	Save changes and exit	50

Press o.k. to change to a sub-menu.

DAT.TIM – date / time

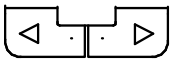
In this option you can set or alter the system date / time.

If the date has never been set, or if the battery is flat , the system date will be 2000-01-01 and the time will be 00:00.

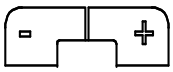
The date format is YY.MM.DD => year / year / month / month / day / day.

The time uses 24 hour format HH.MM => hour / hour / minute / minute.

Use the following buttons to set the date and time:



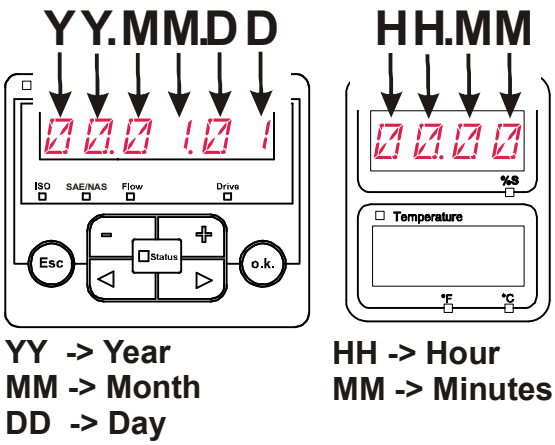
To change digit



To change the value

To confirm the change

Cancel and back



YY -> Year
MM -> Month
DD -> Day

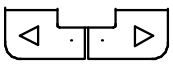
HH -> Hour
MM -> Minutes

ADRESS - Bus address

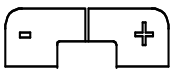
With "ADRESS", you set the bus address to transmit the measurements over the data interface, using the HSI protocol.

There are 26 bus addresses available, from A - Z. Please note that each address may occur only once on any bus.

Use the following buttons to set the address:



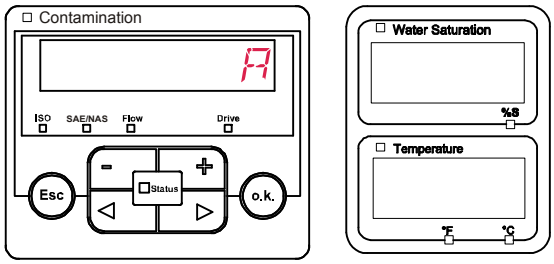
To change digit



To change the value

To confirm the change

Cancel and back



The factory setting of the bus address is: A

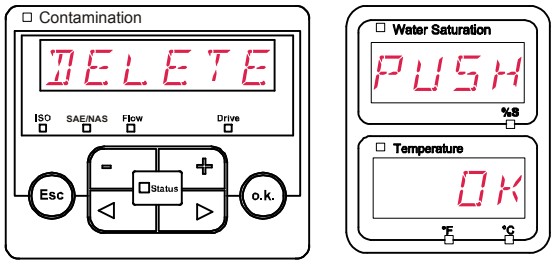
DEL.MEM – Delete Memory

Here, you permanently delete all of the measurement records in the internal memory.

Before deletion, back up all of the measurement records on the USB memory stick.

Push the following buttons to:

- o.k. Confirm deletion
- Esc Cancel and back

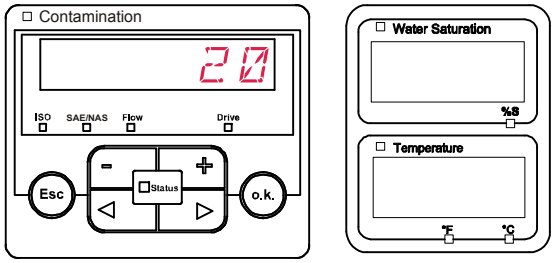


M.TIME – Measurement Time

Here, you set the duration of the measurement. Select the duration in the range from 10 to 300 seconds. This value is factory set to 20 seconds.

Use the following buttons to set the duration of the measurement.

- To change digit
- To change the value
- o.k. To confirm the change
- Esc Cancel and back



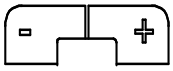
CALIB – Select calibration type

Under CALIB, select the desired calibration type, either ISO.SAE or ISO.NAS.

The calibration type ISO.SAE is based on ISO4406:1999 / SAE.

The calibration type ISO.NAS is based on ISO4406:1987 / NAS.

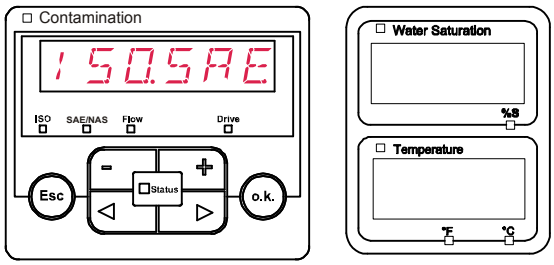
Use the following buttons:



To change between the types of calibration

To confirm the change

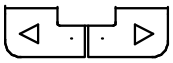
Cancel and back



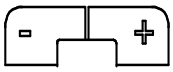
DFAULT – reset to factory settings

DEFAULT resets the FCU back to factory settings. For the factory settings, see page 49.

Use the following buttons:



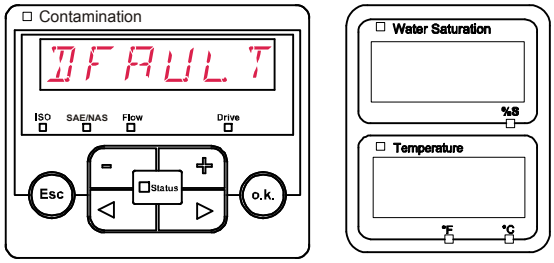
Change to the next option in the menu



Has no function

To confirm the change

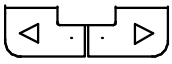
Cancel and back



CANCEL

CANCEL discards all changes and exits the popup menu.

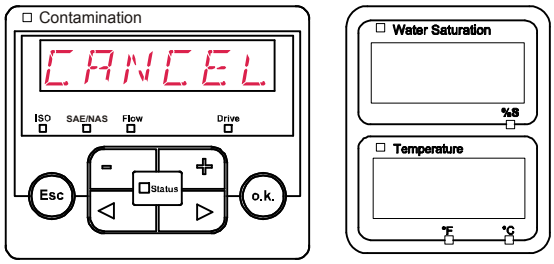
Use the following buttons:



Change to the next option in the menu

o.k. Confirm

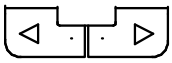
Esc Cancel and back



SAVE – store data

SAVE stores all of your changes and exits the popup menu.

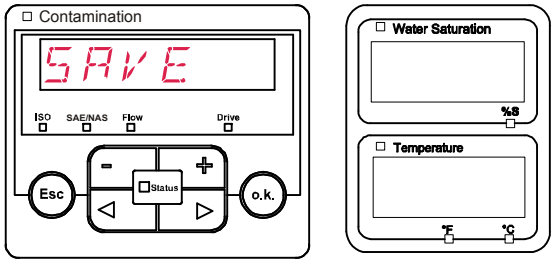
Use the following buttons:



Change to the next option in the menu

o.k. Confirm

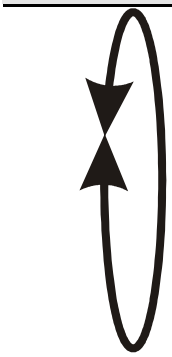
Esc Cancel and back



Measuring Menu

The measuring menu allows you to change settings during operation.

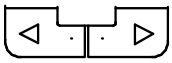
Selection	To do
Start the measuring menu	Press the o.k. button
Exit the measuring menu without saving	Scroll to CANCEL and press o.k. or wait for 30 seconds with no further action and the FCU will automatically switch to display mode.
Save and exit the measuring menu	Scroll to SAVE and press o.k.

Measuring Menu:		Description	For details, see page
	RECORD	Record measurements	52
	MEMORY	Show free memory	53
	EDMPNT	Change measurement location name	54
	TPUNIT	Change temperature units	55
	CANCEL	Discard changes and exit	55
	SAVE	Save changes and exit	55

RECORD - recording measurements

With this option you define under which of the 20 available measurement points the records should be saved.

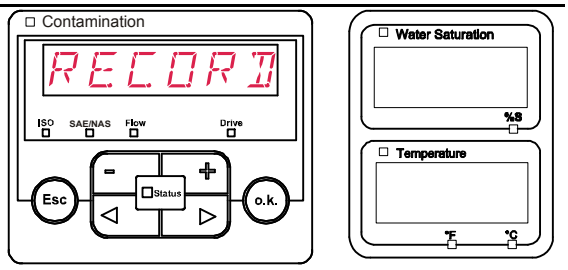
Use the following buttons:



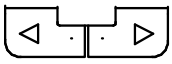
Change to the next option in the menu

o.k. Confirm

Esc Cancel and back



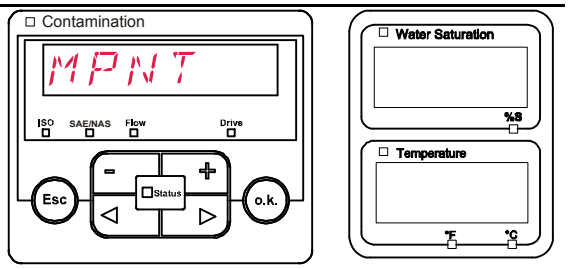
Use the following buttons:



Change the selection

o.k. Confirm

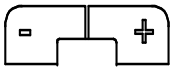
Esc Cancel and back



MNPT makes up to 20 freely definable measurement points available. On delivery, the measurement points are set to MNPT00 to MNPT19.

You can change these names at will, as described under ED.MNPT.

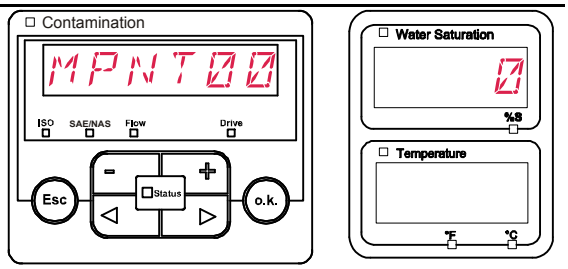
Use the following buttons:



Change to the next measurement point

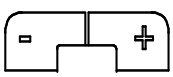
o.k. To confirm the change

Esc Cancel and back



Select STP.STA to create a new file in the internal FCU memory, under which you can create new measurement points. Press o.k. and the display will jump to SAVE. Confirm again by pressing o.k. .

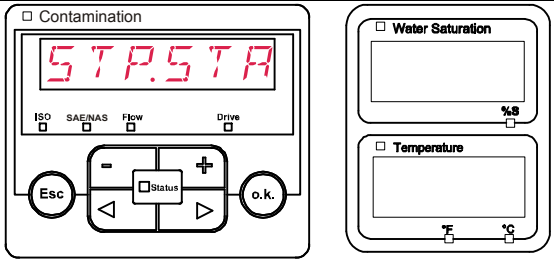
Use the following buttons:



Change the selection

o.k. Confirm

Esc Cancel and back



MEMORY – display free memory

Under MEMORY, you check the current free internal memory capacity of the FCU in %. If there is no more memory available, no measurement records can be saved.

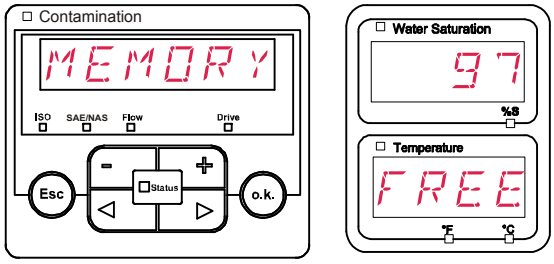
Copy the measurement records that you have already read out as described on page 59**Fehler! Textmarke nicht definiert.**. Then delete those records in the internal memory with DEL.MEM as described on page 48.

For example: 97% free memory.

Use the following buttons:

o.k. To confirm the change

Esc Cancel and back

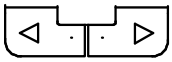


ED.MPNT – Change the name of measurement points

Under ED.MPNT you can modify the names of the measurement points to meet your requirements.

You only have 6 characters available for the name. For example TEST01, DIGGER, CRANE etc.

