Global Challenges, Innovative Solutions.

model CFD-II

CONTAMINATED FUEL DETECTOR

# TECHNICAL MANUAL

Operating and Maintenance Instructions

Follow these instructions for proper and safe use.




TECHNICAL MANUAL

Contaminated Fuel Detector

Cvi P/N: 408001

www.cvintl.com

## 1.1 Documentation Representative

Manufacturer / publisher and responsible for the content:

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# 2 General

This manual was prepared to the best of our knowledge. Nevertheless and despite the greatest care taken, it may contain errors. Therefore, please understand that, in the absence of any provisions to the contrary hereinafter, our warranty and liability – for any legal reasons whatsoever – are excluded in respect of the information in this manual. In particular, we shall not be liable for lost profit or other financial loss.

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 whose absence has been guaranteed, nor in cases of culpable harm to life, physical injury and damage to health. If we negligently breach any material contractual obligation, our liability shall be limited to foreseeable damage. Claims due to the Product Liability shall remain unaffected.

## 2.1 Warranty

For the warranty provided by us, please refer to the Terms of Delivery. They are made available to you at the conclusion of the contract at the latest. You will also find these under www.Cv International Inc.com -> General Terms and Conditions (T&C).

## 2.2 © CV INTERNATIONAL INC, 2021

Distributing and copying this document and utilizing and disclosing its content is not permitted, except where this has be agreed upon explicitly. Any infringement will entail liability for damages. All rights reserved in the case of a patent being granted or a utility model or the design being registered.

We reserve the right to changes to the contents of this manual without prior notice.

## 2.3 Using this manual

You will find the following information on the title page of this manual:

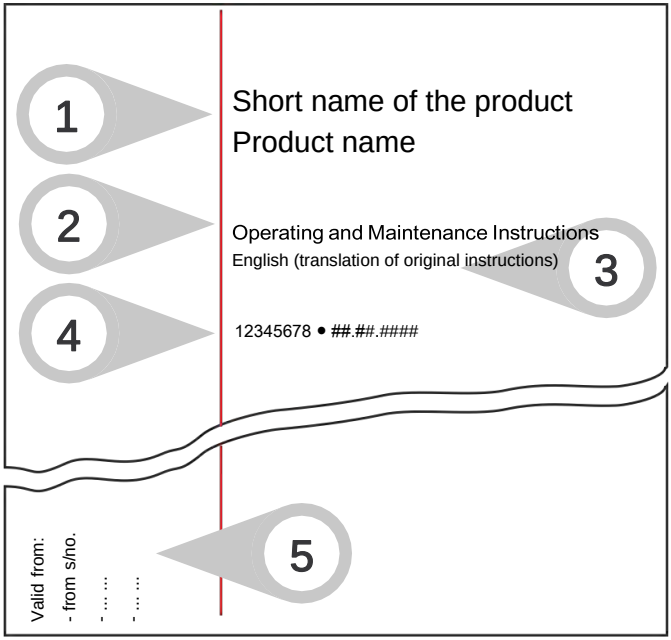



*Fig. 1:* Overview / labeling of the title page

| | |
|---|---|
| 1 | Short name of the product / product name |
| 2 | Type of document |
| 3 | Language |
| 4 | Document no./Index • Date of printing |
| 5 | Supplementary instructions regarding the validity of the manual (optional) |

Please note that you can directly access information through the directories. However, this does not release you from the obligation to read this manual fully before commissioning.

The document no. with the index (4) is meant for identifying and reordering the manual. The index is incremented every time the manual is revised or changed.

The manual contains a table of contents, a list of tables and figures, an index and a glossary.

You will find the following symbols in the manual as additional details:



Tip for handling the product



Required tools

# 3 Safety information

The product was built according to the statutory directives, regulations and standards valid at the time of delivery and satisfies current safety requirements. Any residual hazards are indicated by the general safety information and are described in this manual.

Observe all safety and warning instructions attached to the product and keep them always complete and easily legible.

## 3.1 Signal words and their meaning in the safety information and instructions

In these instructions you will find the following signal words:

**DANGER**

DANGER – The signal word indicates a hazardous situation with a high level of risk, which, if not avoided, will result lethal or serious injury.

**WARNING**

WARNING – The signal word indicates a hazardous situation with a medium level of risk, which, if not avoided, can result lethal or serious injury.

**CAUTION**

CAUTION – The signal word indicates a hazardous situation with a low level of risk, which, if not avoided, can result in minor or moderate injury.

***NOTICE***

NOTICE – The signal word indicates a hazardous situation with a high level of risk, which, if not avoided, will result in damage to property.

## 3.2 Design of Warning - / General Safety Information

All the warning / general safety information in this manual are highlighted with pictograms and signal words. The pictogram and the signal word give you an indication of the severity of the danger.
Warning / general safety information, which are placed ahead of each activity, are represented as follows:



Hazard symbol

**⚠CAUTION**

Type and source of danger

Consequence of the danger

- ► Measures to avert danger

## 3.3 Safety symbols / pictograms

The following are the safety symbols / pictograms in this manual. They indicate specific dangers to persons, property or to the environment. Observe these safety symbols / pictograms and act with particular caution in such cases. Always keep all symbols / pictograms intact and legible.

### Warning signs used

These signs are listed for all safety information and instructions in these operating instructions which indicate particular hazards to persons, property or the environment.



Danger point warning



Dangerous electrical voltage warning



Hot surface warning

## Signs used for giving orders

These symbols are listed for all safety information and instructions in these operating instructions which indicate particular hazards to persons, property or the environment.



Follow the instructions.



Disconnect before working.

## Signs used for the required specialist personnel

These symbols show the required training/knowledge for installation work and/or maintenance work.



Specialist personnel / operators
Such persons have had the corresponding specialist training and several years' work experience. They are able to assess and perform the work assigned to them, they are also able to recognize potential hazards.



Specialist personnel - Mechanic
Such persons have specific specialist training and several years' work experience. They are able to assess and perform the work assigned to them, they are also able to recognize potential hazards.



Specialist personnel - Electrician
Such persons have specific specialist training and several years' work experience. They are able to assess and perform the work assigned to them, they are also able to recognize potential hazards.

## Others symbols used

These signs are listed for the general safety instructions in these operating instructions, for example, which indicate a particular danger to persons, property or the environment.



Danger due to operating pressure

## 3.4 Observe regulatory information

Observe the following regulatory information and guidelines:

- Legal and local regulations for accident prevention
- Legal and local regulations for environmental protection
- Country-specific regulations, organization-specific regulations

## 3.5 Stoppage in an emergency (EMERGENCY STOP)

Disconnect the product from all sources of energy in an emergency.

## 3.6 Fire-fighting / extinguishing a fire

Use a powder extinguisher that corresponds to fire class B as per 2 to extinguish any fires / to fight fires.




*Fig. 2:* Fire protection class B

Maintain a minimum safe distance from electrical components. For a mains voltage of up to 1000 V, the minimum safe distance is 1 m.

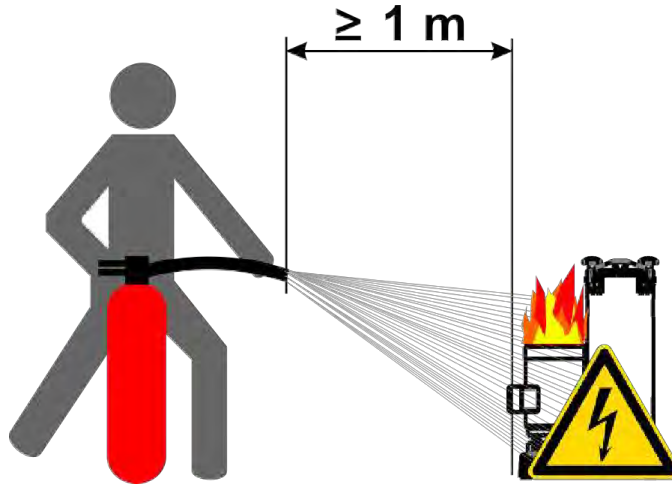



*Fig. 3:* Minimum distance for fire fighting

# 4 Overview

The Contaminated Fluid Detector Unit CFD II is a portable service unit for taking short-term measurements of the solid particle contamination, the temperature and the water saturation in hydraulic systems.

Knowledge on the level and amount of contamination allows you to check and document quality standards and introduce the required optimization measures.

The integrated pump and the hoses supplied enable usage with:

- Control circuits
- Pressure circuits
- Depressurized containers

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 or to send them to a mobile device via Bluetooth where they can be analyzed using MS Excel or the FluMoS Fluid Monitoring software.

Additional features include:

- Optical measurement of the degree of solid particle contamination
- Capacitive recording of the water saturation in %
- Resistive measurement of the temperature
- Suitable for hydraulic fluids (up to ISO VG 68)
- 2 … 350 mm²/s / 33 … 1622 Sus
- Automatic measurement and display of cleanliness ratings in accordance with:
- ISO 4406; NAS 1638
- ISO 4406; 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 networks with Load Dump fuse protection
- 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 supplying the CFD II with the fluid to be analyzed

## 4.1 Counting contaminant particles optically (light blockade procedure)

The measuring principle of the light blockade 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, that 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, NAS 1638 and SAE AS 4059.

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

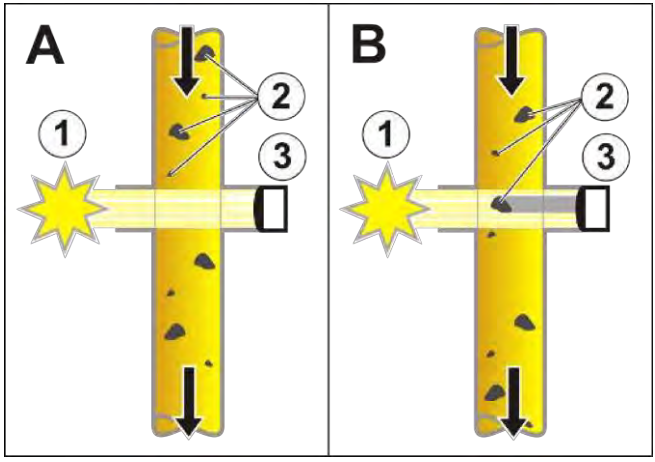



*Fig. 4:* Light blockade procedure

| | |
|---|---|
| 1 | Light source |
| 2 | Contaminant particle |
| 3 | Photo detector |

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 µm, >5-15 µm, >15-25 µm, >25 µm or >4 $\mu m_{(c)}$, >6 $\mu m_{(c)}$, >14 $\mu m_{(c)}$, >21 $\mu m_{(c)}$.

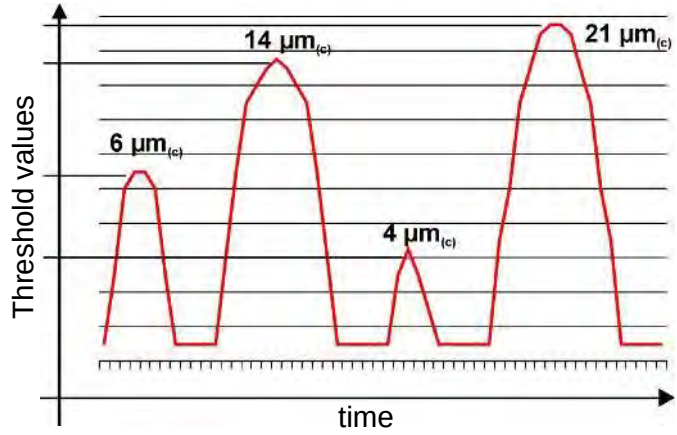



*Fig. 5:* Signal amplitudes

## 4.2 Proper/Designated Use

Use the product only for the intended use described below .

The Contaminated Fluid Detector Unit CFD II is a portable service unit for taking short-term measurements of the solid particle contamination, temperature and water saturation level in hydraulic systems and diesel fuels in accordance with DIN 590 / ASTMD975 4-D, with a flash point of > 55°C.

**NOTICE**

Impermissible operating conditions

The CFD II can be damaged.

- Use the CFD II with mineral oils or mineral oil-based raffinates with flash points higher than 55°C / 131°F.
- Flush the CFD II with low-viscosity mineral oils or mineral oil-based raffinates (e.g. diesel) whose flash point is higher than 55°C / 131°F.
- Never flush the CFD II with universal thinners or other degreasing fluids.
- Observe the permissible viscosity range (up to ISO VG 68): of 2 - 350 mm²/s / 33 - 1622 SUS.
- Operate the CFD II only in periodic intermittent duty (S3) with a (relative) duty cycle of 40% in relation to a useful life of 10 minutes (S3 in accordance with DIN 60034 / VDE 0530).
- Never use the CFD II without a suction strainer.
- Operation with diesel fuel only with the equipotential bonding cable connected.
- Observe all the instructions contained in these Operating and Maintenance Instructions.
- Comply with all inspection and maintenance work.

**NOTICE**

Connection to 24 V DC on-board networks without **load dump**

The CFD II can be damaged.

Use the CFD II only on 24 V DC on-board networks which have a central "Load Dump" "Load Dump" fuse.

uBefore connecting to the 24 V DC on-board network, be sure to check that a load dump is installed with a maximum of 30 V DC and that it is effective.

Claims for defects or liability, regardless of the legal foundation, do not apply with incorrect or improper installation, commissioning, usage, handling, storage, maintenance, repair, use of unsuitable components or other circumstances for which the manufacturer is not responsible.

The manufacturer assumes no responsibility for determining the interfaces for installation in a system or the installation, use or functionality of the product in this system.

### 4.2.1 Periodic intermittent duty – operating mode S3

Periodic intermittent duty in accordance with DIN 60034-1 / DIN VDE 0530, Part 1, means that, during the period $t_0$, opera- tion $t_1$ repeats itself periodically in alternation with the power $(P_N)_{S3}$, followed by the cooling-down phase (downtime) $t_2$. The relative duty cycle is 40% in relation to a useful life of 10 min- utes.

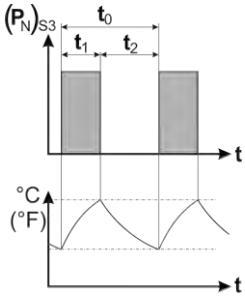



*Fig. 6:* Operating mode S3 – Periodic intermittent duty

| | |
|---|---|
| $(P_N)_{S3}$ | Nominal power, operating mode S3 |
| t | time |
| $t_0$ | Period |
| $t_1$ | Operation |
| $t_2$ | Cooling phase (downtime) |
| °C (°F) | Temperature |

## 4.3 Improper Use or Use Deviating from Intended Use

Improper use of the product may result in hazards and/or will damage/destroy the product.



**DANGER**

Improper Use or Use Deviating from Intended Use

Danger of bodily injury

> Operation only with the approved fluids.

> Operation with fluids that have a flash point under 55°C / 131°F.

> Operate only with fluids whose temperature is not at least 10°C below their individual flash point.

> Improper connection of the pressure and return flow hoses.

> Operation at a measurement point with impermissible pressure.

> Operation on 24 V DC on-board networks without central "Load Dump" fuse.

> Operation with damaged connector cable.

> Operation with faulty, damaged hoses.

> Operation with diesel in pressure operation ≥ 16 bar.

> Operation with diesel fuel permitted only with connected equipotential bonding:voltage equalizing cable with the voltage equalizing cable.

> Modifications to the product made by the user or purchaser.

> Operation in potentially explosive atmospheres.

> Continuous operation.

## 4.4 Checking the scope of delivery

The Contaminated Fluid Detector Unit comes packed and ready for operation. Before commissioning the CFD II, check the contents of the consignment to make sure everything is present.

| Item | Qty. | Designation |
|---|---|---|
| - | 1 | Contaminated Fluid Detector Unit CFD II, including attachable bag for cables and hoses |
| - | 1 | Power supply, primary: 90-240 V AC / secondary: 24 V DC / 5 A |
| - | 4 | Connection cable for power adapter (Europe, USA/Canada, UK, Australia, Japan) |
| - | 1 | Suction tube, end open |
| - | 1 | High-pressure hose with screwed joint, type 1620, color: black, L = 2 m |
| - | 1 | High-pressure adapter |
| - | 1 | Return hose, transparent, L = 2 m |
| - | 1 | Voltage equalizing cable |
| - | 1 | Document bag, comprised of:<br>- Operating and Maintenance Instructions (this document)<br>- CD-ROM with FluMoS software<br>- USB memory stick, with Operating and Maintenance Instructions (PDF file) in additional languages |

*Tab. 3:* Scope of delivery

## 4.5 Decoding the model code label

For identification of the Contaminated Fluid Detector Unit, see the type label. The type label displays the product ID and important technical data.