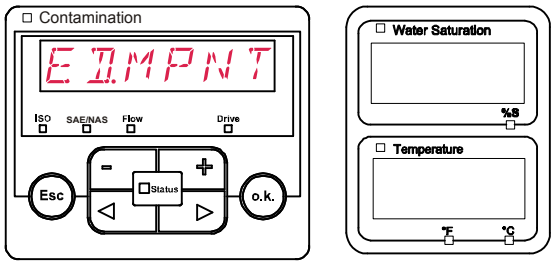
Use the following buttons:



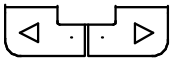
Change to the next option in the menu

o.k. To confirm the change

Esc Cancel and back



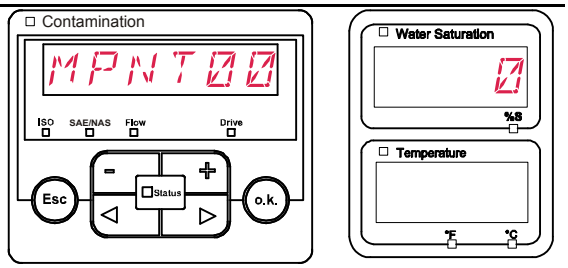
Use the following buttons:



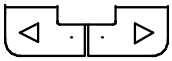
Change to the next measurement point

o.k. To confirm the change

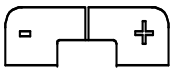
Esc Cancel and back



Use the following buttons:



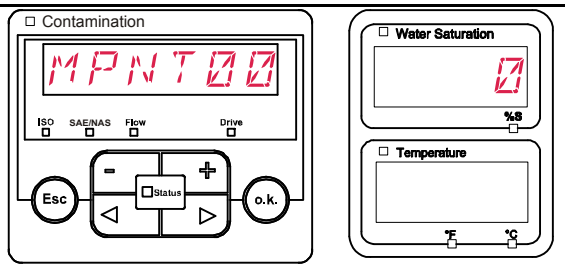
Select another character

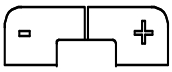


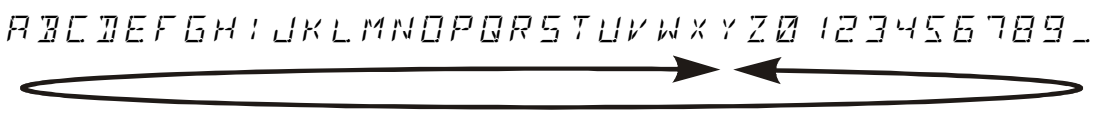
Change the current character

o.k. To confirm the change

Esc Cancel and back



The following characters will appear, when the  button is pressed, wrapping around at the end.

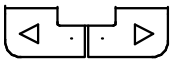


The empty space is located between 9 and A and can be adjusted only from the 6th position to the left. This means that you can enter a name with less than 6 characters.

TP.UNIT – change the temperature units °C / °F

Under TP.UNIT you set the units to display the fluid temperature. You have the choice between Celsius °C and Fahrenheit °F.

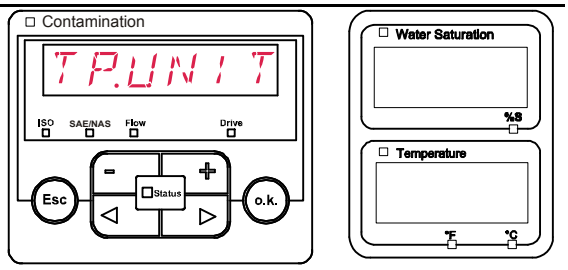
Use the following buttons:



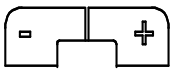
Change to the next option in the menu

o.k. Confirm

Esc Cancel and back



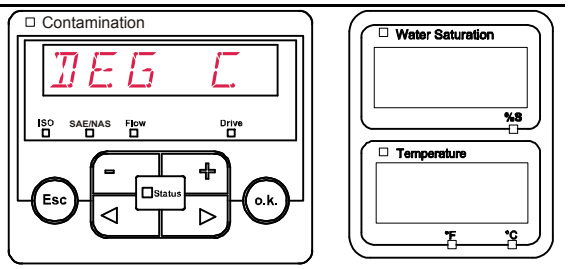
Use the following buttons:



Change the selection

o.k. Confirm

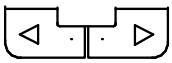
Esc Cancel and back



CANCEL

With CANCEL, you discard all changes and exit the measuring menu.

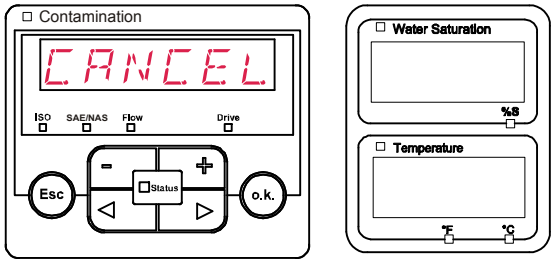
Use the following buttons:



Change to the next option in the menu

o.k. Confirm

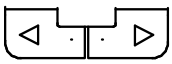
Esc Cancel and back



SAVE - save data

With SAVE, you store all changes and exit the measuring menu.

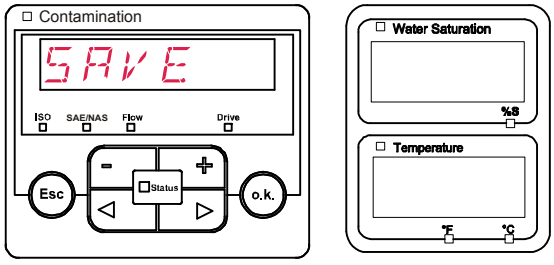
Use the following buttons:



Change to the next option in the menu

o.k. Confirm

Esc Cancel and back



Performing a measurement

1. Check all the hydraulic and electrical connections to the FCU.
2. Now press the green "Pump ON" switch.
3. The pump feeds oil to be analyzed through the FCU.
   After the set measurement duration, the result will be shown on the display, and the status LED will light up green, steadily.

Restrictions pertaining to use

NOTICE

Impermissible operating conditions

The FCU will be damaged

- ► Only use the FCU with mineral oils or mineral oil-based raffinates.
- ► Observe the permissible viscosity range: 10 – 350 mm²/s or 46 – 1622 SUS (ISO VG 68)
- ► Only operate the FCU 1000 for brief periods of time (S4 to DIN EN 60034 / VDE 0530).
- ► After 30 minutes of operation, turn off the FCU 1000 for at least 10 minutes to cool down.

Internal measurement memory

All measurements are kept in internal memory, with a reference to the measurement point, until deliberately deleted by using the DEL.MEM function.

The internal memory has a capacity of > 30000 lines = measurement records.

To hit the capacity limit of the internal memory, it is theoretically necessary, with a measurement interval of 20 seconds (factory set), to run the FCU for 7 days, 24 hours per day.

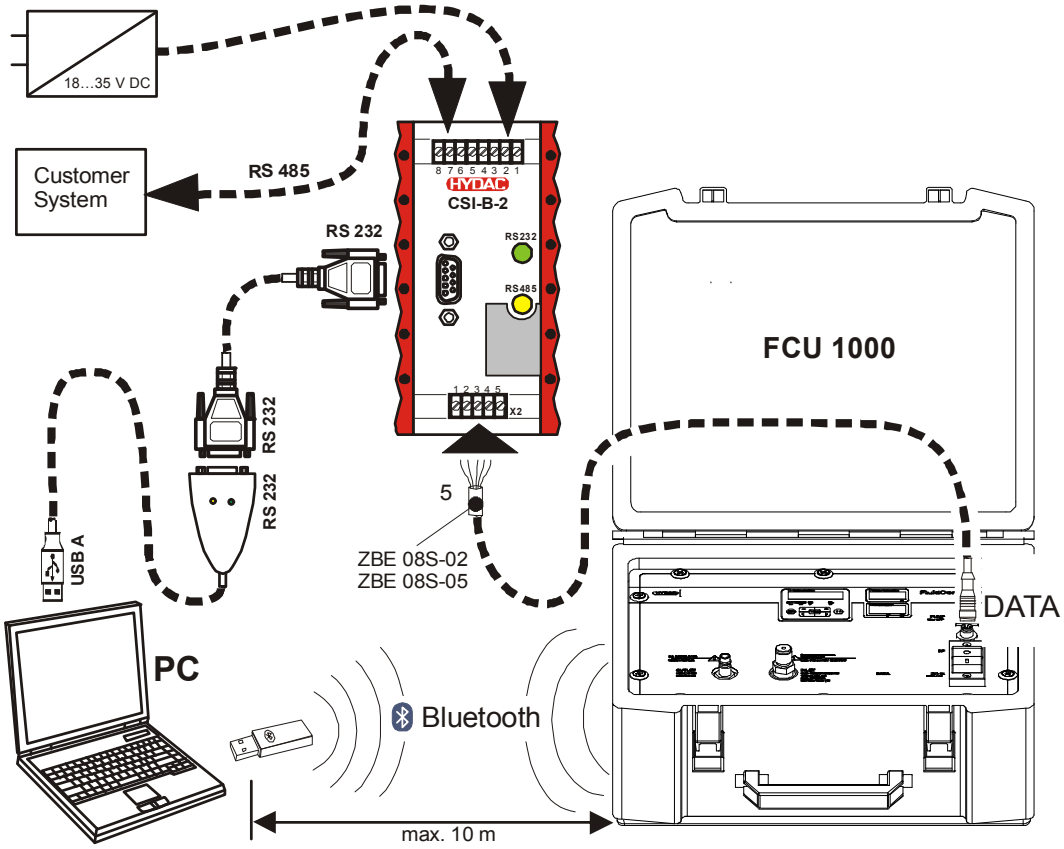
To transfer the data, the target system (e.g. PC or USB stick) has to have at least 10 MB of capacity free.

DATA - interface

The FCU has a DATA interface to transfer the measurement data. The FCU communicates over this using the HSI protocol.

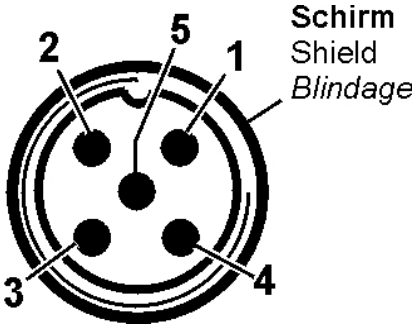
Connecting the FCU with CSI-B-2 kit

The FCU 1000 can be connected to a PC using the CSI-B-2 kit.



Pins used on the DATA interface (HYDAC Sensor Interface – HSI)

The HSI interface has connection plug M12x1, 5-pole, in accordance with DIN VDE 0627.

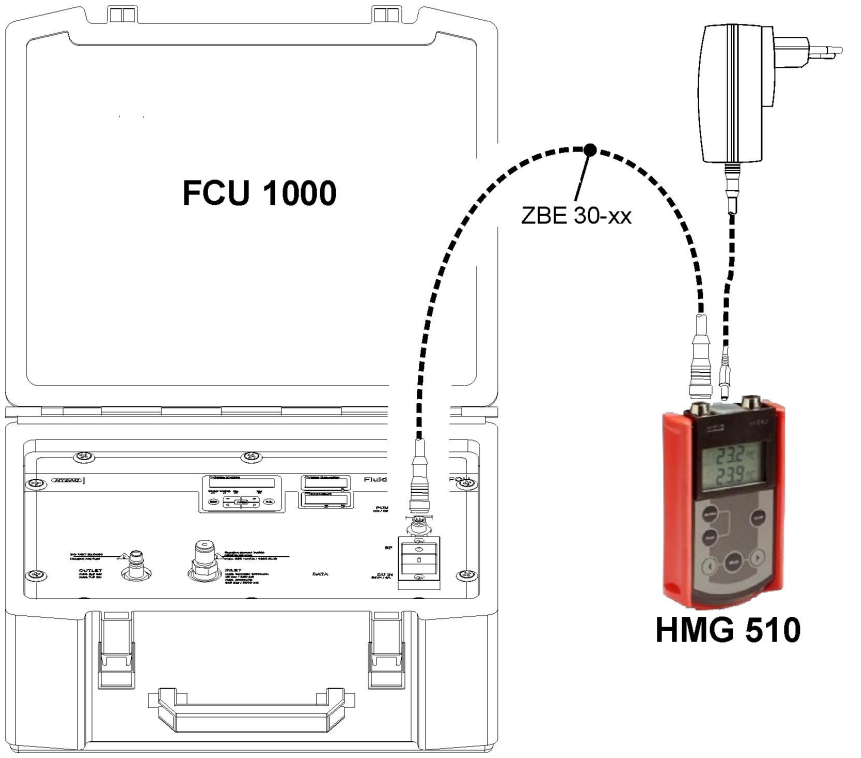


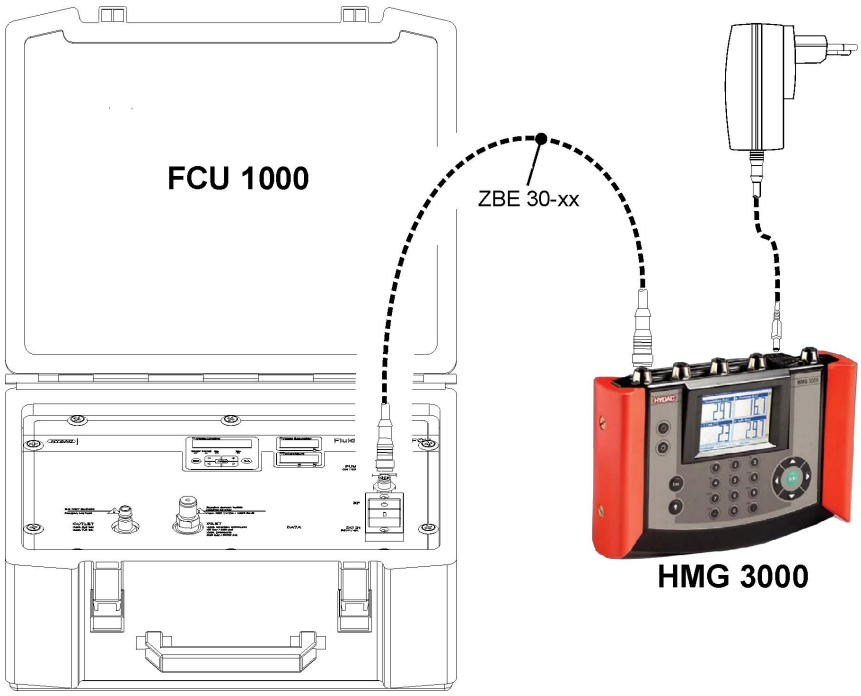
Pin	Assignment
1	Not connected
2	Not connected
3	Not connected
4	GND
5	HSI

Connecting the FCU with HMG 510 / HMG 3000

The following portable data recorders (HMGs) can be used to give a readout of the FCU 1000 via the DATA interface.