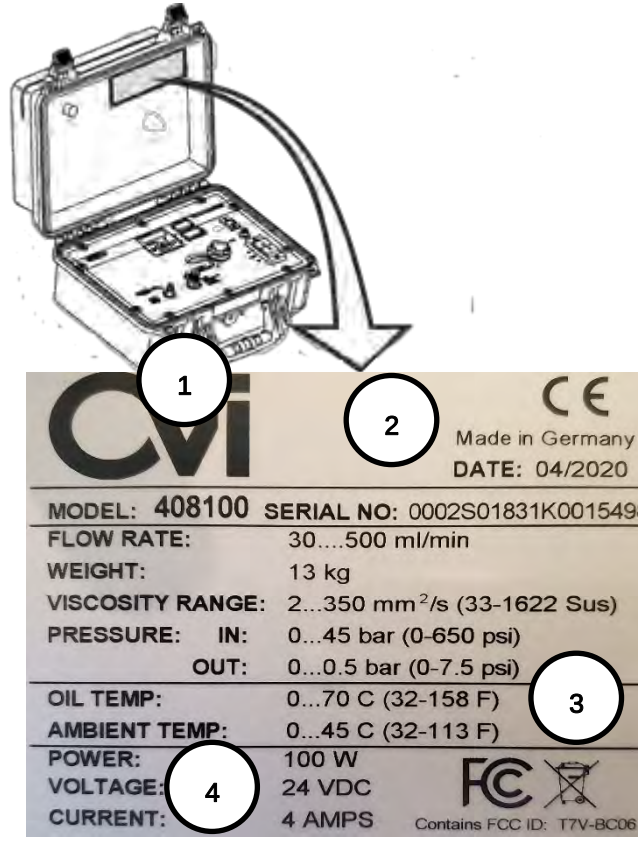



*Fig. 7:* Type label

| Item | -> | Description |
|---|---|---|
| (1) | -> | Type label for CFD II |
| (2) | -> | Model code; for details, see Model Code [ 27] |
| (3) | -> | Information regarding permissible flash point of the fluids to be tested |

| Item | -> | Description |
|---|---|---|
| (4) | -> | Permissible fluids |
| Model | -> | Model code; for details, see Model Code [⟩ 27] |
| Date | -> | Production year/week |
| P/N | -> | Part no. |
| S/N | -> | Serial no. |
| Flow rate | -> | Flow rate |
| Weight | -> | Weight when empty |
| Viscosity range | -> | Permissible viscosity range |
| Pressures | -> | Pressure specifications |
| In | -> | Permissible pressure at port INLET |
| Out | -> | Permissible pressure at port OUTLET |
| Temperatures | -> | Temperature specifications |
| Oil | -> | Permissible oil temperature range |
| Ambient | -> | Permitted ambient temperature range |
| Power | -> | Power consumption |
| Voltage | -> | Voltage |
| Current | -> | Current consumption |

### 4.5.1 Model Code

The CFD II is defined by the following model code:

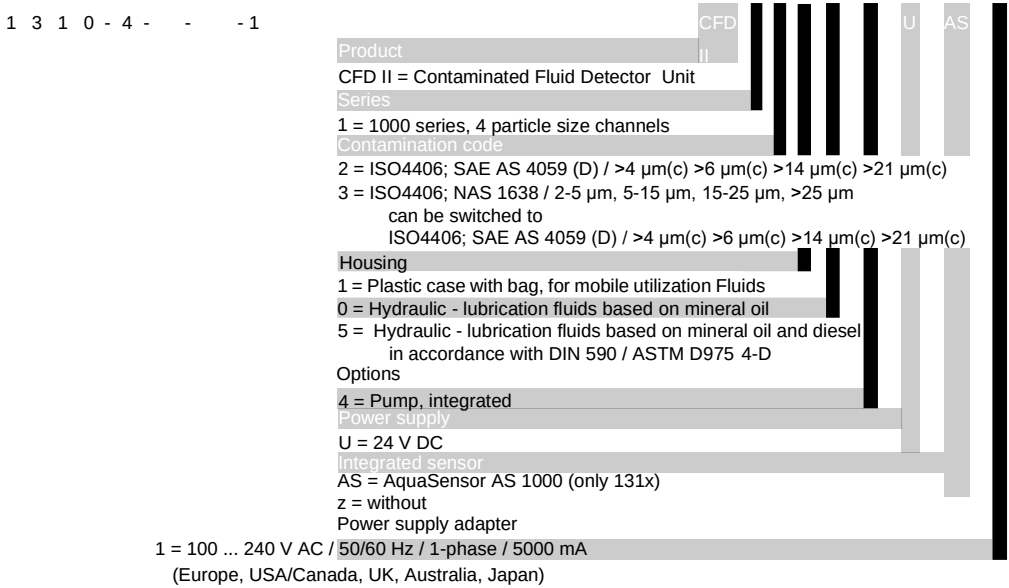



*Fig. 8:* Model Code

## 4.6 Technical Data

The CFD II has the following technical data.

| Contamination sensor | |
|---|---|
| Self diagnostics | continuously with error indication via status LED and display |
| Display | LED, 6 / 4 / 4-digit, each with 17 segments |
| Measured values for solid particle contamination | ISO code / SAE class / NAS class |
| Measured values for fluid temperature | -25 to 100 °C / -13 to 212 °F |
| Measured values for water saturation | 0 … 100 % |
| Measurement range | Display of ISO code between: 9/8/7 … 25/24/23.<br>Calibrated within the range of ISO code: 13/11/10 … 23/21/18 |
| Accuracy | Contamination sensor: ± ½ ISO code<br>AquaSensor: ≤ ±3 % FullScale |
| Service Display | FLOW / DRIVE |
| Measuring time configurable | 10 … 300 Seconds |

*Tab. 4:* Contamination sensor

| Hydraulic data | |
|---|---|
| Suitable Fluids | Mineral oil or raffinate based on mineral oil |
| Hydraulic connections | |
| INLET | Test connector type 1604 |
| OUTLET | DN7 nipple socket |

| Hydraulic data | |
|---|---|
| Maximum permissible operating pressure at INLET connection | |
| without high-pressure adapter | -0.5 … 45 bar / 0 … 650 psi |
| With high-pressure adapter | 15 … 345 bar / 217 … 5000 psi |
| Maximum permissible operating pressure at OUTLET connection | 0 … 0.5 bar / 0 … 7.5 psi |
| Measurement flow rate | 30 - 500 ml/min (viscosity dependent) |
| Permissible viscosity range | 2 … 350 mm²/s / 33 … 1622 Sus (for hydraulic oil up to ISO VG 68) |
| Suction height | ≤ 1 m |
| Suction tube INLET | DN4 end open |
| High-pressure hose INLET | DN4 with screw connection for measurement point 1620, color: black, Length = 2 m |
| Return hose OUTLET | DN7, open-end, color: clear-transparent, Length = 1 m |

*Tab. 5:* Hydraulic data

| Electrical data | |
|---|---|
| Power supply | 24 V DC, ± 20%, residual ripple ≤ 10% |
| Power consumption | ≤ 100 W |
| Current consumption | ≤ 4 A |
| Operating mode | S3, periodic intermittent duty as per DIN 60034-1 / DIN VDE 0530 part 1 relating to a useful life of 10 minutes. |
| Relative duty cycle | 40 % |

| Electrical data | |
|---|---|
| Degree of protection | IP 50 (open, in operation)<br>IP 67 (closed) |
| Protection class | III (low voltage protection) |

*Tab. 6:* Electrical data

| General data | |
|---|---|
| Emission sound pressure level $L_{PA}$ | < 70 db(A) |
| Material of sealings | FKM (FPM, Viton®), NBR |
| Permitted temperature range of fluid | 0 … 70 °C / 32 … 158 °F |
| Permitted ambient temperature range | 0 … 45 °C / 32° … 113 °F |
| Permitted storage temperature range | -40 … 80 °C / -40 … 176 °F |
| Permitted relative humidity | max. 90%, non-condensing |
| Weight when empty | ≈ 13 kg |

*Tab. 7:* General data

## 4.7 Dimensions

The CFD II has the following dimensions.

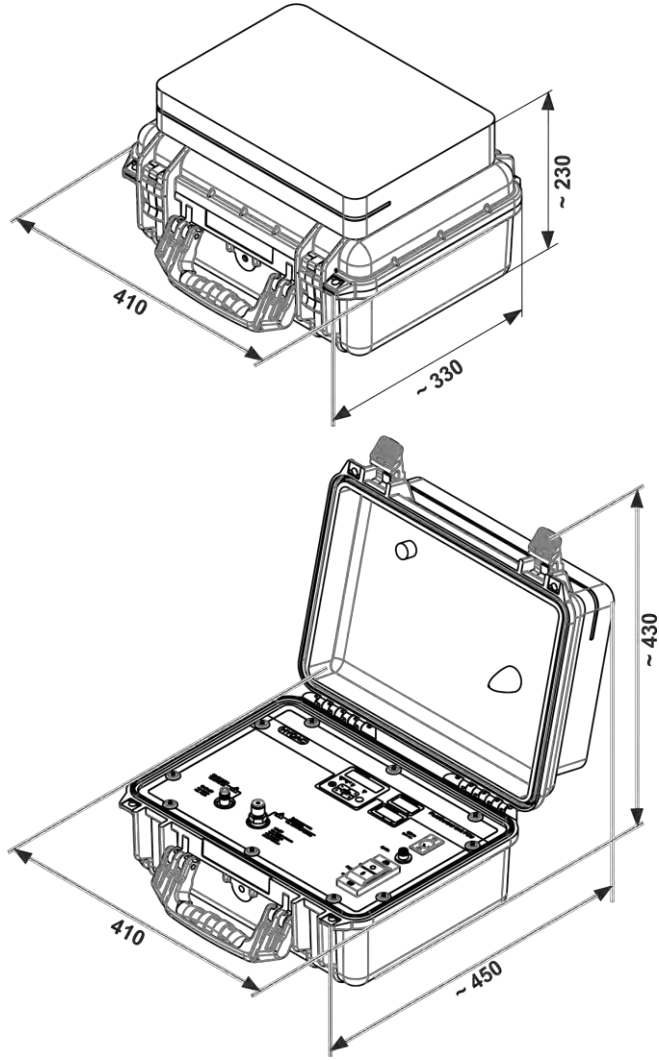



*Fig. 9:* Dimensions

All dimensions in mm.

## 4.8 Hydraulic circuit

The CFD II has the following hydraulic circuit.

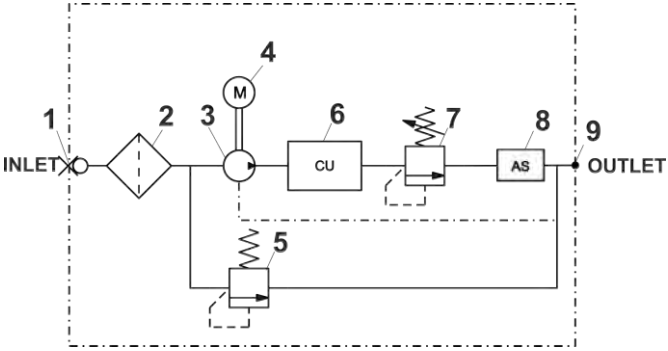



*Fig. 10:* Hydraulic circuit

| Item | Designation |
|---|---|
| 1 | INLET, gauge port type 1604 |
| 2 | Suction strainer, 400 µm |
| 3 | Gear pump |
| 4 | Electric motor |
| 5 | Pressure relief valve |
| 6 | Contamination sensor |
| 7 | Counter balance valve |
| 8 | AquaSensor |
| 9 | OUTLET, DN7 quick coupling nipple |

## 4.9 Opening / closing the case

Open the CFD II case by releasing the two clips.

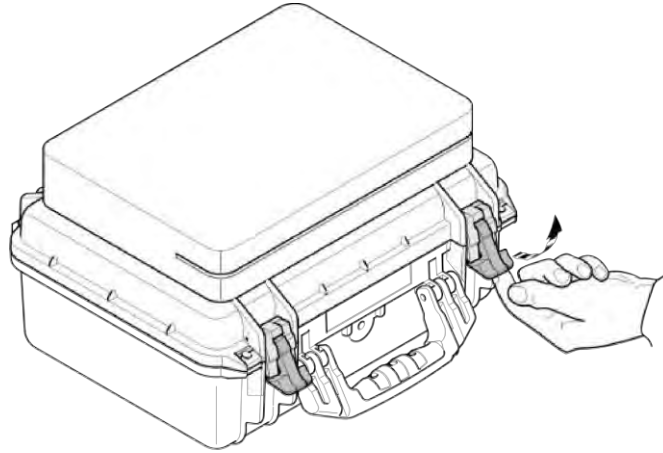


*Fig. 11:* Opening the CFD II case

Close the CFD II using both clips. Make sure that these audibly snap into place.

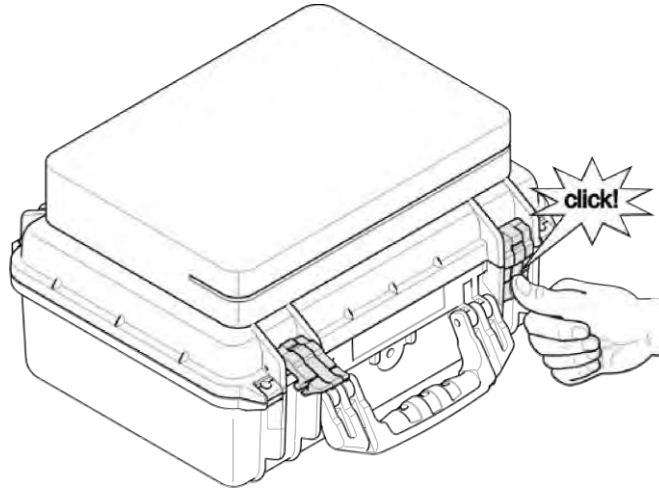



*Fig. 12:* Closing the CFD II case

## 4.10 How it works:

From the measurement point (either a pressure port or a reservoir or a bottle sample) a continuous oil current is established through the INLET connector by an electrically controlled gear pump (16). The suction screen (17) protects the pump from coarse contamination.

The oil current to be analyzed flows through an optical contamination sensor (6). The contaminant particles contained in the oil current cause a pulsating darkening of the light beam; these pulses are classified and counted as measurement signals in the contamination sensor. The evaluation module shows cleanliness classes continuously with the aid of the measuring signals of the optical sensor with respect to a measurement volume of 100 ml. A defined pressure in the flow of oil is generated by the counter balance valve (7). This is used to minimize the 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 flow leaves the port (9) OUTLET and is routed by the return hose to a pressurized tank.

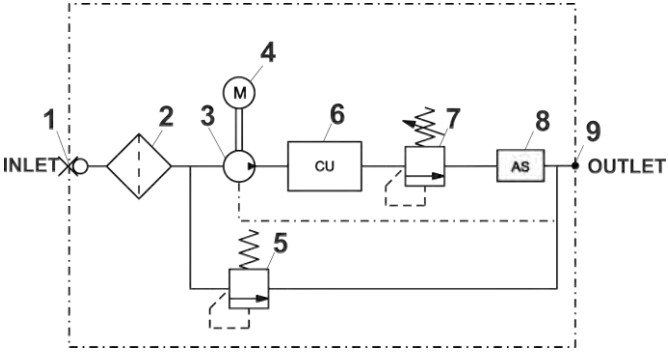



*Fig. 13:* Hydraulic circuit

The electronic evaluation module monitors:

- the function of the contamination sensor
- the oil flow
- the function of the AquaSensor

The status display will indicate an error in the event that one occurs. The evaluation module will recognize when the cause of error has been corrected, and the unit will reset automatically and resume the measurement operation.

# 5 Transporting / storing the CFD II

Observe the following chapter on transport and storage.

## 5.1 Preparing the CFD II for transport



Prior to transport of the CFD II, the USB stick is to be removed, the power supply unit and the hoses are to be packed away neatly and/or stored in the bag, and the case is to be correctly sealed.



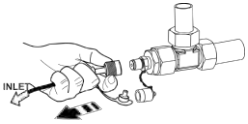
**CAUTION**

Hot fluid at the connection OUTLET

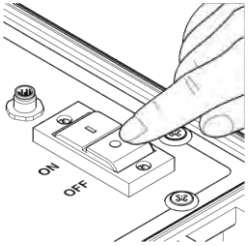
Danger of burns

u Let the CFD II and the hoses cool down.