- HMG 510 (with firmware version 2, release 15 or higher)
- HMG 3000 (with firmware version 2, release 1 or higher)





See the operating instructions for the HMG for further details.

USB interface

Copying measurements onto a USB data stick

Compatibility with other USB memory sticks cannot be guaranteed as the FCU communicates directly with the microprocessor. This means that communication errors can't be corrected in software, as on a PC with an operating system.

We recommend using the HYDAC USB memory stick, which we successfully tested for many PC/operating system combinations.

On page 99. you will find an overview of additional tested USB sticks.

(diagram similar)

For HYDAC part-no., see page 86, chapter "Zubehör".

We accept no liability for the functionality and compatibility of the Bluetooth USB memory stick with your system. We do not offer support or replacements in this case.

Saved measurements can be copied on the USB memory stick supplied with the unit. After copying to the USB stick, the data still exists in the internal memory.

During the download, no measurement data are stored in the internal memory. After another download, the measuring data for the duration of the download are missing.

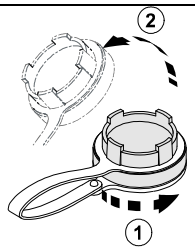
You have to explicitly delete the data in the internal memory of the FCU. See the DEL.MEM menu option on page 48.

Before using the USB stick for the first time, we recommend that you format it. To do that, insert it into a free USB port on your PC. Then change to the file manager (e.g. Explorer) and format the stick in FAT32 format. You will find details of this in the documentation of your operating system.

There must be at least 10 MB of free memory available on the USB stick.

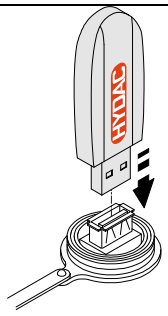
To save your measurements on the USB stick, proceed as follows:

1. Open the cover to the USB connection by turning it anticlockwise (1) and then lifting it (2).

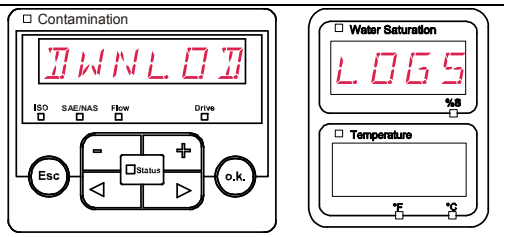


2. Insert the USB memory stick into the socket. Note that the stick only fits one way around.

   It must be easy to insert the USB stick into the socket.

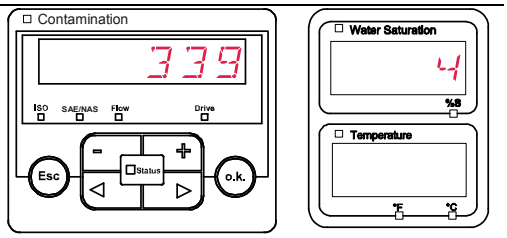


3. After inserting the USB memory stick, the FCU will detect it and immediately start copying the measurement data.



4. In the "Contamination" display, you can see the number of measurement records to be copied (e.g. 339)

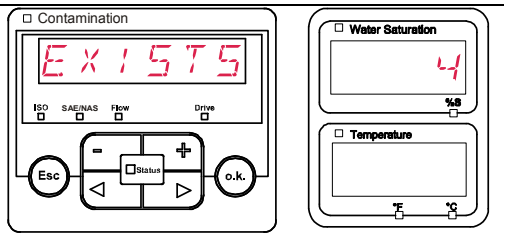
   The "Water saturation" display shows the number of records to be viewed (e.g. 4).



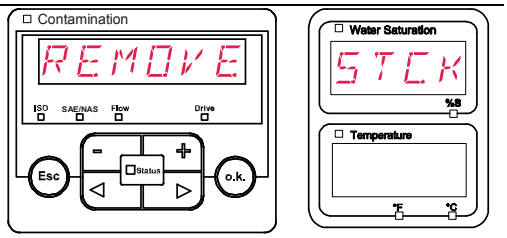
5. If the FCU detects existing records on the USB memory stick, the following message will appear on the display.

   Example: The FCU has found the record number 4 on the USB memory stick.

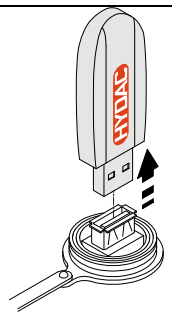
   This function is especially suited to the synchronization of the copied data with the FCU's internal memory. The existing records will be displayed.



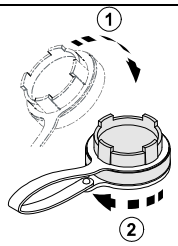
6. After successfully copying the records, the following message will appear on the display.



7. Now remove the USB memory stick from the socket by gently pulling it upwards.

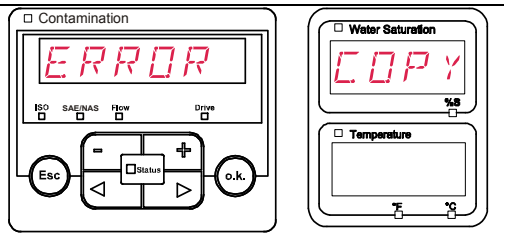


8. Close the cover to the USB connection (1) by turning it clockwise (2).



Data transmission failed - "ERROR COPY"

If a fault occurs during the copy procedure, or if you remove the USB memory stick from the socket before the procedure is complete, the following message will be output on the display.



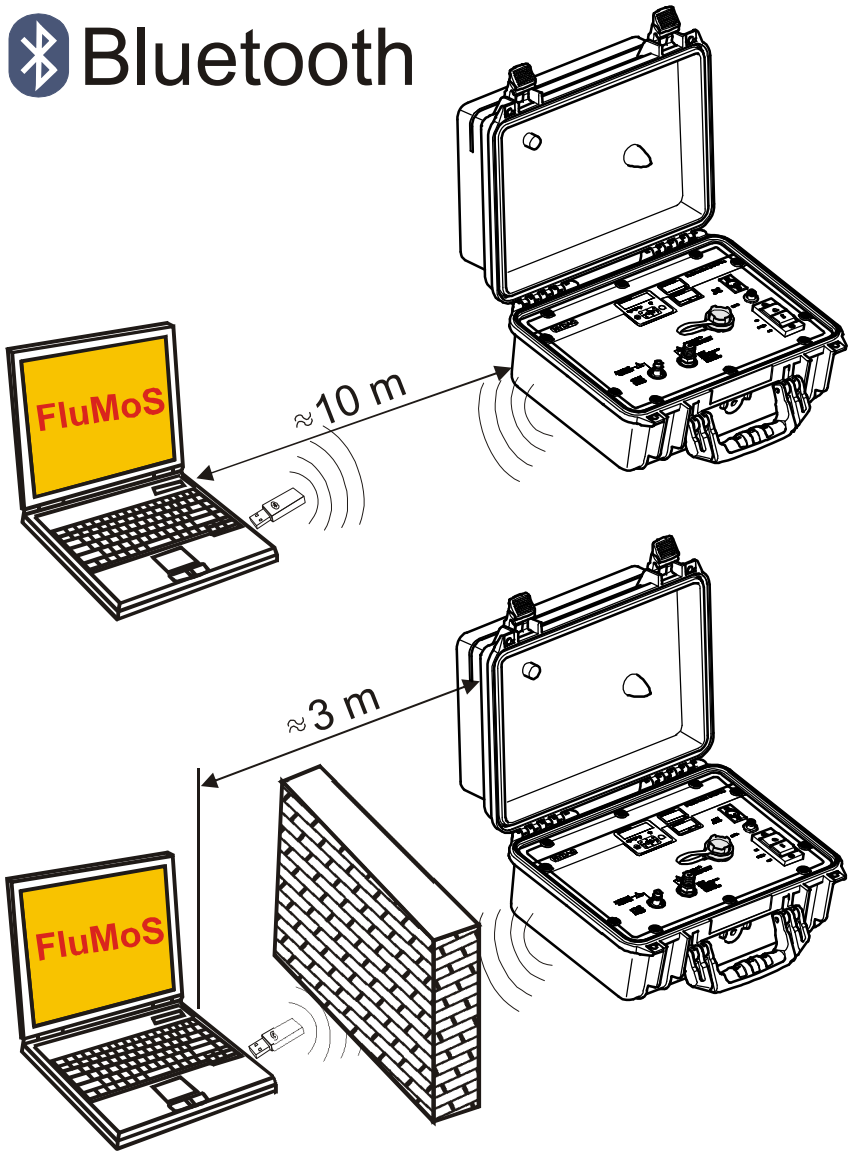
To remedy faults, proceed as follows:

Step		Description	
1.		Insert the USB memory stick in your PC and delete all data.	
2.		Put the USB stick back in the FCU USB socket. The download will start automatically.	
3.	->a.	If the error recurs	-> go to step 4.
	->b.	If the error does not recur	-> go to step 11.
4.		Insert the USB stick in your PC and reformat it.	
5.		Put the USB stick back in the FCU USB socket. The download will start automatically.	
6.	->a.	If the error recurs	-> go to step 7.
	->b.	If the error does not recur	-> go to step 11.
7.		Use another compatible USB memory stick (see page 99).	
8.		Put the USB stick back in the FCU USB socket. The download will start automatically.	
9.	->a.	If the error recurs	-> go to step 10.
	->b.	If the error does not recur	-> go to step 11.
10.		Contact the HYDAC service department.	
11.		The download has been successfully completed	

Bluetooth interface

The FCU 1000 Bluetooth interface is based on Bluetooth **Version 1.2**, **Class 3**. This means that:

- **Bluetooth Version 1.2**:
  is less sensitive to static disturbances (e.g. WLAN), the maximum data transfer rate is 732.2 kBit/s
- **Class 3**:
  a maximum performance of 1mW or 0 dBm, reaches a maximum of 10 m outdoors. This distance is strongly influenced by disturbances and obstacles in its vicinity.



Installing the Bluetooth USB adaptor

If the PC already has a Bluetooth interface, use only this to establish a connection to the FCU.

Prior to the installation of new Bluetooth software, we strongly recommend deinstalling all existing Bluetooth drivers. The parallel use of different Bluetooth interfaces leads to diver conflicts.

If problems should arise, consult the Bluetooth USB adaptor handbook or consult the manufacturer of your PC hardware.

We recommend using the HAMA USB adaptor "Nano", which we successfully tested for many PC/operating system combinations.

(looks something like this)

For HYDAC part-no., see page 86, chapter "Zubehör".

We cannot guarantee the functionality and compatibility of the Bluetooth USB adaptor with your system. We do not offer support or replacements in this case.

Guarantee and liability for the USB adapter

Warranty and liability - for whatever legal reason - for the delivered item shall be excluded. This exclusion of liability does not apply in cases of intent and gross negligence. Moreover, it does not apply to defects which have been deceitfully concealed or in cases of culpable harm to life, physical injury and damage to health. We shall not be liable for loss not incurred by the supplied object itself, and in particular we will accept no liability for loss of profit or other financial loss incurred by the customer.

Connecting the FCU via Bluetooth

The FCU 1000 is registered in the Bluetooth vicinity as device FCU 1310.

If the connection to the FCU is established via Bluetooth, the measured values can be read by FluMoS, for example. The HSI protocol is used to communicate with the FCU.

The data transfer through the Bluetooth connection depends on your PC hardware and on the installed software. There are a multitude of Bluetooth modules and software drivers on the market that do not completely fulfill the specifications of IEEEE 802.15.