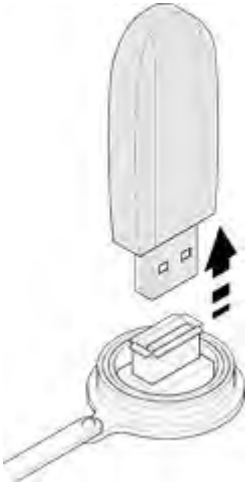
To prepare the CFD II for transport, observe the following se- quence:



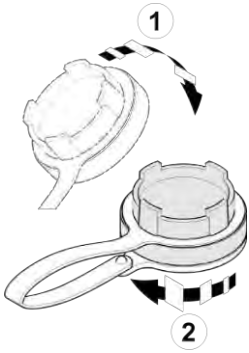

1. Undo the measurement hose from the measurement point.



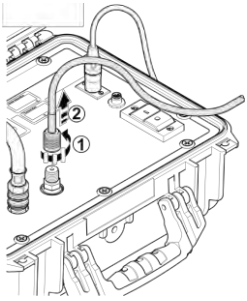

2. Use the switch to turn the internal pump off.



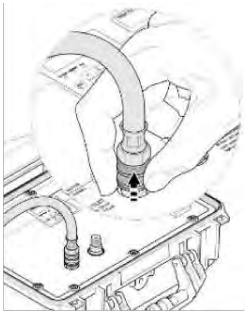
3. Remove the USB stick, should it be inserted.




4. Close the USB socket with the corresponding cover.

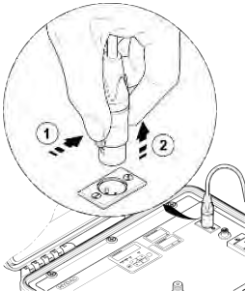



5. Remove the hose by turning counterclockwise from the INLET connection of the CFD II.

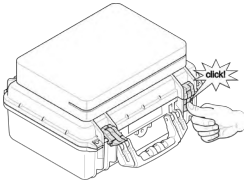


6. Undo the quick-action coupling of the return hose by lifting the outer ring.

   Empty the hose into a depressurized container. To allow air into the hose, open it by using a thin object to press in the check valve on the quick-action coupling. Doing so enables the fluid in the hose to drain off rapidly. Plug the two ends of the hose into one another after emptying is complete. 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 CFD II using both clips. Make sure that both clips audibly snap into place.

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

⇨ The CFD II is ready for transport.

## 5.2 Transporting the CFD II

Transport the CFD II only when is in closed position; carry it flat or by the handle.

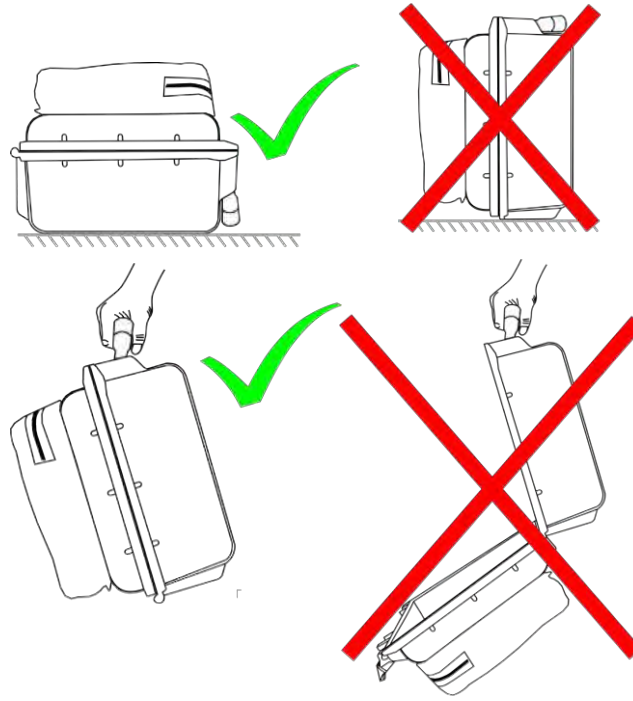


*Fig. 14:* Transporting the CFD II

## 5.3 Storing the CFD II

Drain and rinse the CFD II completely before putting it into storage. See the"Rinsing the CFD II" chapter for details on rinsing the CFD II.

Details regarding permissible storage conditions can be found in the Technical Data [› 28] chapter.

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

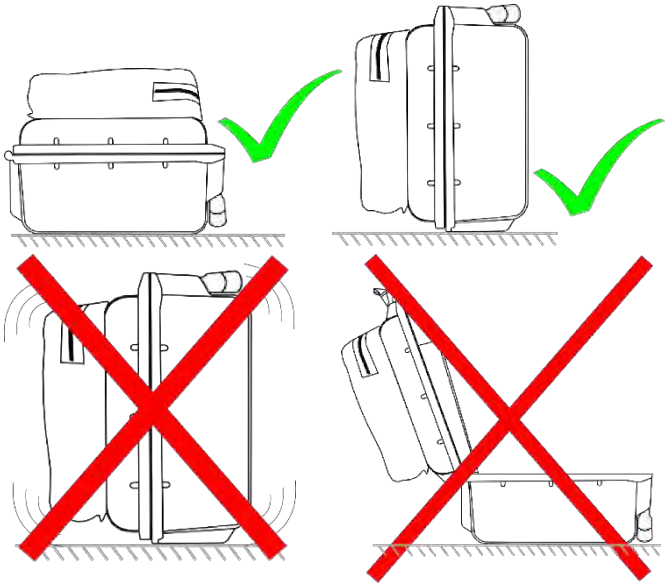


*Fig. 15:* Storing the CFD II

# 6 Putting the CFD II into operation

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

## 6.1 Connecting / disconnecting the power supply

The CFD II has a 3-pole socket for connection with a 24 V DC power supply.

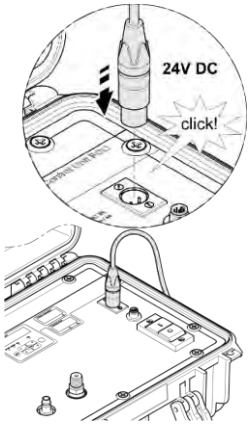



*Fig. 16:* Connecting the power supply

1. Insert the 3-pole socket plug, e.g. of the power pack, into the socket until the ratchet can be heard to click in ( click!). Connect the other end with the voltage source.
2. Once the CFD II is supplied with voltage, the display will show "FCU1315 1###" in ticker format. Afterwards, the firmware version will be shown for 2 seconds.
   The internal sensors will be checked after that. The display shows 2. SENSOR. and the firmware of the sensors.
   The self-test is followed in the display by a countdown WAIT 99 ... WAIT 0.
3. The CFD II is now ready for the measurement.
4. Flashing in the displays T AMB and ) 45C indicates that the CFD II is in a safety disconnection. For details, see Finding / rectifying errors [} 131].



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 present.

### 6.1.1 Disconnecting the power supply

To remove the power supply, press the catch (1) on the connector and then pull (2) the connector out.

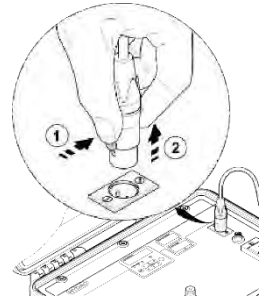



*Fig. 17:* Disconnecting the power supply

## 6.2 Plug in/Detach return hose

**NOTICE**

Closed or blocked outlet at the connection OUTLET

The CFD II can be damaged.

- Never seal the connection OUTLET.
- Put the free end of the OUTLET return hose into an unpressurized container.

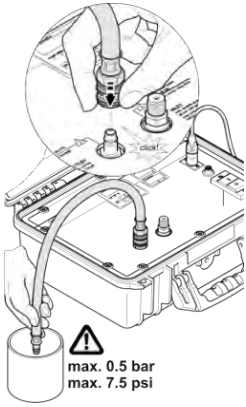



*Fig. 18:* Plug in return hose

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

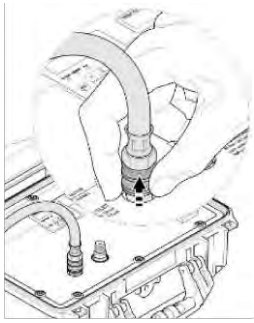


*Fig. 19:* Detach return hose

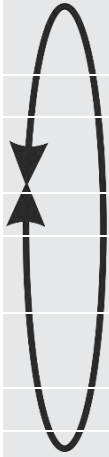
Put the other end of the return hose into a depressurized container or tank.

## 6.3 Configuring / setting CFD II (PowerUp)

You establish the basic settings for operation of the CFD II in the Power Up menu.

| Selection | To do |
|---|---|
| Power Up Start menu | Press and hold down a button while the supply voltage is being plugged in. |
| Power Up Exit the menu without saving | Scroll to CANCEL and use the o.k. button for confirmation or wait 30 seconds without actuating a button. |
| Power Up Exit the menu with Save | Scroll to SAVE and confirm with the o.k. button. |

You are scrolling through the PowerUp menu:



| For details, see: | |
|---|---|
| DAT.TIM | DAT.TIM – Setting the date/time [› 45] |
| ADRESS | ADRESS - Set bus address [› 46] |
| DEL.MEM | DEL.MEM – Deleting the measurement report memory [› 47] |
| M.TIME | M.TIME - Set measuring time [› 48] |
| CALIB | CALIB – Selecting the calibration type [› 49] |
| DFAULT | DFAULT – Reset to default settings [› 50] |
| CANCEL | CANCEL - Cancel [› 51] |
| SAVE | SAVE – Saving settings / data [› 52] |

*Tab. 8:* PowerUp Menu

Press the o.k. button to switch to a sub-menu.

### 6.3.1 DAT.TIM – Setting the date/time

You can set / change the system date / system time at DAT.TIM.

If the date has never beset, or if the buffer battery is flat, the system date will be 00.00.01 and the time will be 00.00 . The date format is: **YY.MM.DD**
=> year / month / day. The time uses the 24-hour format:
=> hour / minute. **HH.MM**

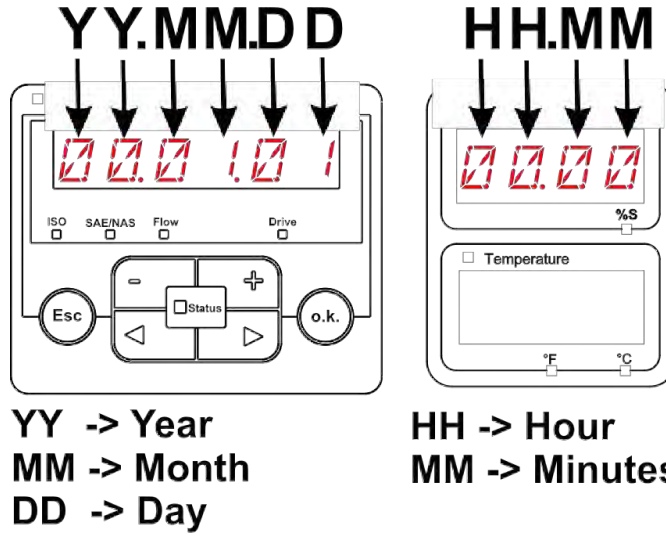



*Fig. 20:* DAT.TIM – Setting the date/time

Use the following buttons to set the date and time:

| | |
|---|---|
| − + | Change the values. |
| ◀ ▶ | Change the position. |
| o.k. | Confirm the changes. |
| Esc | Cancel and back. |

### 6.3.2 ADRESS - Set bus address

With "ADRESS" you set the bus address to transmit the measured values via 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.

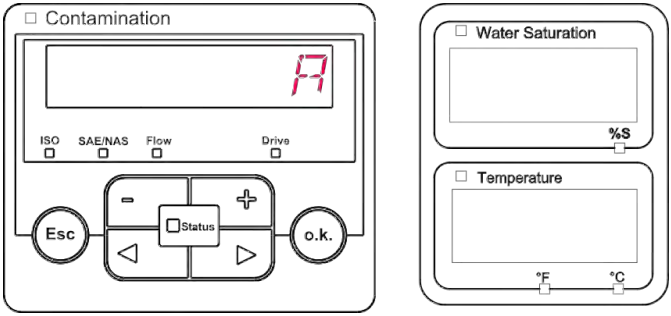



*Fig. 21:* ADRESS - Set bus address

Use the following buttons to set the address:

| | |
|---|---|
| − + | Change the values. |
| ◁ ▷ | Change the position. |
| o.k. | Confirm the changes. |
| Esc | Cancel and back. |

| | |
|---|---|
| The factory setting of the bus address is: | A |

### 6.3.3 DEL.MEM – Deleting the measurement report memory

Use DEL.MEM for final deletion of all of the measurement records located in the internal measurement report memory.

**NOTICE**

Deletion of the measurement report memory

Data loss

- Backup / copy all of the measurement reports to the USB memory stick before deleting them.

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

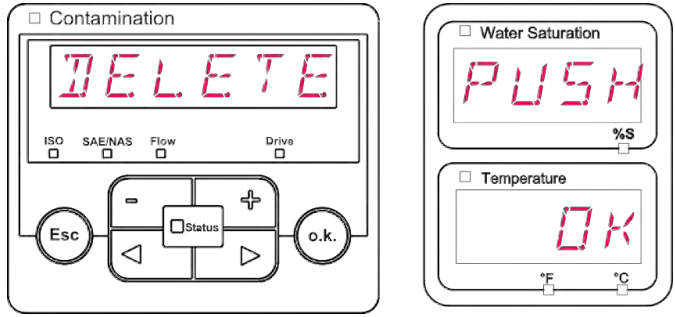



*Fig. 22:* DEL.MEM – Deleting the measurement report memory

Push the following buttons for deletion:

| | |
|---|---|
| o.k. | Confirm the changes. |
| Esc | Cancel and back. |

### 6.3.4 M.TIME - Set measuring time

You set the measuring time under M.TIME. Select the duration in the range from 10 to 300 seconds. Use the following buttons to set the duration of the measurement:

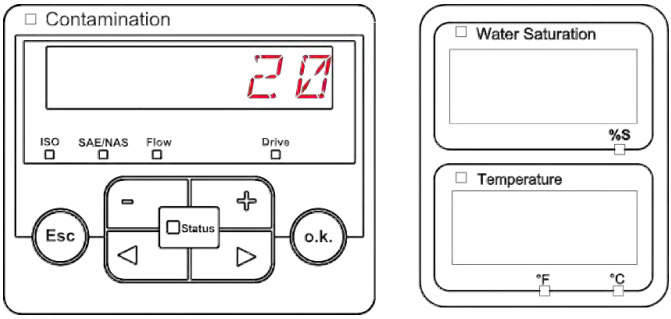



*Fig. 23:* M.TIME - Set measuring time

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

| | |
|---|---|
|  | Change the values. |
|  | Change the position. |
|  | Confirm the changes. |
|  | Cancel and back. |

The factory setting is: 20

### 6.3.5 CALIB – Selecting the calibration type

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

- The calibration type ISO.SAE is based on ISO4406 / SAE.
- The calibration type ISO.NAS is based on ISO4406 / NAS.

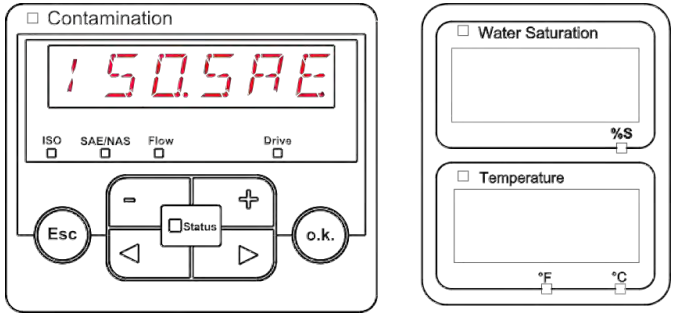



*Fig. 24:* CALIB - Calibration selection

Use the following buttons:

| | |
|---|---|
| − + | Change the values. |
| o.k. | Confirm the changes. |
| Esc | Cancel and back. |

### 6.3.6 DFAULT – Reset to default settings

Reset the CFD II to the factory settings under DFAULT. The fac- tory settings can be found in chapter Factory settings [〉 53].

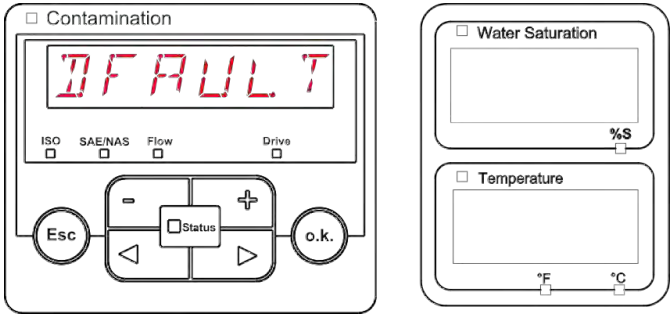



*Fig. 25:* DFAULT - Reset to default settings

Use the following buttons:

| | |
|---|---|
| − + | Change the values. |
| ◀ ▶ | Change the position. |
| o.k. | Confirm the changes. |
| Esc | Cancel and back. |

### 6.3.7 CANCEL - Cancel

Use CANCEL to discard all changes and exit the menu.

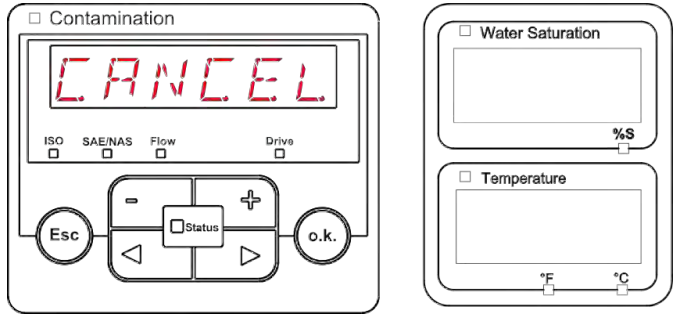



*Fig. 26:* CANCEL - Cancel

Use the following buttons:

| | |
|---|---|
|  | Change the position. |
|  | Confirm the changes. |
|  | Cancel and back. |

### 6.3.8 SAVE – Saving settings / data

Use SAVE to store all of your changes and exit the menu.

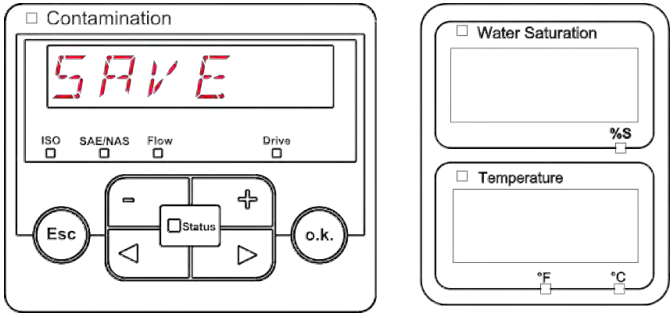



*Fig. 27:* SAVE – Saving settings / data

Use the following buttons:

| | |
|---|---|
|  | Change the position. |
|  | Confirm the changes. |
|  | Cancel and back. |

### 6.3.9 Factory settings

Reset the CFD II to the factory settings under the DFAULT menu item. This will cause the following factory settings to be loaded:

| | value | For details, see: |
|---|---|---|
| ADRESSA | | ADRESS - Set bus address [› 46] |
| M.TIME | 20 | M.TIME - Set measuring time [› 48] |
| CALIB | ISOSAE | CALIB – Selecting the calibration type [› 49] |
| Bluetooth Code | 0000 | Connecting/Linking the CFD II via Bluetooth [› 109] |

*Tab. 9:* Factory settings

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

## 6.4 Connecting the equipotential bonding

When operating with diesel fuel, connect with the voltage equalizing cable.



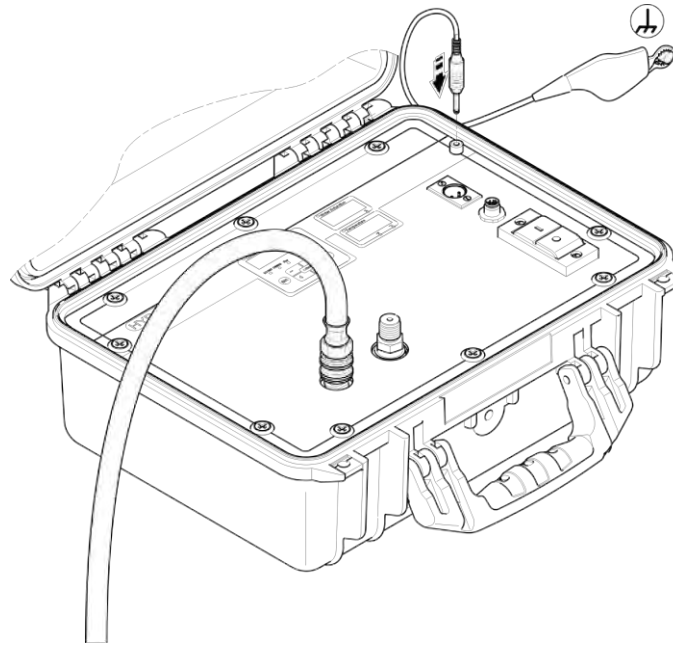
**WARNING**

Statically charged fluid

Risk of explosion

- Connect the CFD II during the measurement of the operation to the plant, to the system, to the tank or to the container, etc. via the voltage equalizing cable.
- Use the hoses included in the scope of delivery or the suction tube for measuring fluids.
- Guide the measured fluid back into an often, well-ventilated vessel below the liquid level.

The permissible types of diesel have a low conductivity. This means that static charges can come about during flows through tubes or pipes which, in the event of an uncontrolled electrostatic discharges can become an ignition source for explosive mixtures.



The flow speed through the CFD II is so low that the fluid normally cannot build up a static charge. The possibility cannot however be excluded that statically loaded fluid will be aspirated from the system, that will then result in an uncontrolled electrostatic discharge when it exits the CFD II. This can lead to spark formation, which will become an ignition source for any ignitable mixtures that may be on hand.

The CFD II has a safety disconnection that switches off the pump when the ambient temperature of > 45°C is exceeded in the CFD II.

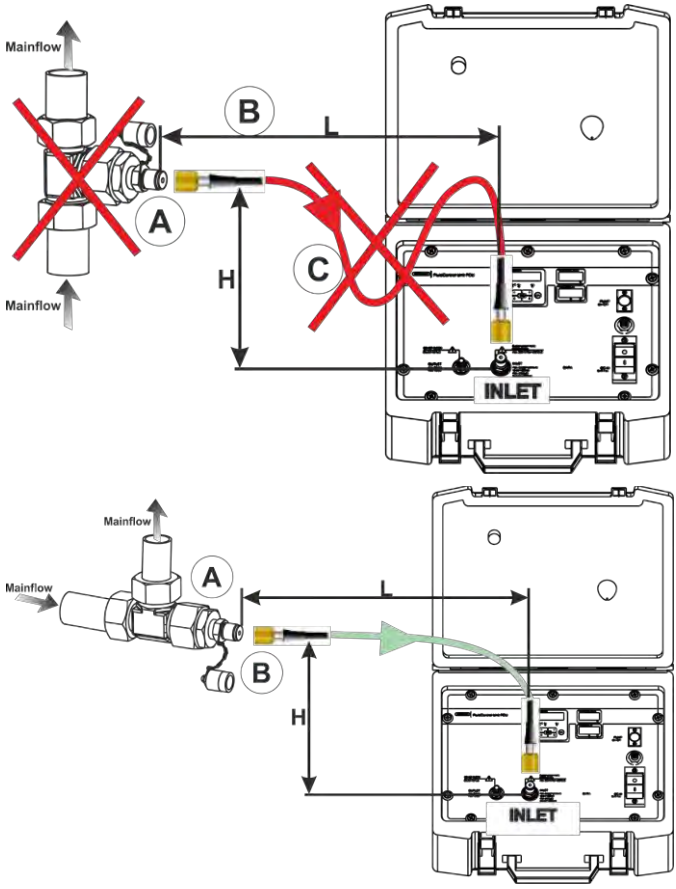
If the safety disconnection is active, then T AMB and > 45C will flash in the display; for details see rectifying errors [} 131].

## 6.5 Selecting the measurement location

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

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

While installing the inlet hose INLET, make sure that no siphon (C) results.



# 7 Operation

Observe the following notices during operation.

## 7.1 Overview of control panel/operating elements

The following operating elements can be found on the control panel:

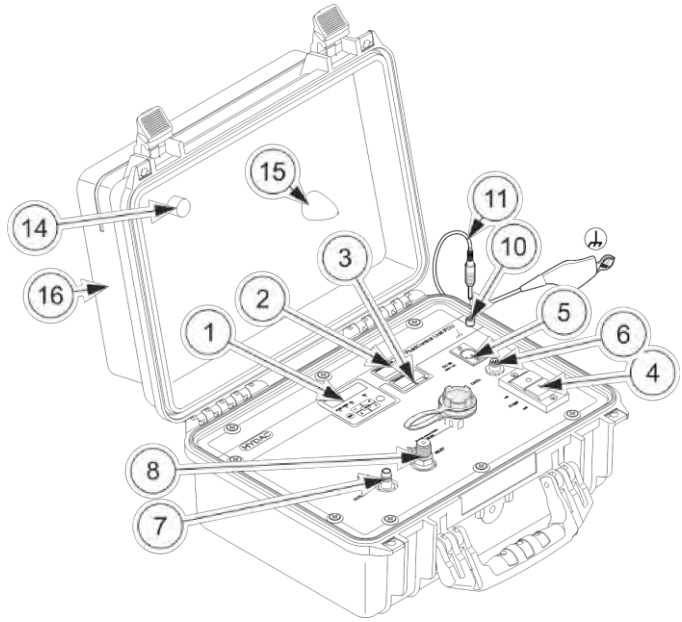



*Fig. 28:* Control panel/operating elements

| | |
|---|---|
| 1 | Display of ISO, SAE/NAS, FLOW, DRIVE with key-board |
| 2 | Water saturation display |
| 3 | Fluid temperature display |
| 4 | ON / OFF switch for the internal pump |
| 5 | 3-pole connection for 24 V DC supply voltage |
| 6 | Data interface DATA |
| 7 | Connection OUTLET |
| 8 | Connection INLET |

| | |
|---|---|
| 9 | Socket for connecting the voltage equalizing cable |
| 10 | Voltage equalizing cable |
| 11 | Fastener for the OUTLET connection when the case is closed |
| 12 | Holding-down device |
| 13 | Bag for hoses and accessories |
| - | Bluetooth interface |

### 7.1.1 Reading the display and operating the keyboard

The CFD II has three displays and additional LEDs for displaying cleanliness classes, water saturation and temperature.

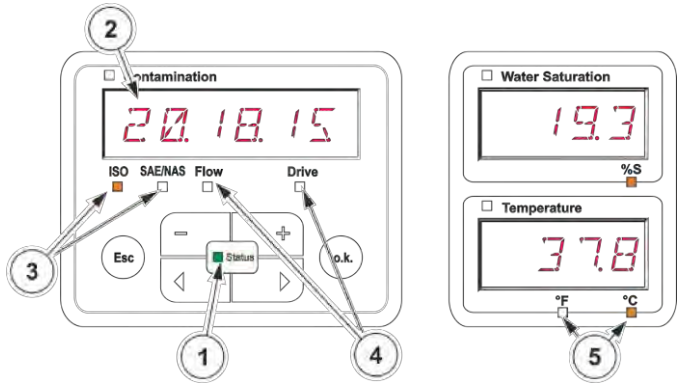



*Fig. 29:* Display

| | | |
|---|---|---|
| 1 | Status LED | Status display Green/ Red In the event of a malfunction, the status LED will show red and flash as code.<br>(Details regarding this can be found in the "Finding / rectifying errors [ 131]" chapter) |
| 2 | Display | Consists of a 6-digit display on which the selected measured values are output. |
| 3 | Measured variable | Indicates the respective measured variable presented in the display, e.g.: **ISO / SAE/NAS** |
| 4 | Service variable | Indicates the respective service variable presented in the display, e.g.: **Flow / Drive** |

| | | |
|---|---|---|
| 5 | Unit | The units for the fluid temperature display: **°C / °F** |

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

| Keyboard | Description |
|---|---|
|   | Go one level down.<br>Confirmation of a changed value (lowest level).<br>Confirm in order to save changes or discard them (top level). |
|   | Go one level up (back)<br>Cancel (no values changed). |
|   | Change values at the lowest levels<br>(If you are at the lowest menu level, the display will flash). |
|  | Scroll through the display.<br>Scroll through the menu.<br>Select positions. |

*Tab. 10:* Keyboard overview

See also

Finding / rectifying errors [} 131]

### 7.1.2 Scrolling through the display

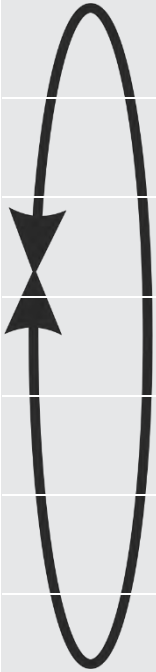
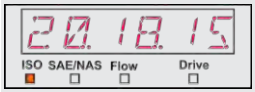
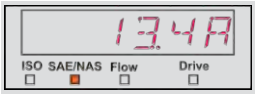
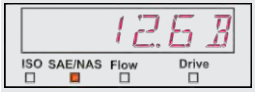
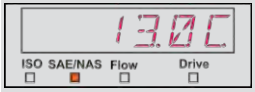
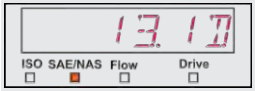
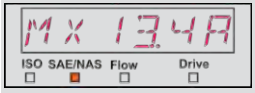
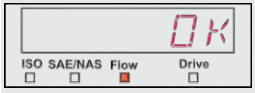
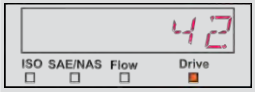
Depending on the selected type of calibration ( CAL 1 B) in the Power Up menu you can scroll through the following displays using the keys .

See also

Finding / rectifying errors [} 131]

### 7.1.2.1 Displays with ISO.SAE

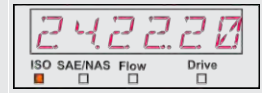
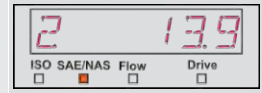
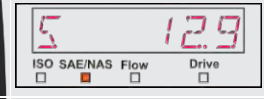
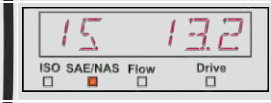
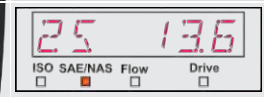
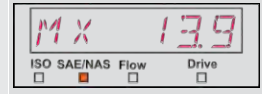
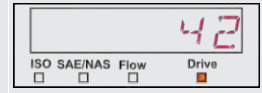
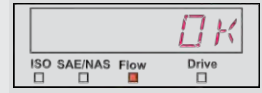
The following displays are available:

| | Display | Description |
|---|---|---|
|  |   | 3-digit ISO code |
| |   | SAE Class A |
| |   | SAE Class B |
| |   | SAE Class C |
| |   | SAE Class D |
| |   | SAE Max. |
| |   | Flow status |
| |   | LED current in % |

*Tab. 11:* Displays with ISO.SAE

### 7.1.2.2 Displays with ISO.NAS

The following displays are available:

| Display | Description |
|---|---|
|  | 3-digit ISO code |
|  | NAS 2-5 µm channel |
|  | NAS 5-15 µm channel |
|  | NAS 15-25 µm channel |
|  | NAS > 25 µm channel |
|  | NAS Max. |
|  | LED current in % |
|  | Flow status |

*Tab. 12:* Displays with ISO.NAS

### 7.1.3 Displaying measured variables

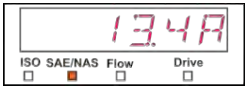
The measured variables supply you with information regarding the degree of cleanliness, the water saturation and the temperature of the hydraulic system under investigation. The measurement variables ISO, SAE and NAS are calibrated. They indicate a measured value with an accuracy of ± ½ ISO code in the calibrated range.

#### 7.1.3.1 Measured variable - ISO



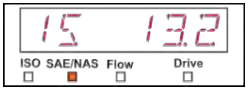

The measured variable is updated depending on the set measuring time. The presentation appears as a 3-digit ISO code. Example: ISO code 20.18.15

#### 7.1.3.2 Measured variable - SAE



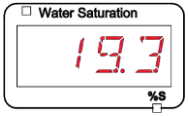

The measured variable is updated depending on the set measuring time. The presentation takes the form of a channel of the SAE class. Example: SAE class A = 13.4

#### 7.1.3.3 Measured variable - NAS



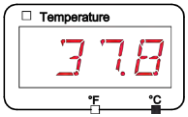

The measured variable is updated depending on the set measuring time. The presentation takes the form of a channel of the NAS class. Example: NAS class, channel 15-25 = 13.2

#### 7.1.3.4 Measured variable – Water Saturation




The integrated AquaSensor continuously measures the saturation. The measured value is shown on the display as the water saturation of the fluid, expressed as percentage saturation. Example: 19.3% water saturation

#### 7.1.3.5 Measured variable – Temperature

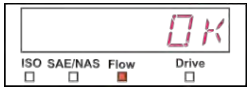



The integrated AquaSensor continuously measures the fluid temperature. The output as Celsius °C or Fahrenheit °F can be set under TP.UNIT. Example: Temperature = 37.8 °C

### 7.1.4 Display service variables

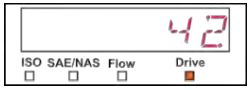
These values give you information about the determined flow and the light source power. The service variables are not calibrated.