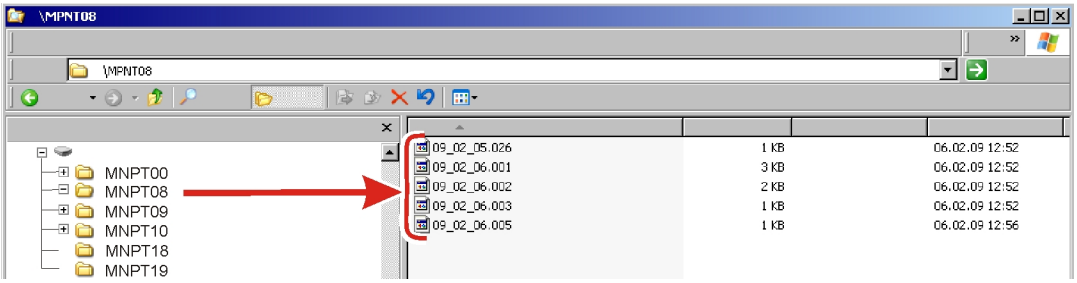
The code for the security question is: 0000

Evaluating stored records

The measurement records read out of the FCU and stored on the USB memory stick are defined as follows.

Directories to store the records by measurement points

If measurements are to be stored under a measurement point MNPT, the FCU will automatically produce a directory for this measurement point and will put the record there.



Record file names

The file names of the measurement records consist of date YY -> year, MM -> month, DD -> day, as well as a incremental number.

09 _ 02 _ 05 . 026

YY _ MM _ DD . incremental number

A new record is created:

- on request by STA.STP
- after a restart of the FCU (see page 84)
- after the data is downloaded to the USB stick

For each new record, the incremental number is increased by one.

Evaluating the file containing the measurements

The file containing the measurements has a file extension, for example "026". This extension may not be recognized by your PC. This means that you must tell your PC that, in future, you would like to open this file with MS Excel.

Open the file with MS excel by right-clicking on it and then selecting "Open". A window will open where you will be asked to choose which program should open the file.

In principle, you can do this for every extension from "000" to "999".

A measurement file consists of two parts:

Part	Contents
1	General information about the data collected, sensors and equipment.
2	After the word ***Data,** the actual measurement data is shown, line by line. The first line contains the column titles.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	HYDAC FCU	310 V02.00 Data File												
2														
3	Start													
4	Interval													
5	DeviceCount	1												
6														
7	Device	0												
8	Name	FCU1310												
9	SerNumber													
10	MeasPoint													
11	Port													
12	Address													
13	Protocol													
14	ChannelCount													
15														
16	Channel	0	1	2	3	4	5	6	7	8	9	10	11	
17	LowerRange	0	9	8	7	0	0	0	0	30	0	0	-25	
18	UpperRange	4	25	24	23	14	14	14	14	300	100	100	100	
19	Unit									ml/min	%	%	°C	
20														
21	Comment													
22														
23	*Data*													
24	Date	Time	State	ISO 4	ISO 6	ISO 14	SAE A	SAE B	SAE C	SAE D	Flow	Drive	Sat	Temp
25	03.03.2009	12:45:21	2	-0,1	-0,1	-0,1	-0,1	-0,1	-0,1	-0,1	-1	41	20,92	26,67
26	03.03.2009	12:45:42	2	-0,1	-0,1	-0,1	-0,1	-0,1	-0,1	-0,1	-1	41	20,95	26,68
27	03.03.2009	12:46:03	0	13,7	11,7	7	4	3,4	0,7	0	192	41	20,93	26,68
28	03.03.2009	12:46:24	0	15,9	14,1	9	6,2	5,8	3,2	3,9	201	41	21	26,33
29	03.03.2009	12:46:46	2	-0,1	-0,1	-0,1	-0,1	-0,1	-0,1	-0,1	-1	41	20,99	26,44
30	03.03.2009	12:47:07	0	16,9	15,2	10,2	7,2	6,8	4,4	4,6	206	41	20,89	26,56
31	03.03.2009	12:47:28	0	18,6	16,7	12,2	8,8	8,4	6,4	7,3	208	41	20,8	26,48
32	03.03.2009	12:47:49	0	18,9	17	11,7	9,2	8,7	5,9	5,5	205	41	20,66	26,37
33	03.03.2009	12:48:10	0	18,9	17,1	13	9,1	8,8	7,1	8,8	204	41	20,68	26,27
34	03.03.2009	12:48:31	0	18,8	16,9	11,4	9,1	8,6	5,5	5,3	208	41	20,69	26,16

Faults are shown as negative values, e.g. -0.1 or -1.

The "State" status can take the following values:

Fault Code	Description		
0	Ready	=>	Sensor / equipment is working
2	Minor fault / warning	=>	Sensor / equipment continues to work A warning that is automatically reset by the FCU.
3	Moderate fault	=>	Sensor / equipment status us "fault" Restart the FCU by switching it off and then on again.
4	Serious fault	=>	The sensor or equipment is faulty. Contact the HYDAC service department.

See page 81 for more information about the individual faults.

The values for SAE A-D or NAS 2-25 as well as the temperature units are defined by the FCU settings.

The measurements are shown as dates

On opening the file, all decimal numbers will be shown as dates. To resolve this, proceed as follows:

1. Start Excel.

2. From the menu bar, select the "Open" command.

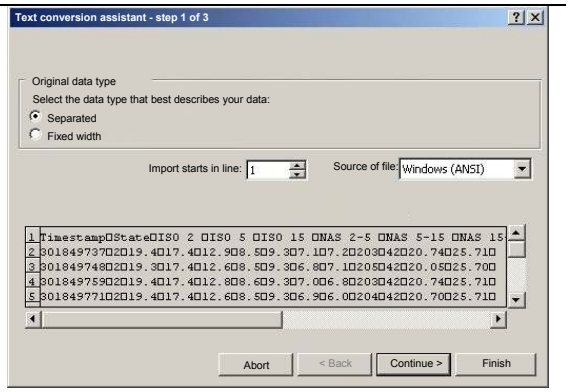
   Open the measurement file.

3. The

   text conversion assistant will open - step 1 of 3.

   Check the settings

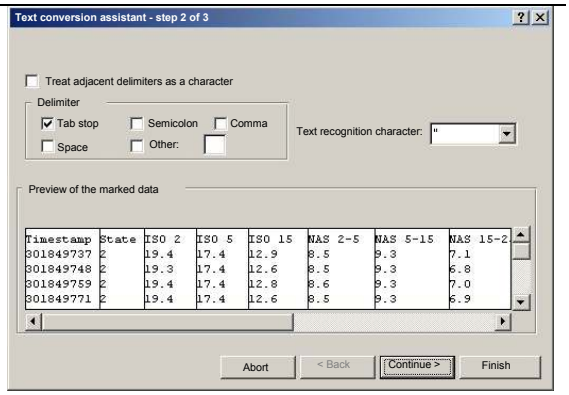
   Press the "Continue" button to accept the settings.



4. Text conversion assistant step 2 of 3

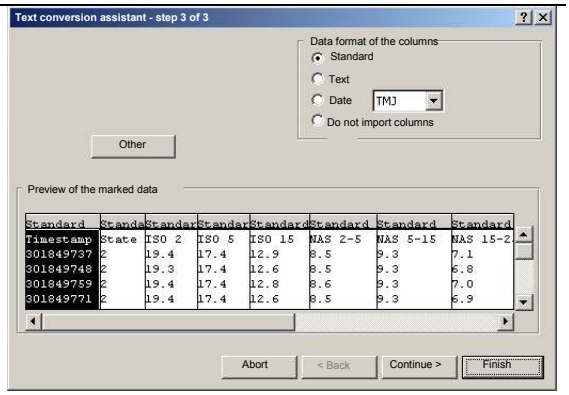
   Check the settings

   Press the "Continue" button to accept the settings.



5. Text conversion assistant - step 3 of 3

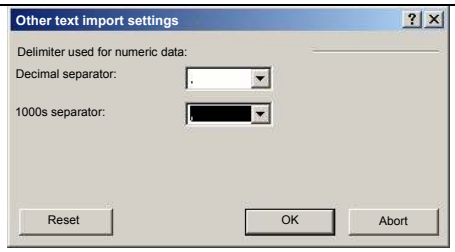
   Press the "Continue" button.



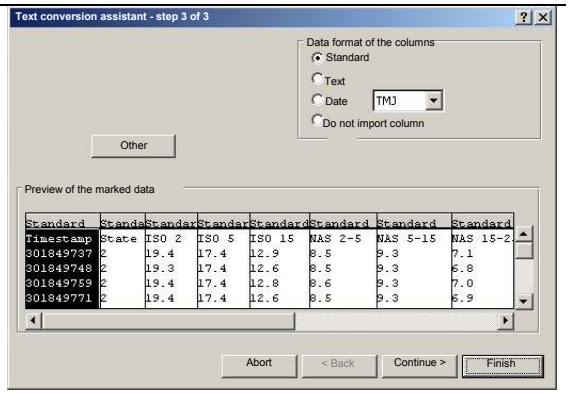
6. Change the following settings

   Set the decimal separator to be a dot and the 1000s separator to be a comma.

   Confirm the changes with the OK button.



7. Click on the "Finish" button, to complete the import of the measurement data.



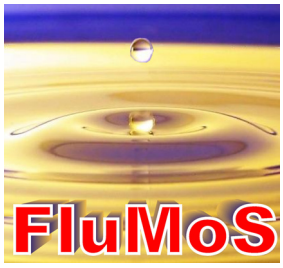
8. Decimal numbers are now displayed correctly.

Measurement value readouts with FluMoS

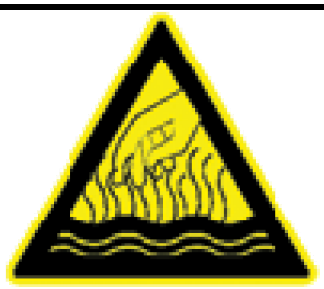
The fluid monitoring software FluMoS serves to read the measurements from the FCU 1000. From version 1.30 of FluMos Light, it is possible to display and evaluate the data on the USB memory stick.

FluMoS light is available as freeware on the CD included in the delivery or as a download.

You will find the link for the download on our homepage at www.hydac.com



Preparing the FCU for transport



⚠ CAUTION

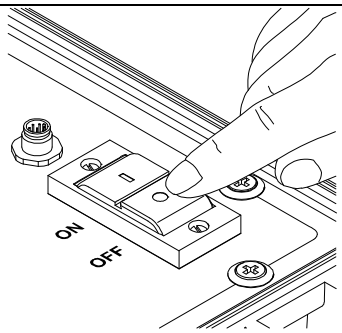
Hot fluid at the OUTLET

Danger of burns

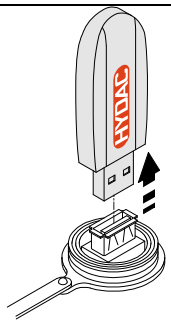
► Before removing the OUTLET hose from the FCU, allow it to cool off.

To prepare the FCU for transport, observe the following sequence:

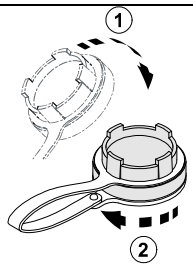
1. Use the switch to turn the internal pump off.



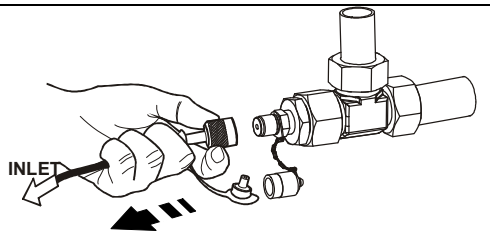
2. Remove the USB stick, should it be inserted.



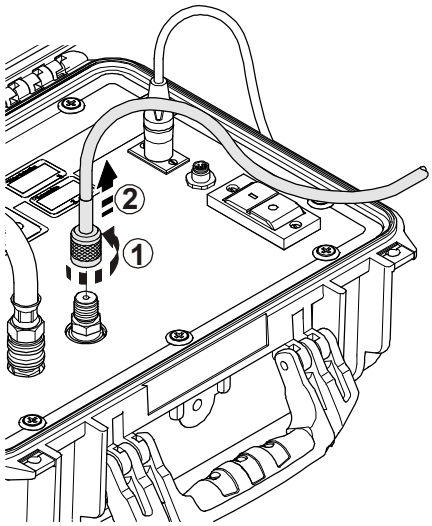
3. Close the USB socket with the corresponding cover.