#### 7.1.4.1 Service variable – Flow




Flow contains the display indicating whether the flow is in the permissible range. Example: Flow rate = OK

#### 7.1.4.2 Service variable - Drive




Display of the light source efficiency (1-100%) with which the ContaminationUnit currently works. Example: Light source efficiency = 42%

## 7.2 Operating/Setting measuring menu

Settings in the measuring menu are possible during operation.

| Selection | To do |
|---|---|
| Start the measuring menu | Press the o.k. button. |
| Exit the measuring menu without saving | Scroll to CANCEL and use the o.k. button for confirmation or wait 30 seconds without actuating a button. |
| Save and exit the measuring menu | Scroll to SAVE and confirm with the o.k. button. |

You are scrolling through the measuring menu:



| | For details, see: |
|---|---|
| RECORD | RECORD – Record measurements [› 67] |
| MEMORY | MEMORY – Displaying free measurement report memory [› 70] |
| ED.MPNT | ED.MPNT – Change name of measurement point [› 71] |
| TP.UNIT | TP.UNIT - Set temperature unit [› 73] |
| CANCEL | CANCEL - Cancel [› 75] |
| SAVE | SAVE – Saving settings / data [› 76] |

*Tab. 13:* Measuring Menu

Press the o.k. button to switch to a sub-menu.

### 7.2.1 RECORD – Record measurements

Under RECORD, you define under which of the 20 available names of the measurement locations the measurement reports will be stored.

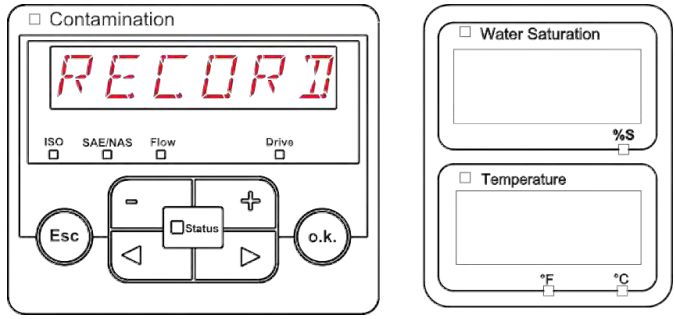



*Fig. 30:* RECORD – Record measurements

Use the following buttons:

| | |
|---|---|
|  | Change the values. |
|  | Change the position. |
|  | Confirm the changes. |
|  | Cancel and back. |

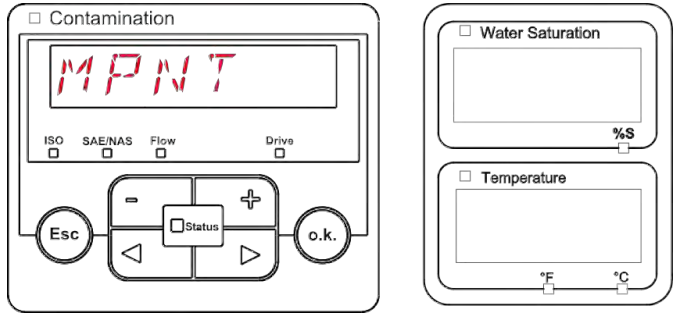



*Fig. 31:* MPNT - xx

20 freely definable measurement points are available to you under MPNT. At the time of delivery, the measuring points are defined as MPNT00 . . .MPNT 19. You can change this measuring point designation at will (maximum 6 characters), as described under ED.MPNT.

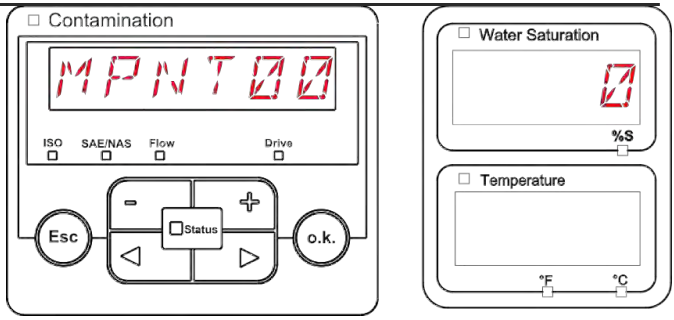



*Fig. 32:* MPNT00 - xx

| | |
|---|---|
|  | Change to the next measurement point. |
|  | Change the position. |
|  | Confirm the changes. |
|  | Cancel and back. |

Select STP.STA to create a new measurement report file in the internal measurement report memory under a new measurement point designation.






Confirm with the button, after which the display will jump to. Confirm once more by pressing the key.

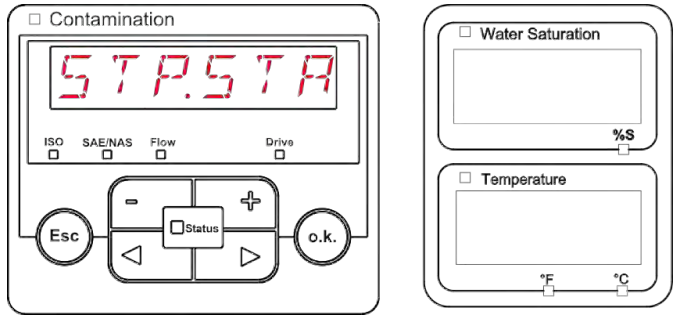



*Fig. 33:* Restarting the STP.STA - measurement report

Use the following buttons:

| | |
|---|---|
|  | Change the values. |
|  | Change the position. |
|  | Confirm the changes. |
|  | Cancel and back. |

### 7.2.2 MEMORY – Displaying free measurement report memory

Under MEMORY, check the current free internal measurement report memory in %. If there is no more memory available, no measurement reports can be saved.

**NOTICE**

No free measurement report memory

Data loss

- Check the measurement report data memory regularly (depending on frequency of use) for free memory space.

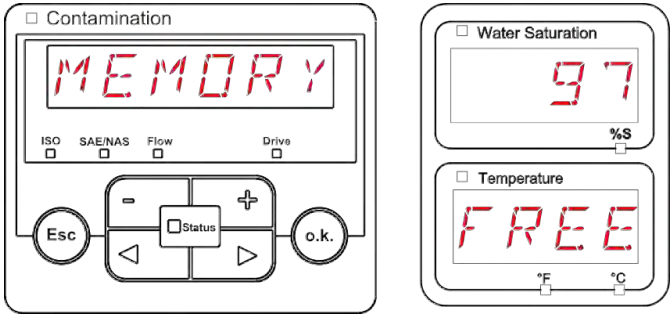



*Fig. 34:* MEMORY – Displaying the free measurement report memory

Use the following buttons:

| | |
|---|---|
| o.k. | Confirm the changes. |
| Esc | Cancel and back. |

### 7.2.3 ED.MPNT – Change name of measurement point

You change the measurement point designation with ED.MPNT. You have a maximum of 6 characters available for the measurement point designation. Example: TEST01, EXCAVATOR, CRANE02, etc.

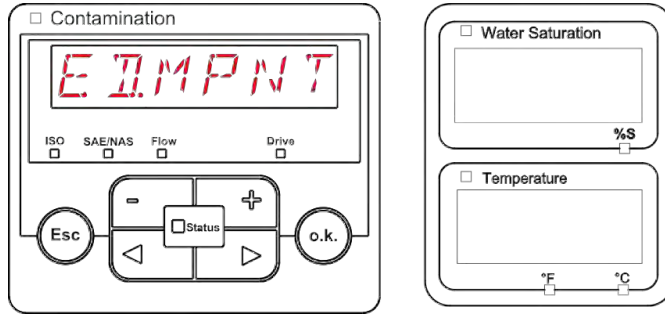
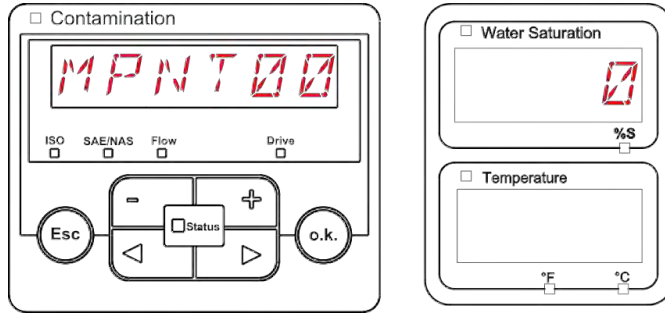



*Fig. 35:* Changing the ED.MPNT - measurement point designation

Push the following buttons for deletion:

| | |
|---|---|
| − + | Change the values. |
| ◀ ▶ | Change the position. |
| o.k. | Confirm the changes. |
| Esc | Cancel and back. |




| | |
|---|---|
| − + | Change the values. |

| | |
|---|---|
|  | Change the position. |
|  | Confirm the changes. |
|  | Cancel and back. |

The following rolling characters appear after confirmation of the buttons .




The empty space is located between 9 and A and can be adjusted only from the 6th position to the left. This means it is possible to enter a measurement point designation with less than six characters.

### 7.2.4 TP.UNIT - Set temperature unit

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

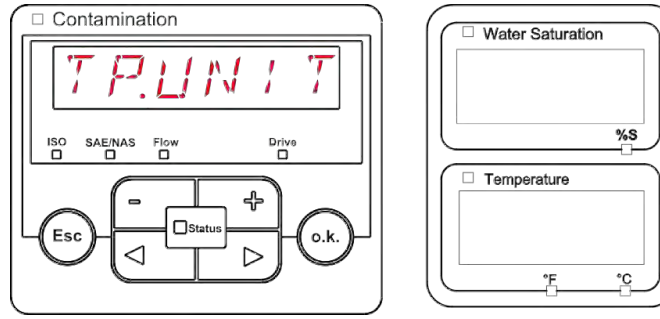



*Fig. 36:* TPUNIT – Setting the temperature unit

Use the following buttons:

| | |
|---|---|
| − + | Change the values. |
| ◀ ▶ | Change the position. |
| o.k. | Confirm the changes. |
| Esc | Cancel and back. |

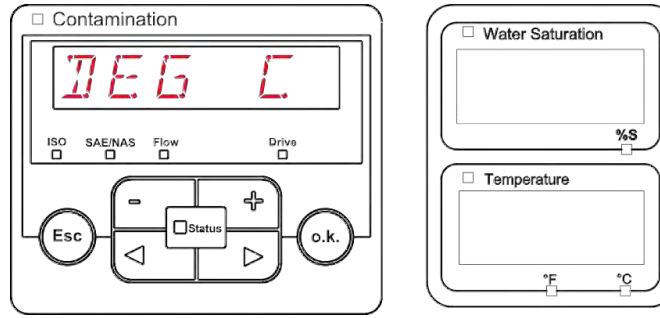



*Fig. 37:* TPUNIT – setting degrees Celsius

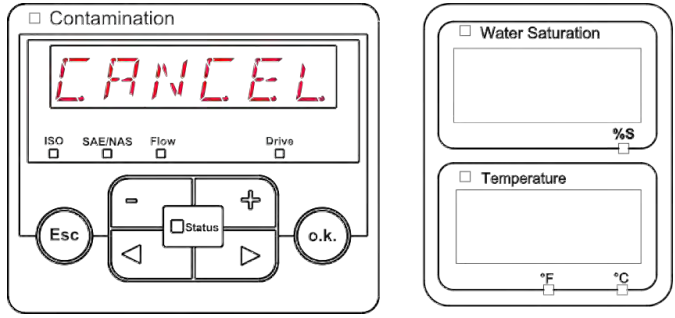
| | |
|---|---|
| − + | Change the values. |

| | |
|---|---|
|  | Change the position. |
|  | Confirm the changes. |
|  | Cancel and back. |

### 7.2.5 CANCEL - Cancel

Use CANCEL to discard all changes and exit the menu.

*Fig. 38:* CANCEL - Cancel




Use the following buttons:

| | |
|---|---|
|  | Change the position. |
|  | Confirm the changes. |
|  | Cancel and back. |

### 7.2.6 SAVE – Saving settings / data

Use SAVE to store all of your changes and exit the menu.

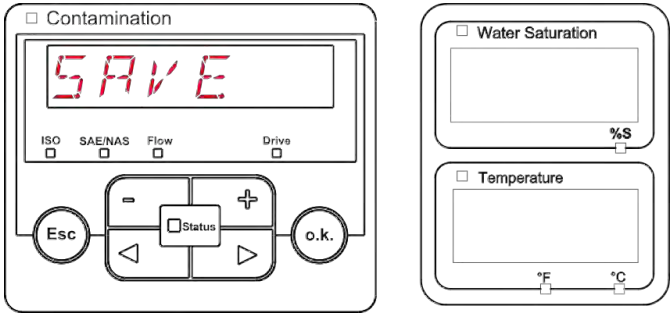



*Fig. 39:* SAVE – Saving settings / data

Use the following buttons:

| | |
|---|---|
|  | Change the position. |
|  | Confirm the changes. |
|  | Cancel and back. |

## 7.3 Select the operating modes / 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 suitable in accordance with the prevailing operating pressure:

| Fluid | Pressure at the measurement point | Operating mode / measurement method, for details, see |
|---|---|---|
| Diesel / Oil | 0 bar / 0 psi | Measuring from unpressurized containers [› 78] |
| Diesel | 1 … 16 bar / 14 … 232 psi | Measuring diesel fuel up to max. 16 bar / 232 psi [› 85] |
| Oil | 1 … 45 bar / 14 … 650 psi | Measuring up to max. 45 bar / 650 psi with hydraulic fluids [› 82] |
| Oil | 15 … 345 bar / 217 … 5000 psi | Measuring in the range 5 to 345 bar / 217 to 5000 psi with oil [› 88] |

*Tab. 14:* Selecting the operating mode / measurement method

See also

- Measuring up to max. 45 bar / 650 psi with hydraulic fluids [› 82]
- Measuring in the range 5 to 345 bar / 217 to 5000 psi with oil [› 88]
- Measuring from unpressurized containers [› 78]

### 7.3.1 Measuring from unpressurized containers

To measure permissible oil or diesel fuel from depressurized containers, proceed as follows:

| | |
|---|---|
| Required hoses: | -Return hose<br>-Suction tube (A) or suction hose (B) + hose adapter |

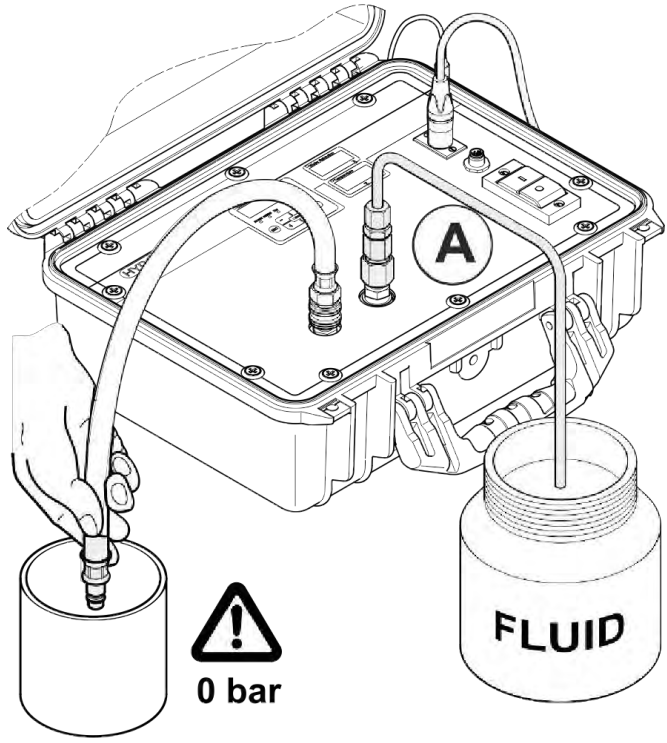



*Fig. 40:* Operating mode - Measurement at 0 bar with suction tube (A)

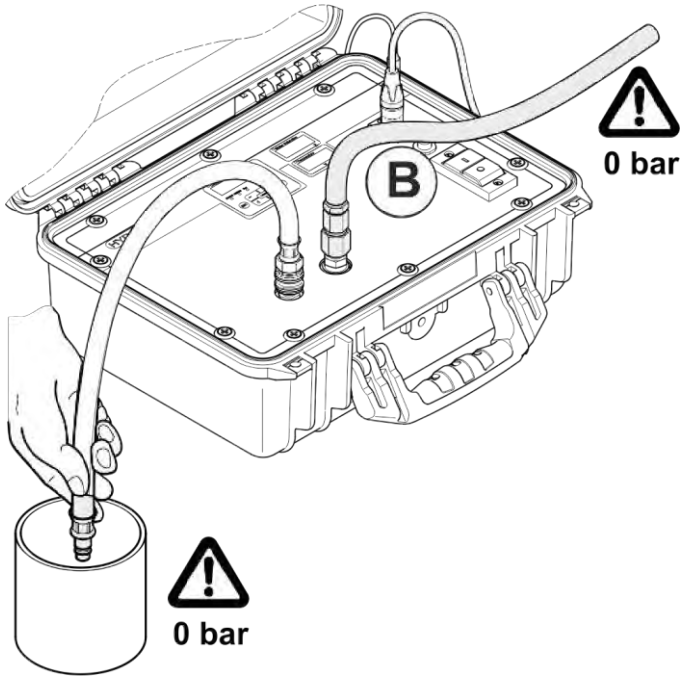



*Fig. 41:* Operating mode - Measurement at 0 bar with suction hose (B)

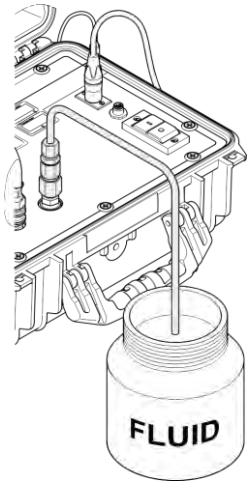
To guarantee valid and direct measurements, prime the CFD II. To do this, draw in approx. 120 ml fluid via the inlet hose in order to completely fill the hydraulic circuit and the inlet hose.

If the CFD II is not primed, an air-oil mixture at the start of measurement will flow through the CFD II. 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 CFD II and hoses, you need ≥ 300 ml of fluid.

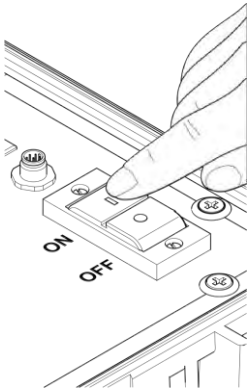
Make sure that the following sequence is observed:

✓ You have performed all of the steps listed in chapter Putting the CFD II into operation [› 41].




1. Connect the suction hose (color: clear transparent) with the INLET of the CFD II.
   Place the other end of the suction hose (color: clear transparent) into a depressurized container.

⇨ This completes the hydraulic installation.




2. Switch on the internal pump.

⇨ The CFD II will start with the measurement.

See also

Putting the CFD II into operation [} 41]

### 7.3.2 Measuring up to max. 45 bar / 650 psi with hydraulic fluids

For the measurement of permissible hydraulic fluids up to a maximum of 45 bar / 650 psi, proceed as follows:



**WARNING**

Hydraulic systems are under pressure

Danger of bodily injury

- u The system must be depressurized before performing any work on the product.
- u If the pressurized connection is connected to the hydraulic system, hydraulic fluid will flow through the CFD II.
- u 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 port OUTLET

- u Never seal the connection OUTLET.
- u Put the free end of the OUTLET return hose into an un-pressurized container.
- u When operating, always observe the permissible operating pressure.

| | |
|---|---|
| Required hoses: | -Return hose<br>-High-pressure hose |

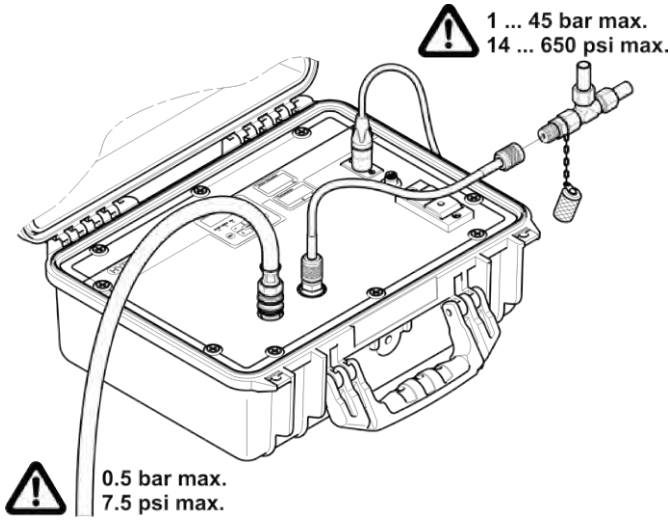
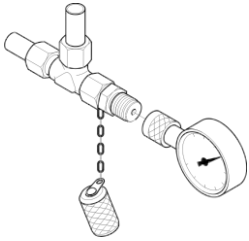


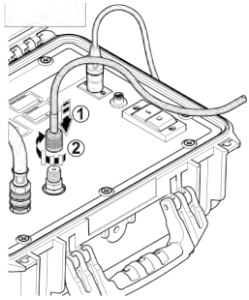

*Fig. 42:* Operating Mode - Measurement ≤ 45 bar

Make sure that the following sequence is observed:

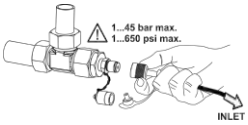
✓ You have performed all of the steps listed in chapter Putting the CFD II into operation [› 41].



1. Check the pressure at the measurement location. The existing pressure must be in the range of 1 … 45 bar / 14 … 650 psi.
   **WARNING! If the pressure is greater than 45 bar / 650 psi, then use the high-pressure adapter.**

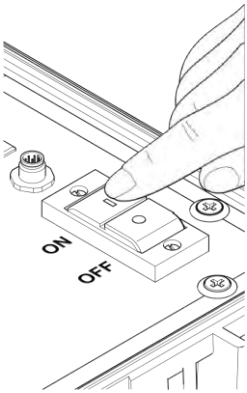



2. Connect the entry hose (color: black) with the INLET connection of the CFD II (1).
   Rotate the measurement coupling clockwise (2) to the connection and tighten it by hand.




3. Connect the other end of the INLET pressure hose to the measurement point of the system.

4. Switch on the internal pump.




⇨ The hydraulic installation of the CFD II is complete.

The CFD II will start with the measurement.

### 7.3.3 Measuring diesel fuel up to max. 16 bar / 232 psi

To measure diesel fuel up to a maximum of 16 bar / 232 psi, proceed as follows:



**WARNING**

Hydraulic systems are under pressure

Danger of bodily injury

> The system must be depressurized before performing any work on the product.

>If the pressurized connection is connected to the hydraulic system, oil will flow through the CFD II.

> 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 port OUTLET

> Never seal the connection OUTLET.

> Put the free end of the OUTLET return hose into an un-pressurized container.

> When operating, always observe the permissible operating pressure.

| | |
|---|---|
| Required hoses: | -Return hose |
| | -High-pressure hose |

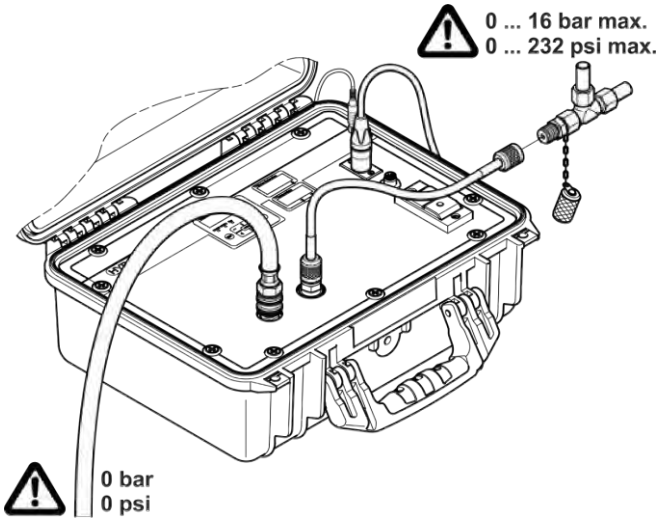
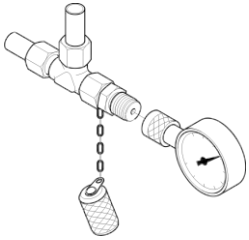


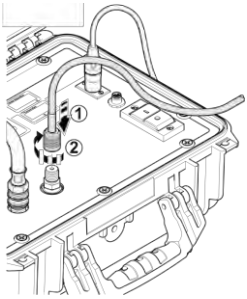

*Fig. 43:* Operating Mode - Measurement ≤ 16 bar / 232 psi

Make sure that the following sequence is observed:

✓ You have performed all of the steps listed in chapter Putting the CFD II into operation [⟩ 41] and set up the equipotential bonding.



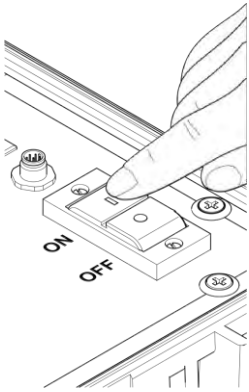
1. Check the pressure at the measurement location. The existing pressure must be within the range of 0 … 16 bar / 0 … 232 psi.
   **WARNING! If the pressure is greater than 16 bar / 232 psi, tha measurement is not permitted.**




2. Connect the entry hose (color: black) with the INLET connection of the CFD II (1).
   Rotate the measurement coupling clockwise (2) to the connection and tighten it by hand.




3. Connect the other end of the INLET pressure hose to the measurement point of the system.




4. Switch on the internal pump.

⇨ The hydraulic installation of the CFD II is complete.
The CFD II will start with the measurement.

### 7.3.4 Measuring in the range 5 to 345 bar / 217 to 5000 psi with oil

For the measurement of permissible oil up to 15 … 345 bar / 217 … 5000 psi, proceed as follows:



**WARNING**

Hydraulic systems are under pressure

Danger of bodily injury

- The system must be depressurized before performing any work on the product.
- If the pressurized connection is connected to the hydraulic system, oil will flow through the CFD II.
- Make sure that the specified sequence is followed.



***NOTICE***

Operating pressure exceeds 345 bar / 5000 psi

The excess pressure will be discharged via port OUTLET

- Never seal the connection OUTLET.
- Put the free end of the OUTLET return hose into an un-pressurized container.
- When operating, always observe the permissible operating pressure.

| | |
|---|---|
| Required hoses / adapters: | Return hose |
| | High-pressure hose |
| | High-pressure adapter |

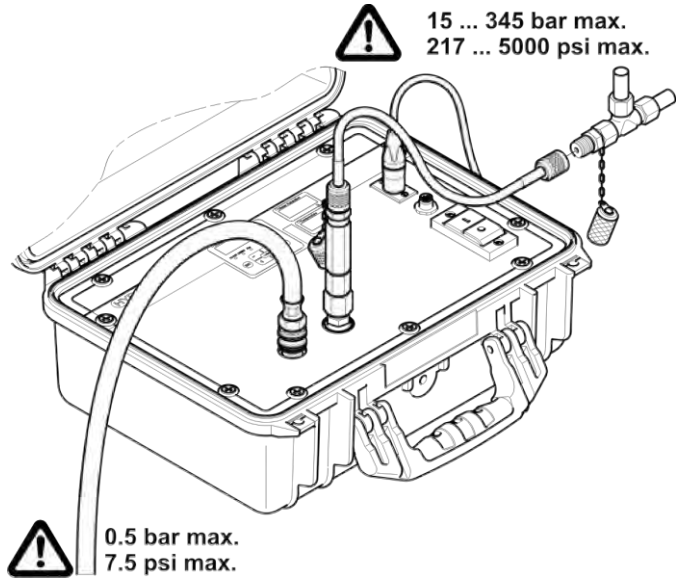
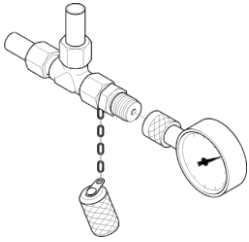


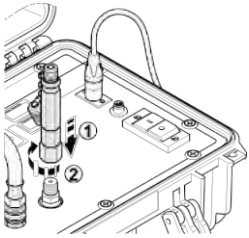

*Fig. 44:* Operating mode - Measurement at 15 … 345 bar

Make sure that the following sequence is observed:

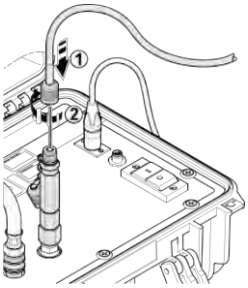
✓ You have performed all of the steps listed in chapter Putting the CFD II into operation [› 41].



1. Check the pressure at the measurement location. The existing pressure must be in the range of 15 … 345 bar / 217 … 5000 psi.
   **WARNING! If the pressure is greater than 345 bar / 5000 psi, abort the measurement attempt.**




2. Screw the high-pressure adapter onto the INLET connection of the CFD II.

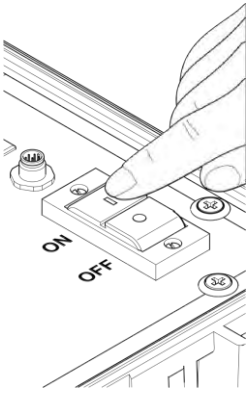



3. Connect the entry hose (color: black) with the INLET connection of the CFD II (1).
   Rotate the measurement coupling clockwise (2) to the connection and tighten it by hand.




4. Connect the other end of the INLET pressure hose to the measurement point of the system.

5. Switch on the internal pump.




⇨ The hydraulic installation of the CFD II is complete.
The CFD II will start with the measurement.

## 7.4 Performing Measurements

To carry out a measurement, observe the following sequence:

- ✓ Preparing the CFD II, see Putting the CFD II into operation [} 41]
- ✓ Make the desired settings for the measurement, see Operating/Setting measuring menu [} 66]
- ✓ Select a corresponding operating mode for the pressure, see Select the operating modes / measurement method according to the pressure involved [} 77]

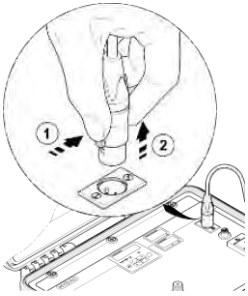
1. Switch on the pump at the switch.
   The pump conveys the fluid for analysis through the CFD II.
2. After the set measurement time, the result is shown on the display, and the status LED lights up green permanently.
3. Switch the pump off after 4 minutes.

⇨ The measurement is complete.

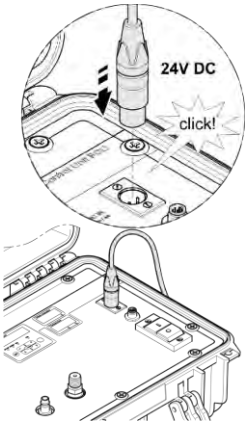
## 7.5 Restarting/resetting

To restart or reset the CFD II, remove the power supply to the CFD II for 10 seconds.

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




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



## 7.6 Using the BatteryPack (accessory)

With the BatteryPack, which is available as an accessory, you can make the CFD II independent of the electrical supply network. The technical details for the Battery Pack can be found in the corresponding instructions.

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

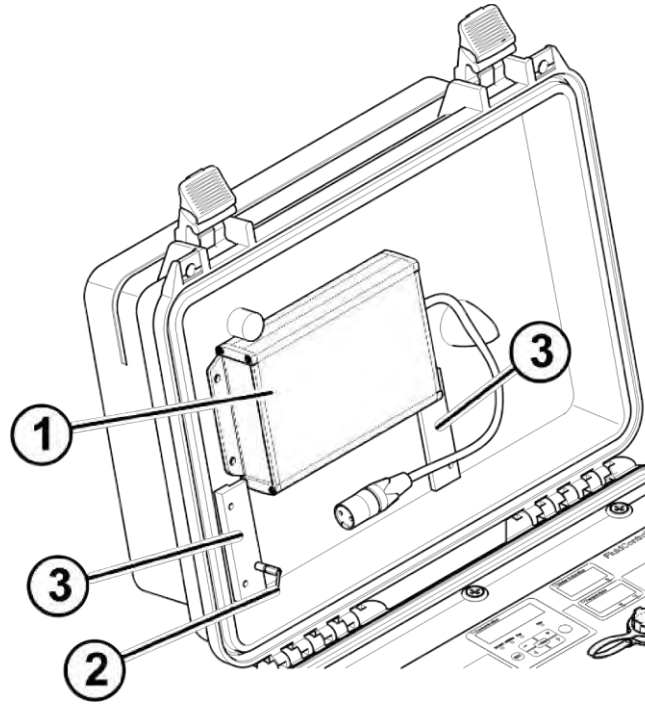



*Fig. 45:* BatteryPack overview

| | |
|---|---|
| 1 | BatteryPack |
| 2 | Indexing plunger |
| 3 | Mounting rails |

For operation with the BatteryPack, fit the connector into the socket labeled DC IN of the CFD II.