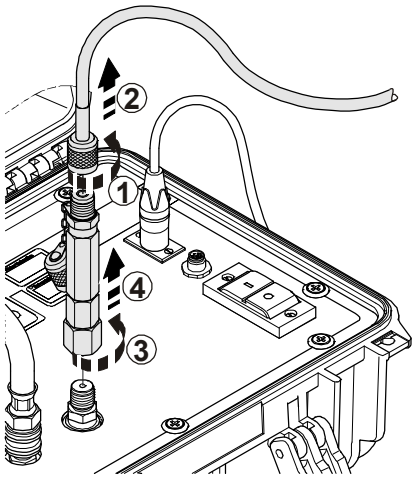


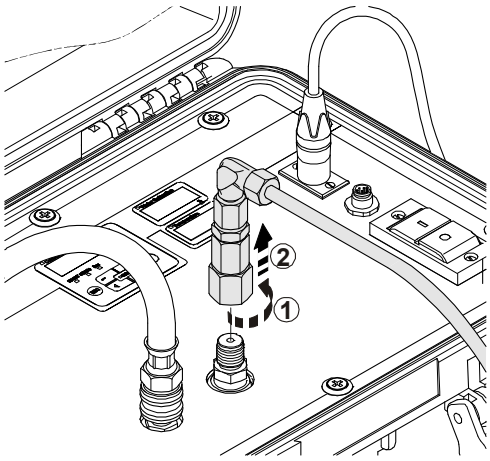
4. First undo the end of the high-pressure INLET hose that is at the measurement point of the hydraulic system.



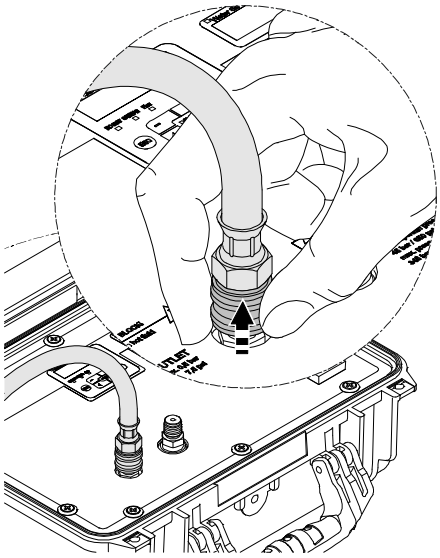
5. Remove the hose by turning the connector to the FCU INLET connection anticlockwise.







6. Undo the quick-action coupling on the OUTLET hose by lifting the outer ring.

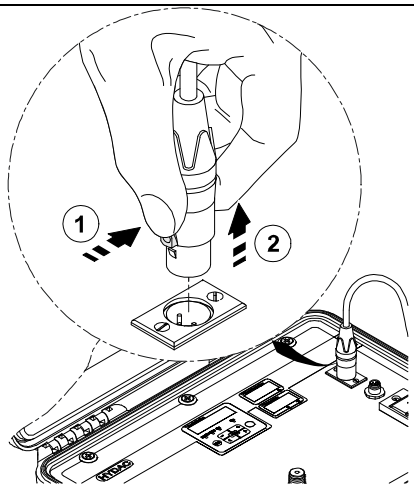


Empty the hose into an unpressurized container.

To let air into the hose, open it by using a thin object to press in the check valve on the quick-action coupling. This means that the fluid can then quickly drain out of the hose.

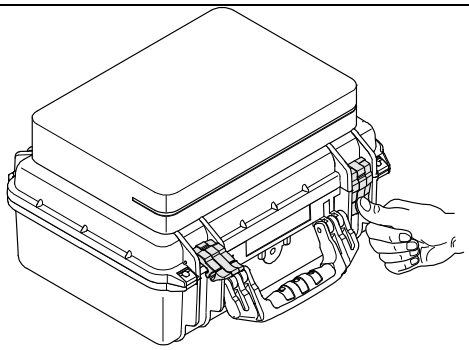
After emptying it, join the two ends of the hose together. In this way you can ensure that no more fluid will leak from the hose during transport.

7. Release the catch (1) and then pull the socket out of the connector (2).



8. Close the FCU using both catches.

The catches must audibly engage.



9. Stow the hose and the power supply in the bag.

10. The FCU is ready for transport.

Performing maintenance

At the latest, conduct the required configuration maintenance and inspection work every six months, otherwise, whenever an error message or malfunction makes it necessary.

All operating media are to be protected/isolated in case the product is accidentally started up.

When performing any maintenance, servicing, inspection or repair work, disconnect the FCU from the power supply and ensure that it cannot be switched back on inadvertently.

Always check the product to see that it functions properly when performing maintenance and servicing work.

All fittings which have been removed must be checked to ensure that they have been properly secured.

Cleaning the FCU

Clean the control panel with a clean, moist cloth. Do not use any chemical cleaning agent as these may damage the film attached to the surface of the FCU.

You can clean the outside of the closed FCU with a damp cloth.

Rinsing the FCU

NOTICE

Impermissible flushing media

The FCU will be destroyed

► Flush the FCU with low-viscosity mineral oils or mineral oil-based raffinates (e.g. diesel) whose flash point is higher than 55°C/131°F.

► Mineral turpentine or other degreasing media are not allowed.

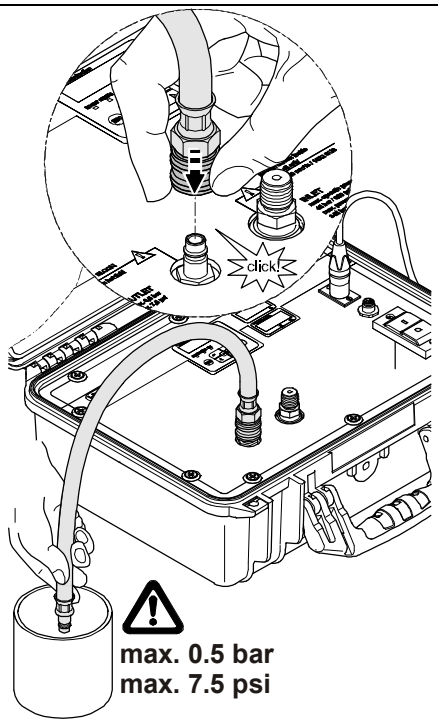
Flush the FCU 1000 after each use, but at least daily, with cleaned mineral oil.

Rinse the FCU immediately if you measure unfiltered oil or oil with a viscosity > 200 mm²/s or if the readings seem unusually high or low.

Flush the FCU as described below:

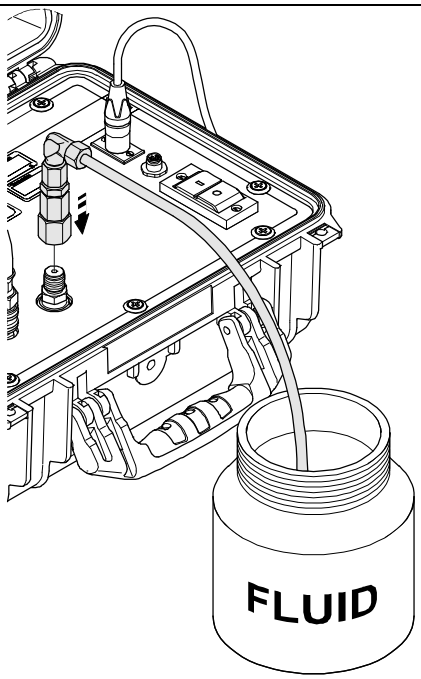
1. Put approx. 0.5 liters of filtered oil into a clean container.

2. Connect the OUTLET return hose to the FCU and put the free end into a container for the used fluid.

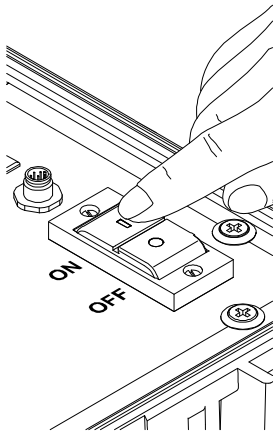


3. Attach the suction hose to the FCU INLET connection.

Put the free end of the suction hose into the container with the filtered oil.

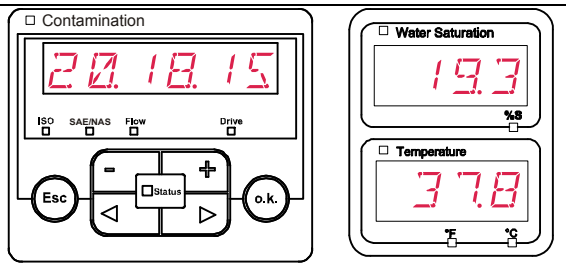


4. Use the switch on the FCU to turn its pump on.

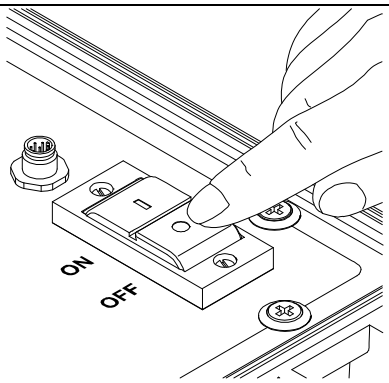


5. Cleanliness values will be displayed during the flushing procedure.

These measurements are not correct, but should decrease during the flushing procedure.



6. Once the 0.5 liters have been sucked up, switch off the pump.



7. The FCU is ready for operation.

Clean the suction strainer.

NOTICE

Operation without a suction sieve

The FCU pump can be damaged

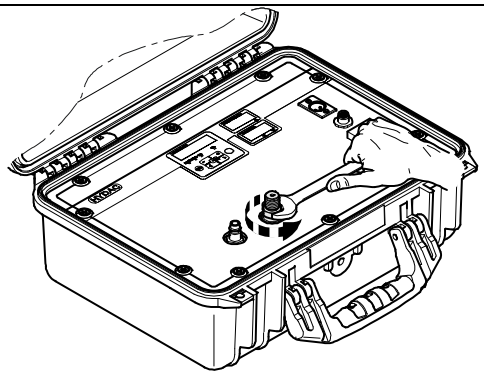
- ► Never use the FCU without a suction screen.
- ► Clean the suction screen regularly.

The sieve is fitted under the INLET connector and protects the pump from contamination by coarse particles.

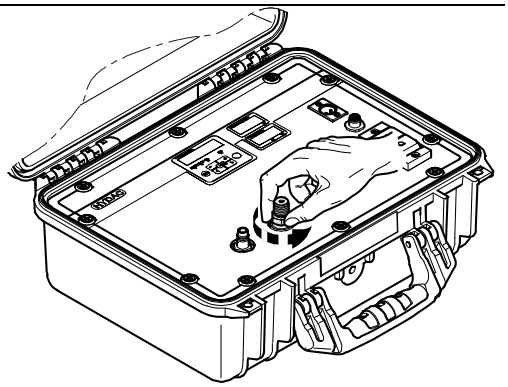
Clean the suction screen regularly. If the FCU is blocked or there is no flow through, clean the sieve immediately.

To check/clean the sieve, proceed as follows:

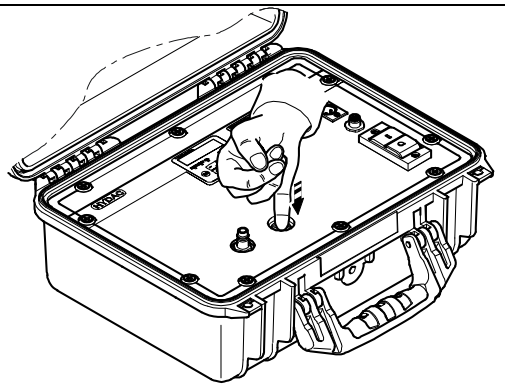
1. Remove all of the hydraulic and electrical connections to the FCU.
2. Loosen the inlet connector, with a 19 mm wrench, turning it anticlockwise.



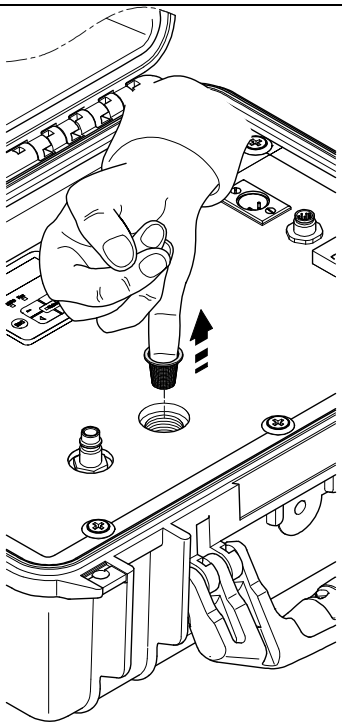
3. Unscrew the INLET connector manually, turning it anticlockwise.



4. Put a finger in the opening ...



5. .. and pull out the suction screen upwards.

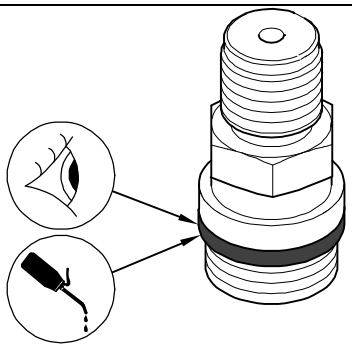


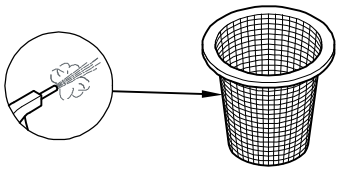
6. Clean the sieve by blowing it out with compressed air.