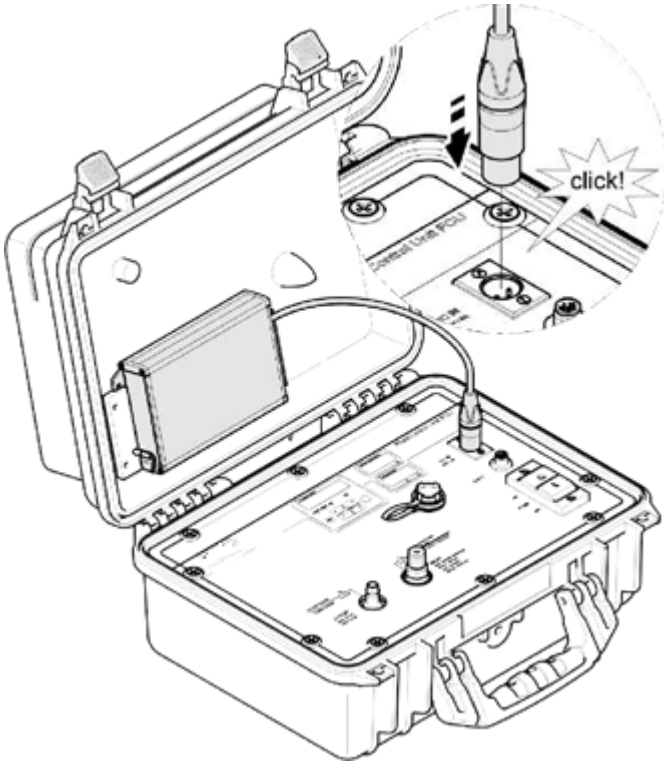


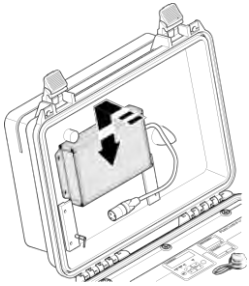

*Fig. 46:* BatteryPack in operation

### 7.6.1 Removing / inserting the BatteryPack

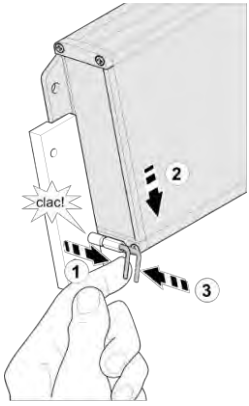
To fit the BatteryPack into its holder, proceed as follows:




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



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




3. Pull the locking pin (1).
   Guide the BatteryPack down to 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 the BatteryPack is sufficiently tight/secured.



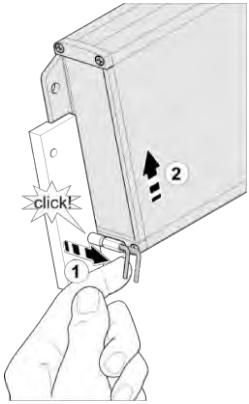
4. Insert the connector into the socket on the BatteryPack.

⇨ The BatteryPack is securely stored and ready for transportation or operation.

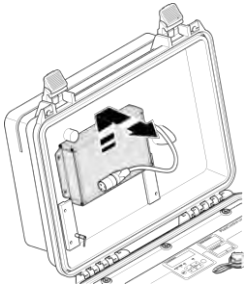
To remove it, proceed as follows:



5. Remove the connector from the socket.




6. Pull the locking pin out to unlock the BatteryPack (1). Slide the BatteryPack upwards (2).



7. Pull the BatteryPack up and out of the mounting rails. Then insert the connector back into the socket on the BatteryPack.

⇨ The BatteryPack is removed from the CFD II.

## 7.7 Extracting the internal measured value memory

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

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

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

The CFD II provides you with the following interfaces for reading the measurement memory:

| Available interfaces | For details see chapter |
|---|---|
| DATA interface | Extracting measurement reports via DATA interface [▷ 99] |
| USB interface | Extracting / copying measurement reports via USB interface [▷ 102] |
| Bluetooth interface | Measurement reports via Bluetooth interface [▷ 108] |

*Tab. 15:* Extracting the measured value memory

### 7.7.1 Extracting measurement reports via DATA interface

The CFD II has one DATA interface for conveying the measurement reports. The DATA interface communicates in the HSI protocol.

#### 7.7.1.1 Pins used on the DATA interface (CV INTERNATIONAL INC. Sensor Interface HSI)

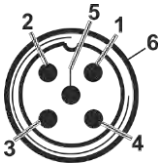



*Fig. 47:* 5-pole connection

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 |
| 6 | Shield |

*Tab. 16:* Pins used on the interface, 5-pole

### 7.7.1.2 Connecting the CFD II with CSI-B-2

The CFD II can be connected to a PC using the CSI-B-2 kit.

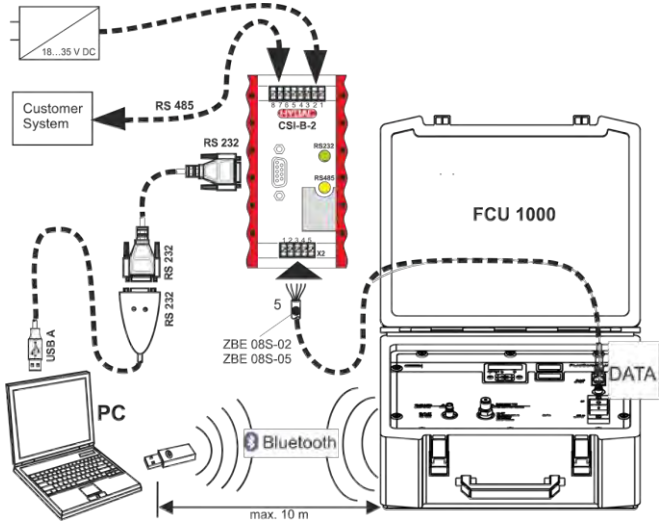



*Fig. 48:* CFD II <-> CSI-B-2

### 7.7.1.3 Connecting CFD II to HMG

The following portable data recorders (HMGs) can be used to give a readout of the CFD II via the DATA interface:

- HMG 510 (with firmware version 2, release 15 or higher)
- HMG 3000 (with firmware version 2, release 1 or higher)
- HMG 4000

See the operating instructions for the HMG for further details.




*Fig. 49:* CFD II<->HMG

### 7.7.2 Extracting / copying measurement reports via USB interface

Saved measurement reports can be copied to the USB memory stick supplied with the unit. The data in the internal memory is not deleted while doing so.

Afterwards, delete the measurement reports explicitly in the internal measured data memory. Details regarding this can be found in chapter 7.



**NOTICE**

No recording of measurement reports during copying

Data loss

- Do not copy the measurement reports from the internal memory during an ongoing measurement.



**NOTICE**

Insufficient memory space on the USB memory stick

Data loss

- Use only a USB memory stick with ≥ 10 MB free memory space.



Format the USB memory stick prior to its first use. 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.

Compatibility with other USB memory sticks cannot be guaranteed as the CFD II communicates directly with the microprocessor. This

means that communication errors cannot be corrected in software, like, for example, on a PC with an operating system.

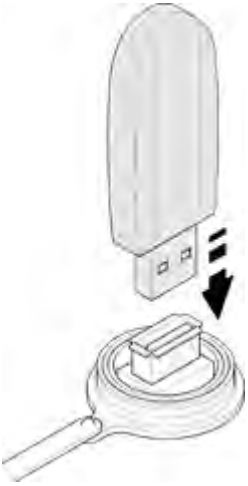
We recommend using the CV INTERNATIONAL INC. USB memory stick, which we successfully tested for many PC/operating system combinations.

CV INTERNATIONAL INC. accepts no guarantee or liability for the functionality and compatibility of the USB memory stick with your system. We do not offer sup- port or replacements in this case.

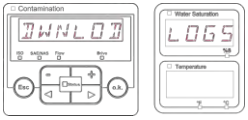
To save your measurements on the USB memory stick, proceed as follows:



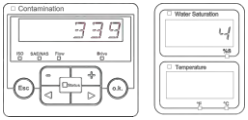

1. Open the cover to the USB connection by turning it clockwise (1) and then lift off the cover (2).



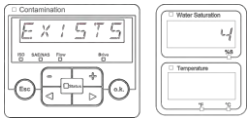
2. Insert the USB memory stick into the USB socket. Note that the USB memory stick fits into only one position in the socket.
   ***NOTICE! Do not insert the USB memory into the USB socket with force.***




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

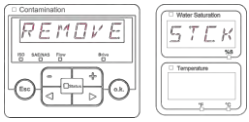



4. You can see the number of the measurement records to be copied in the left display (example: 339)
   You can detect the number of records in the right display (example: 4).

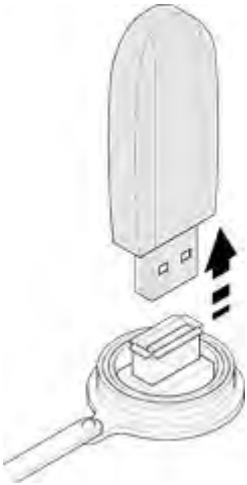



If the CFD II detects existing reports on the USB memory stick, the following message will appear on the display.
Example: The CFD II has detected Report Number 4 on the USB memory stick.

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




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

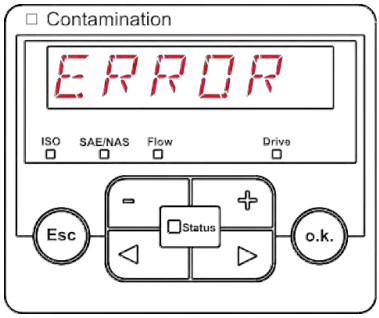


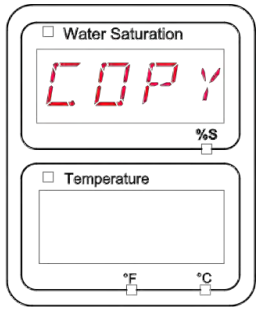
5. Remove the USB memory stick from the USB socket.

6. Close the cover to the USB socket (1) by turning it clockwise (2).

⇨ The measurement reports from the internal measured data memory were copied to the USB memory stick.

### 7.7.2.1 Error when copying the measurement reports




If a fault occurs during the copy procedure, or if you remove the USB memory stick from the socket before the saving procedure is complete, the following message
ERROR COPY 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 USB socket of the CFD II. 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 USB socket of the CFD II. 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 a different compatible USB memory stick. |
| 8. | | Put the USB stick back in the USB socket of the CFD II. 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 CV INTERNATIONAL INC. Service Department. |

| Step | Description |
|---|---|
| 11. | The download has been successfully completed. |

## 7.8 Evaluating measurement records

The measurement reports extracted from the CFD II and stored on the USB memory stick can be found and evaluated as de- scribed below.

### 7.8.1 Measurement record directories according to measurement point

If measurement reports are stored under a measurement point MPNT, the measurement reports are automatically assigned to the directory for this measurement point.




*Fig. 51:* Explorer presentation of measurement record directories

### 7.8.2 Measurement report file names

The file name of measurement reports is comprised of the date YY -> year, MM -> month, DD -> day, and a continuous counter as file extension.

A new record is created:

- On request by STP.STA
- After a restart of the CFD II (see Restarting/resetting [} 92])
- After a copying (download) of the measurement reports to the USB memory stick

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

| YY | _ | MM | _ | DD | . | Incremental number |
|---|---|---|---|---|---|---|
| 18 | _ | 08 | _ | 21 | . | 026 |
| 18 | _ | 08 | _ | 22 | . | 027 |

| YY _ | MM _ | DD . | Incremental number |
|---|---|---|---|
| 18 _ | 08 _ | 23 . | 028 |

*Tab. 18:* Example: Measurement report file names

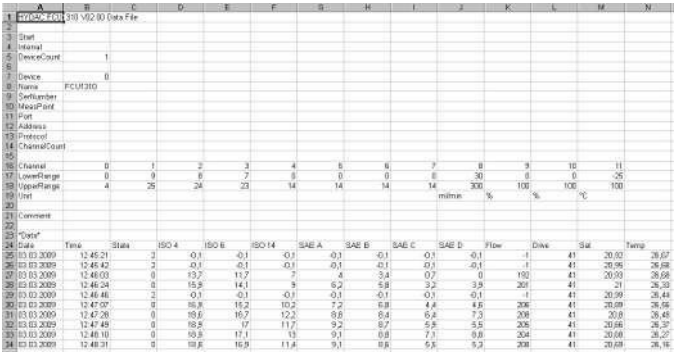
## 7.8.3 Opening the measurement report

The measurement reports have a file extension e.g. ".026". This extension may not be recognized by your PC.



You can set your PC in such a way that you will need to use MS-Excel to open this file extension in the future.
To accomplish this, open the report file with MS-Excel by right-clicking on the file and then on "Open". A dialog box appears in which you are prompted to select a program for opening the file => select Excel here.
Generally speaking, this applies for every file extension from "000" to "999".

A measured data file is comprised of two parts:
Part 1 - General information regarding the recording, sensors and devices.
Part 2 - The actual measured data is presented in lines after the word *Data*. The first line contains the column titles. Faults are shown as negative values, e.g. -0.1 or -1.



| | A | B | C | D | E | F | G | H | I | J | K | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Version Fcu | 310 V02.00 | Data File | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | |
| 3 | Start | | | | | | | | | | | | | |
| 4 | Interval | | | | | | | | | | | | | |
| 5 | DeviceCount | | 1 | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | |
| 7 | Device | | 0 | | | | | | | | | | | |
| 8 | Name | FCU310 | | | | | | | | | | | | |
| 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 | 0 | 0 | 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 | 0 | -0,1 | -0,1 | -0,1 | -0,1 | -0,1 | -0,1 | -0,1 | -1 | 41 | 20,92 | 28,67 |
| 26 | 03.03.2009 | 12:45:42 | 2 | -0,1 | -0,1 | -0,1 | -0,1 | -0,1 | -0,1 | -0,1 | -1 | 41 | 20,96 | 28,68 |
| 27 | 03.03.2009 | 12:46:03 | 0 | 13,7 | 11,7 | 7 | 4 | 3,4 | 0,7 | 0 | 192 | 41 | 20,93 | 28,68 |
| 28 | 03.03.2009 | 12:46:24 | 0 | 15,9 | 14,1 | 9 | 6,2 | 5,8 | 3,2 | 3,9 | 201 | 41 | 21 | 28,33 |
| 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 | 28,44 |
| 30 | 03.03.2009 | 12:47:07 | 0 | 16,8 | 15,2 | 10,2 | 7,2 | 6,8 | 4,4 | 4,5 | 206 | 41 | 20,89 | 28,56 |
| 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 | 28,48 |
| 32 | 03.03.2009 | 12:47:49 | 0 | 18,8 | 17 | 11,7 | 9,2 | 8,7 | 5,8 | 5,5 | 205 | 41 | 20,66 | 28,37 |
| 33 | 03.03.2009 | 12:48:10 | 0 | 18,8 | 17,1 | 13 | 9,1 | 8,8 | 7,1 | 9,8 | 204 | 41 | 20,68 | 28,27 |
| 34 | 03.03.2009 | 12:48:31 | 0 | 18,8 | 16,9 | 11,4 | 9,1 | 8,6 | 5,8 | 5,3 | 208 | 41 | 20,69 | 28,16 |

*Fig. 52:* View of measurement report in Excel

Details regarding the "State" column can be found in the Finding / rectifying errors [› 131] chapter.

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

See also

Restarting/resetting [} 92]

### 7.8.4 The measurements are shown as dates

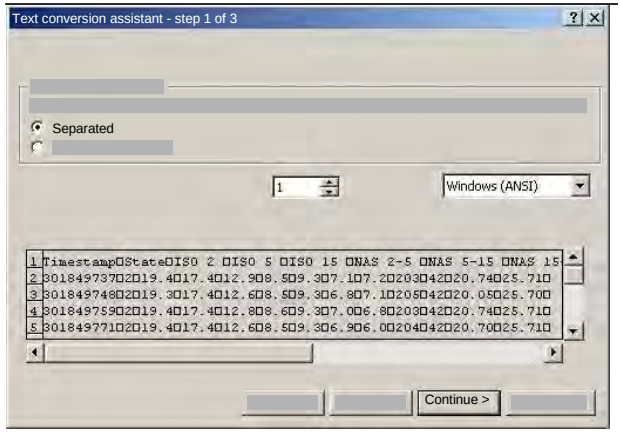
On opening the file in Excel, all decimal numbers will be shown as dates. To correct the presentation, proceed as follows:



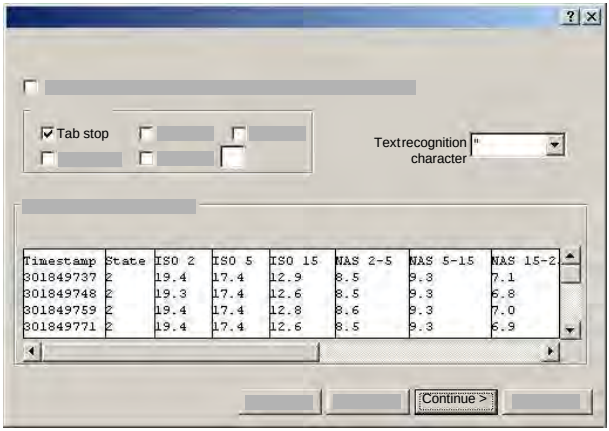
1. Start Excel.