Before reassembly, check that the sealing ring for the connector is undamaged.

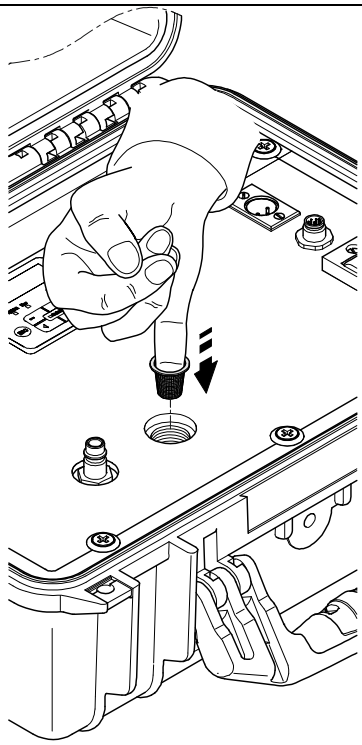
Replace it if necessary.

Before screwing it in place, wet the sealing ring (C) with some hydraulic fluid.

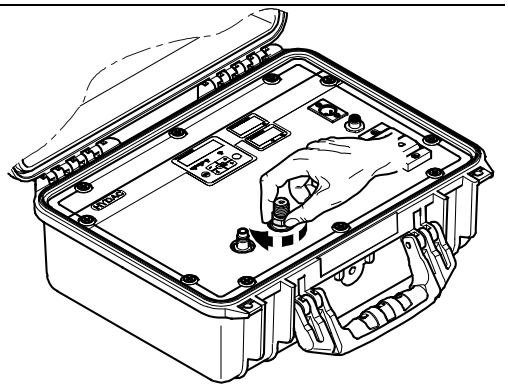




7. Put the sieve back into the opening.

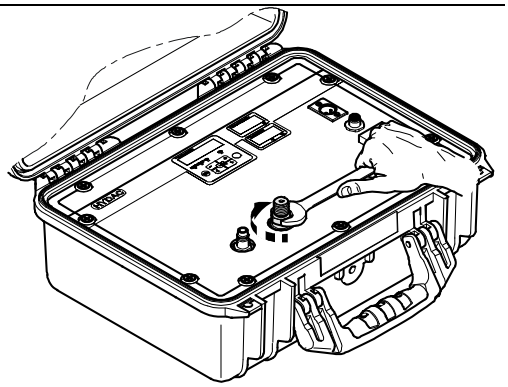


8. Manually screw the INLET connector in clockwise.



9. Using a 19 mm wrench, tighten the INLET connector, turning it clockwise.

Note the maximum torque of 25 Nm.

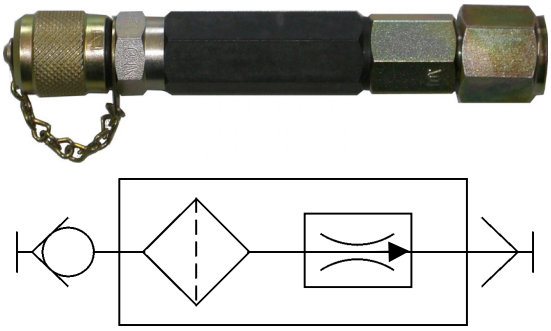


Checking the high pressure adaptor

In the high pressure adapter there is a 400 µm sieve to protect the flow control valve. Clean this sieve at least every 6 months, or more frequently if heavy soiling makes it necessary.

The flow rate through the high-pressure adapter is regulated to approx. 0-55 to 0.7 l/min.

If the necessary flow rate is not reached, you must check the sieve in the adapter and clean it.



Cleaning / changing the sieve in the high pressure adapter

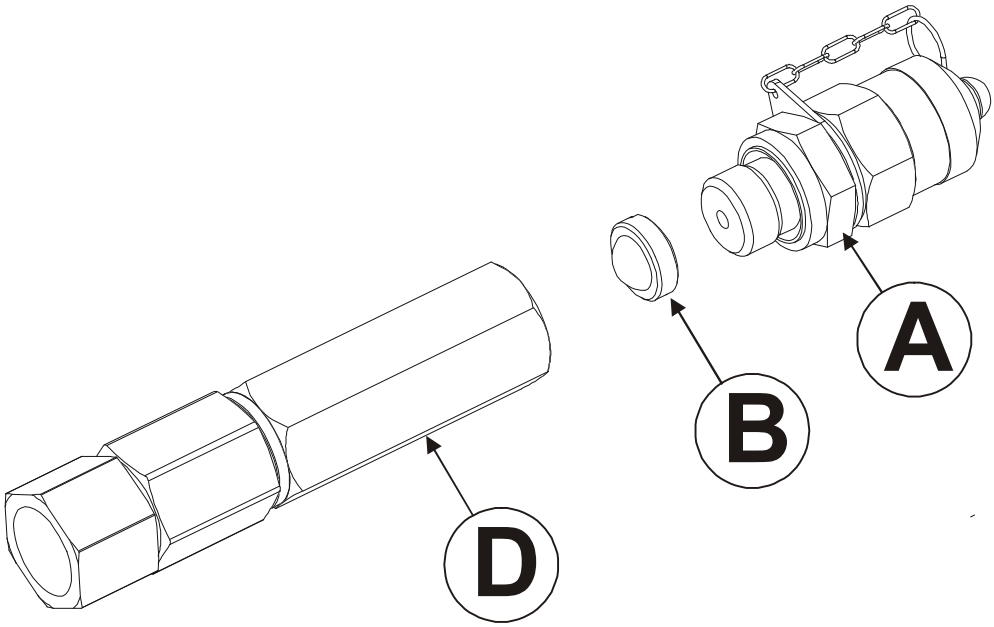
CAUTION

Operation without a sieve

The FCU pump can be damaged

- ► Never use the high-pressure adapter without a sieve.
- ► Clean the sieve regularly

The sieve (B) in the high pressure adaptor must be cleaned regularly



Remove the measurement coupling (A) from the threaded joint (D) with a 22 mm open-jaw wrench, anticlockwise. Then unscrew the sieve (B) anticlockwise with a screwdriver or the special tool (see accessories list 86).

Clean sieve (B) and then blow it out with compressed air.

To fit the sieve (B), screw it in, clockwise, to union (D) using a screwdriver or the special tool.

Then check the sealing ring on the coupling (A) for damage and replace if necessary.

Turn the coupling (A) in a clockwise direction and tighten to 25 Nm.

Cleaning / changing the strainer in the high pressure adapter

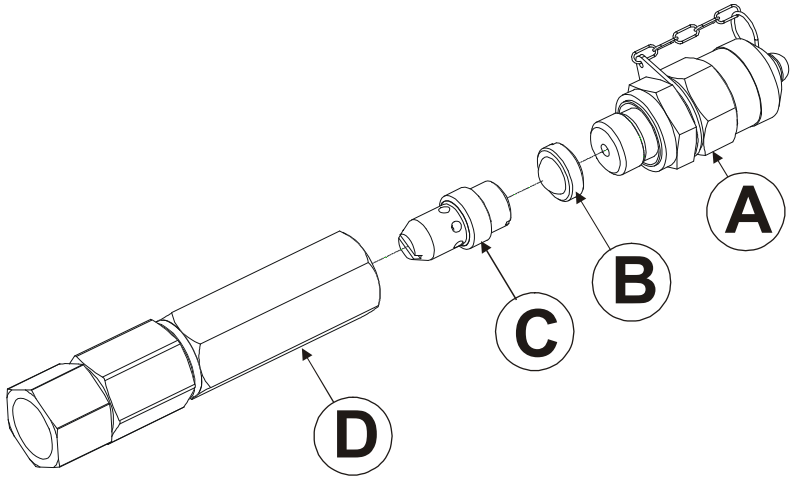
CAUTION

Wrong installation of the flow control valve

Flow control valve is not working

► Pay attention to the direction of flow when installing the flow control valve.

The flow control valve regulates the flow to approx. 0.55 to 0.7 l/min. If the necessary flow rate through the high-pressure adapter is not achieved, then the flow control valve will have to be cleaned or replaced.



Remove coupling (A) using a 22 mm open-jaw wrench turning it anticlockwise out of the screw fitting (D).

Now unscrew the sieve (B) anticlockwise, with a screwdriver or the special tool (see accessories list on page 86).

Clean sieve (B) and then blow it out with compressed air.

Also unscrew the flow control valve (C) anticlockwise with a screwdriver or the special tool (see accessories list on page 86).

To install the new flow control valve (C), screw it firmly clockwise into the union (D) with a screwdriver or the special tool.

Screw the sieve (B) clockwise into union (D) using a screwdriver or the special tool.

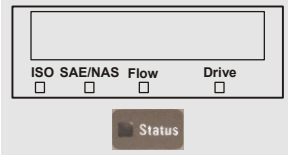
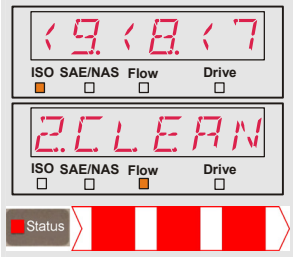
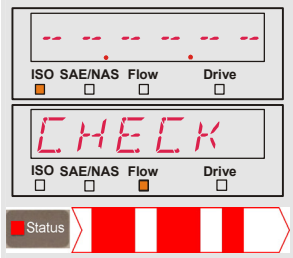
Then check the sealing ring on the coupling (A) for damage. Replace it if necessary.

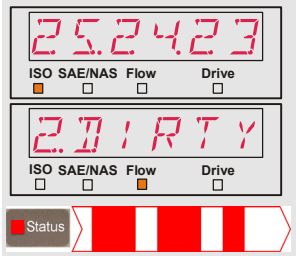
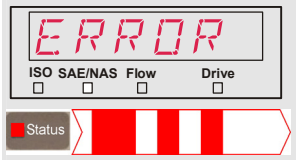
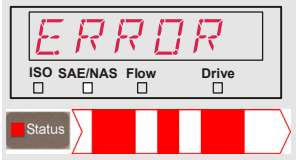
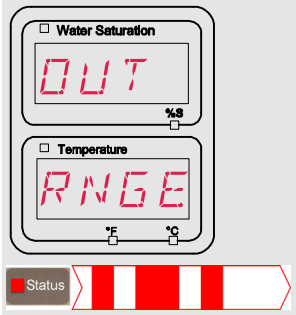
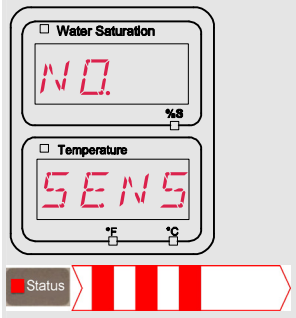
Turn the coupling (A) in a clockwise direction and tighten to 25 Nm.

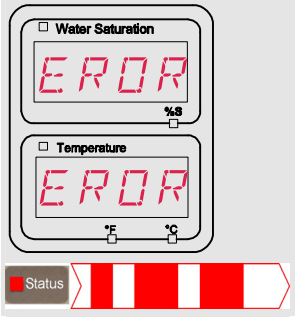
FCU status messages / error messages

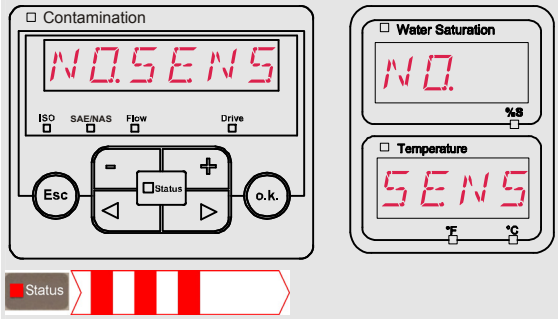
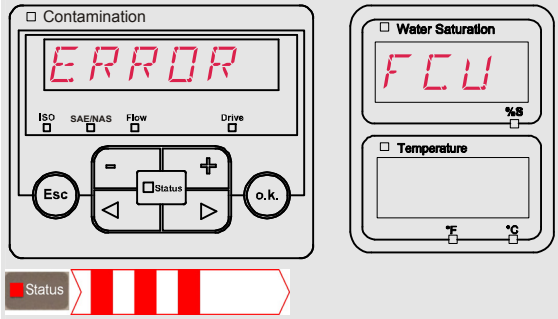
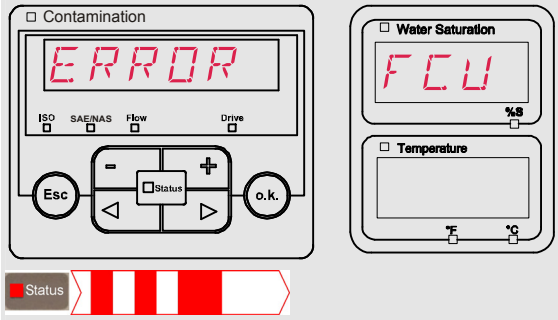
The following error codes are possible. You will find these error codes in the measurement file.

Fault Code	Description		
0	Ready for operation	=>	Sensor / equipment is working
2	Minor fault / warning	=>	Sensor / equipment continues to work A warning that is automatically reset by the FCU.
3	Moderate fault	=>	Sensor / equipment status us "fault" Restart the FCU by switching it off and then on again.
4	Serious fault	=>	The sensor or equipment is faulty. Contact the HYDAC service department.

LED	Display flashing code	Status	To do	Fault Code
-		FCU no digits displayed no function	Check the power supply to the FCU. Contact the HYDAC service department.	-
Green		FCU ready for operation	You can make further measurements.	0
Red		The FCU is below its measurement range < ISO 9/8/7. It is currently not possible to determine the cleanliness of the oil or its flow rate.	You can make further measurements.	2
Red		It is not possible to determine the flow rate. The FCU is in an undefined state.	Switch the pump on. Wait for a few measurement cycles until measured values are again shown.	2

LED	Display flashing code	Status	To do	Fault Code
Red		The FCU is above its range of measurement > ISO 25/24/23. It is currently not possible to determine the cleanliness of the oil or its flow rate.	Filter the oil to improve its cleanliness.	2
Red		No ContaminationSensor is attached.	Switch the FCU off and back on again. If the fault recurs, contact HYDAC service department.	3
Red		The ContaminationSensor is causing a moderate fault.	Switch the FCU off. If the fault recurs, contact HYDAC service department.	3
Red		The ContaminationSensor is causing a major fault.	Contact the HYDAC service department.	4
Red		The AquaSensor is outside of its measurement range.	Wait for a few more measurement cycles.	2
Red		No AquaSensor is connected.	Switch the FCU off and then on again. If the fault recurs, contact HYDAC service department.	3

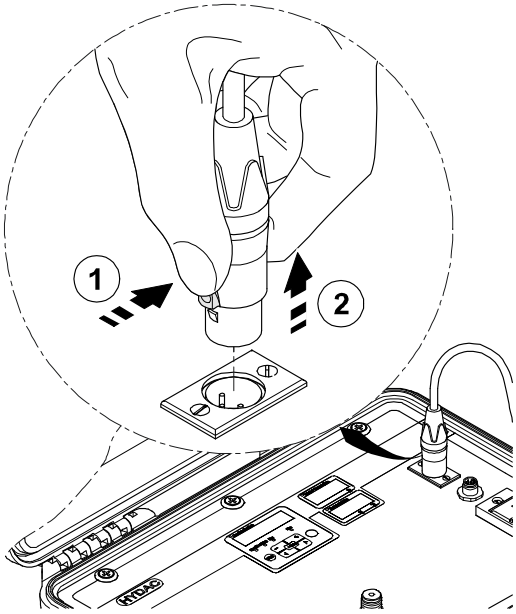
LED	Display flashing code	Status	To do	Fault Code
Red		The AquaSensor is causing a moderate fault.	Switch the FCU off and then on again. If the fault recurs, contact HYDAC service department.	3

LED	Display flashing code	Status / To do	Fault Code
Red		No sensors are attached to the FCU. / Switch the FCU off and then on again. If the fault recurs, contact HYDAC service department.	3
Red		The FCU has a moderate fault. / Switch the FCU off and then on again. If the fault recurs, contact HYDAC service department.	3
Red		The FCU has a major fault. / Contact the HYDAC service department.	4

Restart / Resetting the FCU

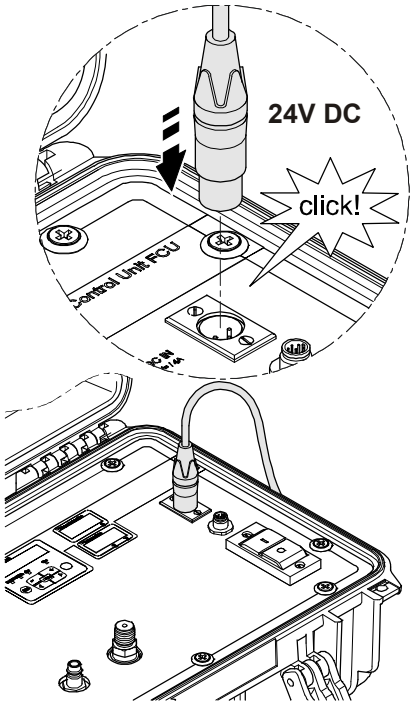
To reset the FCU, remove the power supply to the FCU for 10 seconds.

To remove the connector



Press the catch on the connector (1) and then pull the connector out (2).

To insert the connector



Insert the connector into the socket until it audibly snaps in.

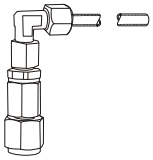
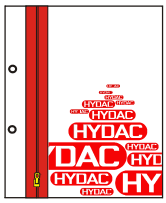
Disposing of the FCU

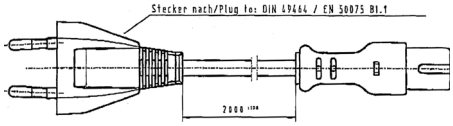
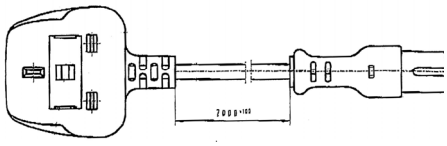
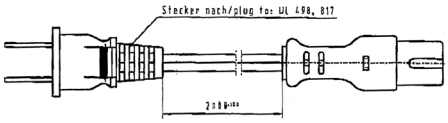
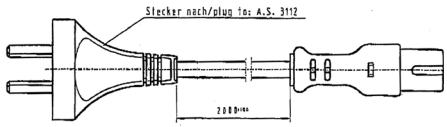
Dispose of the packaging material as appropriate for your area.

When decommissioning and/or disposing of the unit, observe all local guidelines and regulations pertaining to occupational safety and environmental protection. This applies in particular to the oil in the unit, components covered with oil and electronical components.

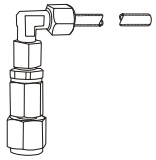
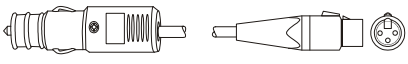
After disassembling the unit and separating the various materials, reuse them or dispose of them properly in accordance with local regulations.

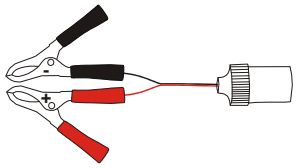
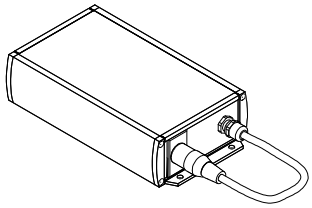
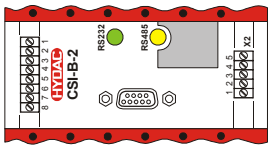
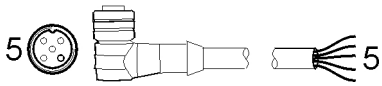
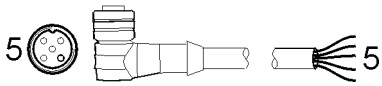
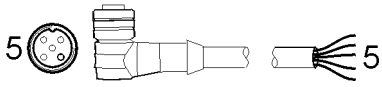
Spare Parts List

Part no.	Description	Figure
349150	INLET high pressure hose with screwed joint, for measurement point type 1620, color: black, L = 2 m (78.74 inch)	
3297276	INLET suction hose with open end, color: clear-transparent, Length = 1.5 m (59.06 inch)	
349151	OUTLET return hose, open end, transparent, length = 2 m	
278475	Suction strainer, 400 µm (for INLET port)	
607755	Seal ring for INLET test point union (Ø 21 mm, according to DIN3869)	
3364502	High pressure adaptor, complete	
3152786	Suction strainer, 400 µm for high pressure adaptor	
710389	Flow control valve for high pressure adaptor	
3455429	Cover seal for case	
3335656	Attachable bag for hoses, cables and accessories	
3377173	Document folder for Operating and Maintenance instructions / Calibration certificate	
3371346	Operation and Maintenance Instructions FCU 1000 (this document)	
3546511	FCU 1000 "Getting started" guide	

Part no.	Description	Figure
6059933	Power adaptor (without power cord) primary: 100-240 V AC secondary: 24 V DC, 5A, cable with 3-pole plug, Length = 1.6 m (62.99 inch)	
6008448	Connection cable for power adaptor European plug, Length = 2 m (78.74 inch)	
6008447	Connection cable for power adaptor plug for England (UK), Length = 2 m (78.74 inch)	
6008446	Connection cable for power adaptor plug for USA, Length = 2 m (78.74 inch)	
6008449	Connection cable for power adaptor plug for Australia (AUS), Length = 2 m (78.74 inch)	

Accessories for the FCU

Part no.	Description	Figure
3 4 **4** 3 2 5 3	FieldVerification Start-Up Kit	
3 4 4 **3** 2 **4 9**	FieldVerification Kit	
3325744	INLET suction hose with open end, color: clear-transparent, Length = 1.5 m (59.06 inch)	
3306236	12V/24V DC cable with universal plug, including 8A fuse, Length = 10 m (393.7 inches)	

Part no.	Description	Figure
3524138	12V/24V DC cable with universal plug, including 8A fuse, Length = 1 m (39.37 inches)	
6052824	Fuse 8 A for universal plug (Ø 6 x 25 mm, according to DIN 72581)	
6051653	Battery adaptor for 12V/24V DC with coupling for universal plug, Length = 0.3 m (11.8 inches)	
3209986	Tool to change the flow control valve in the high pressure adaptor	
6074886	Bluetooth USB adaptor	
3442973	USB Memory stick	
3504605	BatteryPack, 24 V DC / 4500 mAh	
3409462	CSI-B-2 kit ConditionSensor interface	
6019455	Connection cable, screened, with 5-pole connector, socket plug, bent, open, length 2 m (ZBE 08S-02)	
6019456	Connection cable, screened, with 5-pole elbow female connector, open cable end, length 5 m (ZBE 08S-05)	
6023102	Connection cable, screened, with 5-pole connector, socket plug, bent, open, length 10 m (ZBE 08S-10)	
6040851	Connection cable with 5-pole connector <–> 5-pole socket, length 2 m (ZBE 30-02)	
6053924	Connection cable with 5-way female connector <-> 5-way male connector Length 3 m (ZBE 30-03)	

Part no.	Description	Figure
6040852	Connection cable with 5-pole connector <–> 5-pole socket, length 5 m (ZBE 30-05)	

*) available on request

Overview - ISO 4406 / SAE AS 4059 and NAS 1638 classes

ISO 4406:1999

In ISO 4406:1999, particle counts are determined cumulatively, i.e. > 4 $\mu m_{(c)}$, >6 $\mu m_{(c)}$ and >14 $\mu m_{(c)}$ (manually by filtering the fluid through an analysis membrane or automatically using particle counters) and allocated to measurement references.

The goal of allocating particle counts to references is to facilitate the assessment of fluid cleanliness ratings.

In 1999 the "old" ISO 4406:1987 was revised and the size ranges of the particle sizes undergoing analysis redefined. The counting method and calibration were also changed.

This is important for the user in his everyday work: even though the measurement references of the particles undergoing analysis have changed, the cleanliness code will change only in individual cases. When drafting the "new" ISO 4406:1999 it was ensured that not all the existing cleanliness provisions for systems had to be changed.

ISO 4406 table

Allocation of particle counts to cleanliness classes:

	Number of particles / 100 ml			Number of particles / 100 ml	
Class	**More than**	**Up to (and including)**	**Class**	**More than**	**Up to (and including)**
0	0	1	**15**	16,000	32,000
1	1	2	**16**	32,000	64,000
2	2	4	**17**	64,000	130,000
3	4	8	**18**	130,000	250,000
4	8	16	**19**	250,000	500,000
5	16	32	**20**	500,000	1,000,000
6	32	64	**21**	1,000,000	2,000,000
7	64	130	**22**	2,000,000	4,000,000
8	130	250	**23**	4,000,000	8,000,000
9	250	500	**24**	8,000,000	16,000,000
10	500	1,000	**25**	16,000,000	32,000,000
11	1,000	2,000	**26**	32,000,000	64,000,000
12	2,000	4,000	**27**	64,000,000	130,000,000
13	4,000	8,000	**28**	130,000,000	250,000,000
14	8,000	16,000			

Note: increasing the measurement reference by 1 causes the particle count to double.

Example: ISO class 18 / 15 / 11 means:

Cleanliness class	Particle count / 100 ml	Size ranges
18	130,000 – 250,000	> 4 µm (c)
15	16,000 – 32,000	> 6 µm (c)
11	1,000 – 2,000	> 14 µm (c)

Are in 100 ml of the analyzed sample.

Overview of the differences between ISO 4406:1987 and ISO 4406:1999

	“old” ISO 4406:1987	**“new” ISO 4406:1999**	
Size ranges	> 5 µm > 15 µm		> 4 µm (c) > 6 µm (c) > 14 µm (c)
Dimension determined	Longest dimension of a particle		Diameter of the area-equivalent circle ISO 11171:1999
Test dust	ACFTD dust	1-10 µm ultra fine fraction	ISO 12103-1A1
		SAE Fine, AC Fine	ISO 12103-1A2
		SAE 5-80 µm ISO MTD Calibration dust for particle counters	ISO 12103-1A3
		SAE Coarse Coarse fraction	ISO 12103-1A4
Comparable size ranges	Old ACFTD calibration	Comparable ACFTD dusts	New NIST calibration
	----- 5 µm 15 µm	< 1 µm 4.3 µm 15.5 µm	4 µm (c) 6 µm (c) 14 µm (c)

SAE AS 4059

Like ISO 4406, SAE AS 4059 describes particle concentrations in liquids. The analysis methods can be applied in the same manner as ISO 4406:1999.

The SAE cleanliness classes are based on particle size, number and distribution. The particle size determined depends on the measurement process and calibration; consequently the particle sizes are labeled with letters (A-F).

The following table shows the cleanliness in relation to the particle concentration determined.

SAE AS 4059 table

		Maximum particle count / 100 ml					
Size ISO 4402		**> 1 µm**	**> 5 µm**	**> 15 µm**	**> 25 µm**	**> 50 µm**	**> 100 µm**
Size ISO 11171		**> 4 µm$_{(c)}$**	**> 6 µm$_{(c)}$**	**> 14 µm$_{(c)}$**	**> 21 µm$_{(c)}$**	**> 38 µm$_{(c)}$**	**> 70 µm$_{(c)}$**
Size Code		**A**	**B**	**C**	**D**	**E**	**F**
Classes	000	195	76	14	3	1	0
	00	390	152	27	5	1	0
	0	780	304	54	10	2	0
	1	1,560	609	109	20	44	1
	2	3,120	1,220	217	39	7	1
	3	6,250	2,430	432	76	13	2
	44	12,500	4,860	864	152	26	4
	53	25,000	9,730	1,730	306	53	8
	6	**50,000**	**19,500**	**3,460**	**612**	**106**	**16**
	7	100,000	38,900	6,920	1,220	212	32
	8	200,000	77,900	13,900	2,450	424	64
	9	400,000	156,000	27,700	4,900	848	128
	10	800,000	311,000	55,400	9,800	1,700	256
	11	1,600,000	623,000	111,000	19,600	3,390	512
	12	3,200,000	1,250,000	222,000	39,200	6,780	1,020

Cleanliness codes according to SAE

Absolute particle count larger than a defined particle size

Example: cleanliness class to AS 4059:6

The maximum permissible particle count in the individual size ranges is shown in the table in boldface.

Cleanliness class to AS 4059:6B

Size B particles may not exceed the maximum number indicated for class 6

6 B = max. 19,500 particles > 5 µm in size

Specifying a cleanliness class for each particle size

Example: cleanliness class to AS 4059: 7 A / 7 B / 6 C / 5 D

Cleanliness class	Particle count / 100 ml
Size A (> 1 µm / > 4 $\mu m_{(c)}$)	100,000
Size B (> 5 µm / > 6 $\mu m_{(c)}$)	38,900
Size C (> 15 µm / > 14 $\mu m_{(c)}$)	3460
Size D (> 25 µm / > 21 $\mu m_{(c)}$)	306

Specifying the highest cleanliness code measured

Example: Cleanliness Class according to AS 4059 6 A – F

The 6 A – F specification requires a particle count in size ranges A – F.
The respective particle concentration of cleanliness class 6 may not be exceeded in any of these ranges

NAS 1638

Like ISO 4406, NAS 1638 describes particle concentrations in liquids. The analysis methods can be applied in the same manner as ISO 4406:1999.

In contrast to ISO 4406, certain particle ranges are counted in NAS 1638 and attributed to measurement references.

The following table shows the cleanliness in relation to the particle concentration determined.

		Maximum particle count / 100 ml					
		2..5 µm	**5..15 µm**	**15..25 µm**	**25..50 µm**	**50..100 µm**	**> 100 µm**
Cleanliness class	**00**	625	125	22	45	1	0
	0	1,250	250	44	8	2	0
	1	2,500	500	88	16	53	1
	2	5,000	1,000	178	32	6	1
	3	10,000	2,000	356	64	11	2
	4	20,000	4,000	712	128	22	4
	45	40,000	8,000	1,425	253	45	8
	6	80,000	16,000	2,850	506	90	16
	7	160,000	32,000	5,700	1,012	180	32
	8	320,000	64,000	11,400	2,025	360	64
	9	640,000	128,000	22,800	4,050	720	128
	10	1,280,000	256,000	45,600	8,100	1,440	256
	11	2,560,000	512,000	91,200	16,200	2,880	512
	12	5,120,000	1,024,000	182,400	32,400	5,760	1,024
	13	10,240,000	2,048,000	364,800	64,800	11,520	2,048
	14	20,480,000	4,096,000	729,000	129,600	23,040	4,096

Increasing the class by 1 causes the particle count to double on average.

Checking the measuring accuracy of the FCU

With the help of the **FieldVerification Kit**, you can check the error of measurement of the FluidControl Unit FCU 1000 on site based on a fluid defined as contaminated. Based on these results, you can decide whether you have the FCU 1000 recalibrated or extend the period of its use.

The part no. for the FieldVerification Kit can be found in the accessories list.

The use of the FCU 1000 Field Verification Kit **does not eliminate the need for factory recalibration**.

Calibrating the FCU

Recalibrate the FCU according to ISO 9000 standard.

We recommend a recalibration of the FCU at least every 3 years.

Customer service

Current contacts for product support/customer service, repair and spare parts can always be found on our website at www.hydac.com.

For calibration, contact one of the following HYDAC national subsidiaries:

Germany

HYDAC Service GmbH
Product Support, Werk 10
66128 Saarbrücken, Germany

Telephone:	+49 (0) 6897 509 883
Telefax:	+49 (0) 6897 509 324
E-mail:	service@hydac.com

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USA-Lehigh Valley, PA 18002-2050

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Cooperativa
BR-São Bernardo do Campo – SÃO PAULO

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Fax:	+55 - 11 - 4393.6617
E-mail:	hydac@hydac.com.br
Homepage	www.hydac.com.br

Factory default settings

If the "DFAULT" function is used for a reset, the following settings will be changed to the values shown:

Power Up Menu	Value	For details, see page:
ADRESS	A	47
M .TIME	20	48
CALID	ISO .SAE	49

The names of the measurement locations as well as all other settings are not affected by the reset.

You will find the code for the Bluetooth security check on page 63.

Technical Data

Contamination Sensor	
Self-diagnosis	continuously with error indication via status LED and display
Display	LED, 6 / 4 / 4 digits, in 17 segment format
Measured values for solid particle contamination	ISO code / SAE class / NAS class
Measured values for fluid temperature	-25 … 100°C / -13 … 212°F
Measured values for water saturation	0 … 100 %
Measurement range	Display ISO classes min. 9/8/7 … max. ISO 25/24/23 Calibrated in the range ISO 13/11/10 - ISO 23/21/18
Accuracy	CS: ± 1/2 ISO-Code AS: ≤ ±3% over the entire measurement range
Service Display	Flow / Drive
Measuring time programmable	10 … 300 Seconds
Hydraulic data	
Suitable Fluids	Mineral oil
Hydraulic Connectors INLET: OUTLET:	 Test connector type 1604 DN7 nipple socket
INLET operating pressure without high-pressure adapter With high pressure adaptor	 -0.5 … 45 bar / 0 … 650 psi 15 … 345 bar / 217 … 5000 psi
OUTLET operating pressure	0 … 0.5 bar max. / 0 … 7.5 psi max.
Measurement flow rate:	30 … 300 ml/min (viscosity dependent)
Permissible viscosity range	10 … 350 mm²/s / 46 … 1622 Sus (for hydraulic oil up to ISO VG 68)
Maximal suction height	1 m
INLET suction hose	DN4, open-end, color: clear-transparent, Length = 0.3 m
INLET high-pressure hose	DN4 with screw connection for test point 1620,

Contamination Sensor	
	color: black, Length = 2 m (78.74 inch)
OUTLET return hose	DN7, open-end, color: clear-transparent, Length = 1 m

Electrical data	
Supply voltage	24 V DC, ± 20%, residual ripple ≤ 10%
Power consumption / electricity	100 W max. / 4 A max.
IP class	IP 50 (open, in operation) IP 67 (closed)
Protection class	III (low voltage protection)

General data	
Material of sealings	FPM
Fluid temperature range	0° … +70° C / 32° … 158° F
Ambient temperature range	0° … +45° C / 32° … 113° F
Storage temperature range	-40° … +80 C / -40° … 176° F
Relative humidity	max. 90%, non-condensing
Weight	~ 13 kg

Model Code

FCU 1 3 1 0 - 4 - U - AS - 1

Product
FCU = FluidControl Unit

Series
1 = 1000 series, 4 particle size channels

Contamination code
3 = ISO4406:1987; NAS 1638
ISO4406:1999; SAE AS4059 (D)

Body
1 = for portable use (plastic case with a bag)

Fluids
0 = petroleum-based

Options
4 = with integrated pump

Supply voltage
U = 24 V DC

Integrated Sensor
AS = AquaSensor AS 1000 series

Power supply adaptor
1 = 100 … 240 V AC / 50/60 Hz / 1 phase / 5000 mA
(Europe, USA/Canada, UK, Australia, Japan)

Compatible USB sticks - overview

In the following, you will find an overview of the USB memory sticks which we have tested with the FCU 1000 for compatibility, writing speed and stability in operation.

Manufacturer, name	Type	European Article Number (EAN)	Compatible with FCU 1000	Write speed	Stability
HYDAC (from the delivery)			✓	→	↑
SanDisk 2GB Cruzer Micro	SDCZ4-2048-E11	619659023034	✓	↗	↑
Emtec Flash Drive USB 2.0 1GB	EKMMD1GC150B	3126170043658	✓	→	→
Hama Piko Business 1GB	00090845	4007249908452	✓	↗	↓
Silicon Power 2GB Ultima-II	SP002GBUF2M01V1S	4710700395035	✓	↑	↗
Platinum ultra high performance 2GB		4027927775046	✓	↗	→
CnMemory USB-Stick 2GB	85114_2GB	4040348851144	✓	↗	↗
Freecom Data Bar 1GB	29321 / 1GB	4021801293213	✓	→	→
Intenso USBDRIVE 1GB		4034303006397	✓	→	↓
PNY attaché premium 4GB	P-FD4GBA2M7-BX	3536401508618	✓	↗	↓
Sony Microvault Click 2GB	USM2GL	027242737105	✓	↗	→
Sony Microvault Click 2GB	USM2GLX	027242737204	✓	↑	→
Transcend JetFlash T5 2GB	TS2GJFT5T	0760557814030	✓	↑	↓
TDK Trans-IT 2GB	UFD-2GBUEBBL	4902030780036	✓	↑	↗
ExcelStor Gstor Mini 8GB	GSMS7008	6935758606102	✓	→	→
CnMemory Micro X 512MB			✓	↗	↗
Transcend JetFlash V30 8GB			✓	↗	↗
Kingston Traveler Mini Slim 2GB	DTMSB/2GB	740617131956	✗		
SanDisk 2GB Cruzer Micro	SDCZ6-2048-E11WT	619659025724	✗		
Emtec Flash Drive USB 2.0 1GB	EKMMD1GM200EM	3126170058126	✗		

Explanation:

✓	Compatible with the FCU 1000	↑	Excellent
✗	Not compatible with the FCU 1000	↗	Good
		→	Ok
		↓	Bad

EC declaration of conformity

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CE

EC declaration of conformity

FS / 20 / 09
No.

We hereby declare that the following designated product, on the basis of its design and construction, and in the version which we have brought to market, corresponds to the fundamental safety and health requirements contained in the standards listed below.

Any modification of this product that is not coordinated with us in writing will cause this declaration to lose its validity.

Description	FluidControl Unit
Type	FCU1000 Series
Part no.	-
Serial-no.	-
EU Machinery Directive	2006/42/EG
EU Electrical Equipment Regulations	2006/95/EG
EMC Guideline	2004/108/EG

2009-12-01	Thorsten Trier	
Date	Name	(CE official)

Executive director:
Mathias Dieter, Dipl.Kfm. Wolfgang Haerin g
Registered seat of company: 66280 Sulzbach / Saar - Germany
Registry Court: Saarbrücken, HRB 17216
Value added tax identification number : DE 815001609
Tax number : 040/110/50773

Documentation Representative:
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