2. Now execute the Open command via the menu bar.
   Open the desired measured data file.



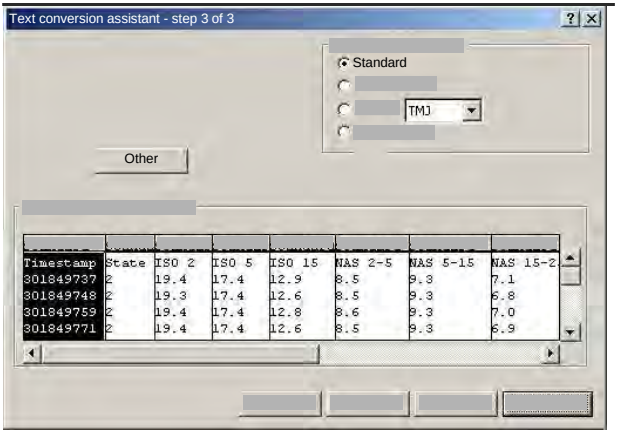

3. The Text Conversion Wizard appears.
4. Text Conversion Wizard – Step 1 of 3.
   Check the settings.
   Confirm the window by pressing the "Next >" button.




5. Text Conversion Wizard – Step 2 of 3.

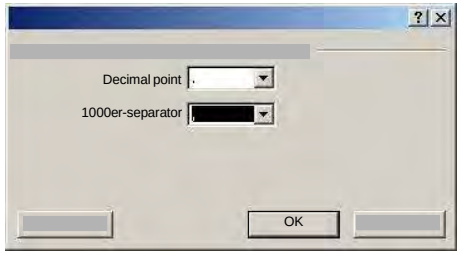
   Check the settings.

   Confirm the window by pressing the "Next >" button.

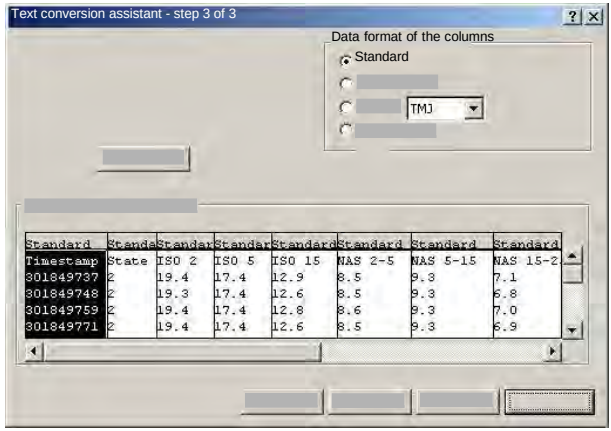



6. Text Conversion Wizard – Step 3 of 3.

   Press the "Next" button.




7. Change the following settings:
   Set the period as the decimal point and the comma as the separation character for 1000s.
   Confirm the changes with the "OK" button.




Finish

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

⇨ The decimal points will now be presented correctly.

## 7.9 Evaluating/Reading measurement reports with FluMoS

The Fluid Monitoring Software FluMoS is for reading and analyzing the measurement reports/measurement data.




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




You can obtain FluMoS professional as an accessory for an additional charge.

See chapter Finding accessories [〉 141].




You can get FluMoS mobile for your Android mobile device on the Google Play Store.

# 8 Performing maintenance

Carry out the specified configuration, maintenance and inspection work every six months or, at the latest, when an error message or malfunction makes it necessary.



**WARNING**

The hydraulic system is under pressure during operation

Danger of bodily injury

- The hydraulic system must be depressurized before performing any work on the hydraulic system.

The CFD II is to be disconnected from the power supply and protected against being inadvertently switched back on when per- forming any maintenance, servicing, inspection or repair work.

Check all previously loosened screwed fittings to see that they have been properly secured.

## 8.1 Maintenance table

| | | Daily | Weekly | Every 6 Months | As required | Every 3 years | Additional information |
|---|---|---|---|---|---|---|---|
| 9.1 | CFD II flushing | 1 | | | | | |
| 9.2 | Cleaning the CFD II | 1 | | | | | |
| 8.4.1 | Cleaning/changing the strainer | | | 2 | | | |
| 8.4.2 | Cleaning / changing the flow control valve | | | 2 | | | |
| 8.3 | Calibrating CFD II | | | | | 3 | |

1 - Operating personnel; 2 - Specialist personnel – Mechanical;
3 - Specialist personnel - Service / Administrator

## 8.2 Clean the suction strainer.





1x Wrench ⬡ = 19 mm

Compressed air

The suction screen is fitted under the measurement point union at the INLET connection and protects the pump from contamination by coarse particles.

Clean the suction screen regularly. If the CFD II is blocked or there is no flow through the CFD II, clean the suction screen without delay.



### *NOTICE*

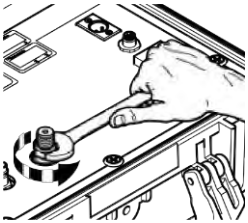
Operation without a suction strainer

The CFD II pump will be damaged / destroyed.

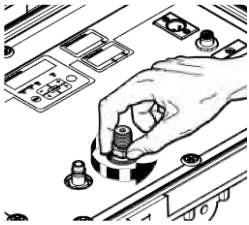
- Never use the CFD II without a suction strainer.
- Clean the suction screen regularly.

To check/clean the suction strainer, proceed as follows:

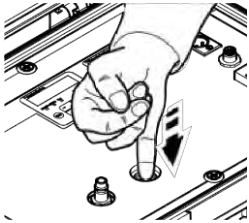
✓ Remove all of the hydraulic and electrical connections to the CFD II.



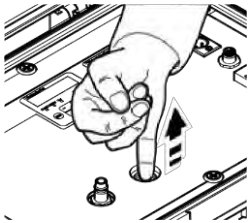
1. Loosen the INLET connector with a wrench (⬡ = 19 mm) by turning it counterclockwise.



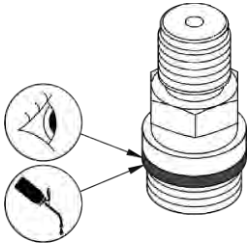
2. Unscrew the INLET connector manually, turning it anti-clockwise.



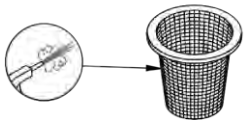
3. Put a finger in the opening ...

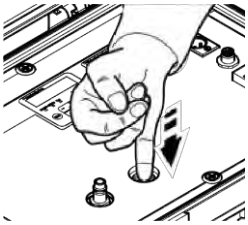


4.and pull out the suction screen upwards.

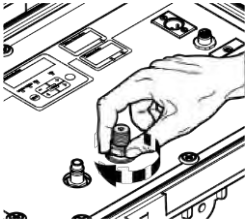


5. Clean the suction screen by blowing it out with compressed air.
6. Before reassembly, check that the sealing ring for the connector is undamaged.
   Replace it if necessary.
7. Moisten the sealing ring (C) with fluid before screwing it into place.

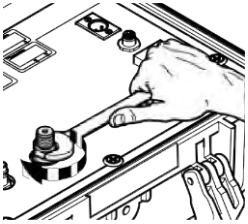




8. Put the suction screen back into the opening.



9. Manually screw the INLET connector in clockwise.



10. Using a wrench (⬡ = 19 mm) to tighten the INLET connector by turning it clockwise. Tighten the connector with a torque of 25 Nm.

⇨ The replacement / cleaning of the suction strainer is complete.

## 8.3 Calibrating CFD II



Calibrate the CFD II in accordance with ISO 9000 for device measurement. We recommend a recalibration of the CFD II at least every 3 years.

For calibration, contact CV INTERNATIONAL INC.

## 8.4 High-pressure adapter maintenance

Check or clean the strainer and the flow control valve in the high-pressure adapter at regular intervals.

If the required flow through the CFD II is not achieved, check and clean the strainer and the flow control valve in accordance with the following chapters.

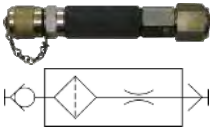


*Fig. 53:* High-pressure adapter

### 8.4.1 Cleaning/changing the strainer



2x Wrench ⬡ = 22 mm

1x screwdriver ⊘ 9x1 mm

or special tool (see chapter Finding accessories [} 141])

Clean this strainer (B) in the high-pressure adapter at least every six months, or more frequently if heavy soiling makes it necessary.

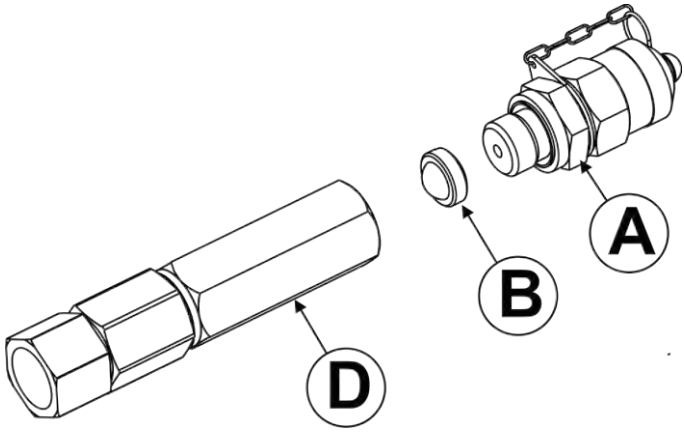



*Fig. 54:* Cleaning / changing the strainer in the high pressure adapter

A Test point

B Strainer
D Screw connection



## NOTICE

Operation without a strainer

The flow control valve in the high-pressure adapter will be damaged / destroyed

- Never use the high-pressure adapter without a strainer
- The suction strainer in the high-pressure adapter must be cleaned regularly

1. Remove the measurement coupling (A) from the threaded joint (D) with a wrench (⎔ = 22 mm) by turning it counterclockwise.
   Then unscrew the strainer (B) counterclockwise with a screwdriver or the special tool (see chapter Finding accessories [} 141]).
2. Clean strainer (B) and then blow it out with compressed air.
3. To fit the strainer (B), screw it in, clockwise, to union (D) using a screwdriver or the special tool.
4. Then check the sealing ring on the coupling (A) for damage. Replace it/them if necessary.
5. Screw in the coupling (A) in clockwise direction and tighten it to 25 Nm.

⇨ The cleaning / replacement of the strainer is complete.
The high-pressure adapter is ready for operation.

## 8.4.2 Cleaning / changing the flow control valve





2x Wrench ⎔ = 22 mm

1x special tool (see chapter Finding accessories [⟩ 141])

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

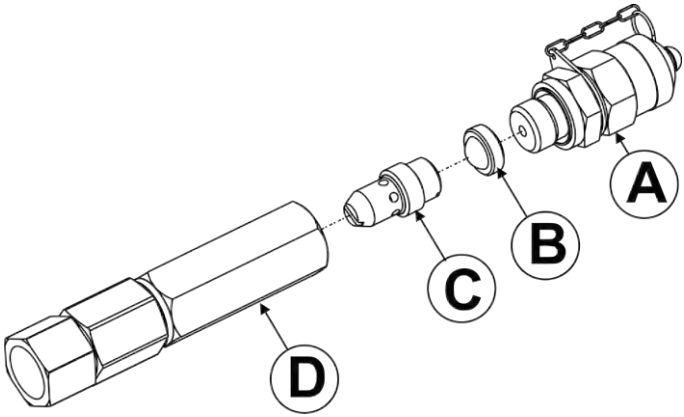



*Fig. 55:* Cleaning / changing the flow control valve in the high pressure adapter

| | |
|---|---|
| A | Test point |
| B | Strainer |
| C | Flow control valve |
| D | Screw connection |



## NOTICE

Wrong installation / wrong flow direction of the flow control valve

Flow control valve is not working

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

1. Remove coupling (A) using a wrench (⬡ = 22 mm) by turning it counterclockwise out of the screw fitting (D).
2. Unscrew the strainer (B) counterclockwise with a screwdriver or the special tool (see Finding accessories [} 141] chapter).
3. Clean strainer (B) and then blow it out with compressed air.
4. Also unscrew the flow control valve (C) counterclockwise with a screwdriver or the special tool (see Finding accessories [} 141] chapter).
5. To install the new flow control valve (C), screw it firmly clockwise into the union (D) with a screwdriver or the special tool.
6. Screw the strainer (B) clockwise into the union (D) using a screwdriver or the special tool.
7. Then check the sealing ring on the coupling (A) for damage. Replace it if necessary.
8. Turn the coupling (A) in a clockwise direction and tighten to 25 Nm.

⇨ The cleaning / replacement of the flow control valve is complete. The high-pressure adapter is ready for operation.

# 9 Rinsing / cleaning the CFD II

The CFD II is a measurement device for determining fluid purity. In order to exclude the possibility of fluid mixing and the erroneous measurement results that would ensue from this, defined (i.e. clean) starting conditions are required.

You will find details on rinsing the CFD II and cleaning it on the outside in the following.

## 9.1 CFD II flushing



Flush the CFD II after each use, but at least daily, with cleaned mineral oil.

Rinse the CFD II immediately if you have measured unfiltered oil or oil with a viscosity > 200 mm²/s or if the measured values seem unusually high or low.



***NOTICE***

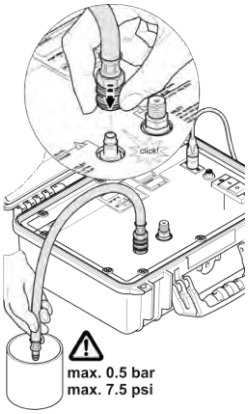
Impermissible flushing media

The CFD II will be destroyed.

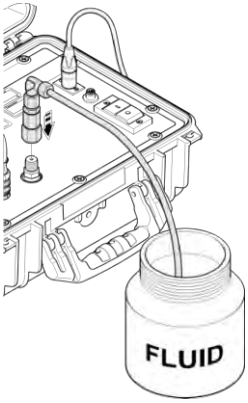
- Flush the CFD II with low-viscosity mineral oils or mineral oil-based raffinates with flash points higher than 55°C / 131°F.
- Never flush the CFD II with universal thinners or other degreasing fluids.

Flush the CFD II as described below:

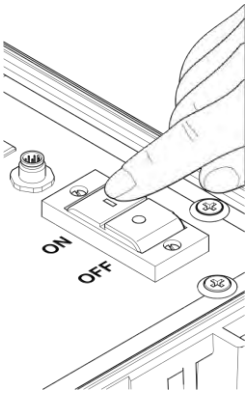
1. Put approx. 0.5 liters of filtered oil into a clean container.



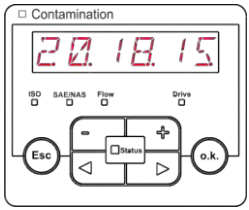

2. Connect the return hose to the CFD II and put the free end into a container for the used fluid.



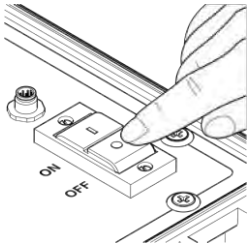

3. Mount the suction hose on the INLET connection of the CFD II.
   Place the suction hose into the reservoir with filtered fluid.




4. Use the switch on the CFD II to turn its pump on.




5. Purity values are displayed during the rinsing procedure. These values are not correct, but nonetheless should drop during the flushing procedure.




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

⇨ The CFD II flushing procedure is complete. The CFD II is ready for operation.

## 9.2 Cleaning the CFD II



Clean the control panel and the case with a clean, moist cloth.



**NOTICE**

Chemical or abrasive cleaning agents

The operating interface will be damaged/destroyed

- Use only water.

# 10 Finding / rectifying errors



The following malfunctions / errors can occur during operation. The error codes can be found in the measurement report:

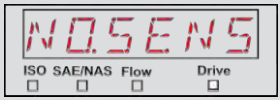
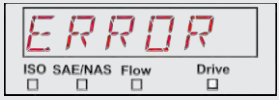
| Error codes | Description | |
|---|---|---|
| 0 | Ready | Sensor / equipment is working. |
| 2 | Minor fault / WARNING | Sensor / equipment continues to work.<br>WARNING is automatically reset by the CFD II. |
| 3 | Moderate fault | Sensor / equipment status is "fault".<br>Restarting/resetting [ 92] |
| 4 | Serious fault | The sensor or equipment is faulty.<br>Contact the CV INTERNATIONAL INC. Service Department. |

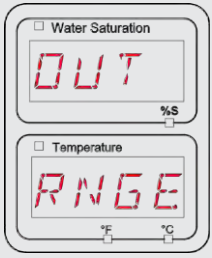
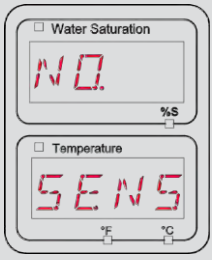
*Tab. 19:* Error codes in the measurement report

The following malfunctions are output in the display and via the flash code of the status LED.

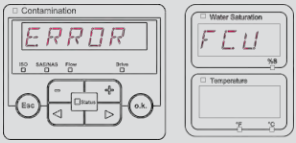
| Disruption / error<br>LED<br>Status LED<br>Display<br>Error code | Status / Possible causes | Solution |
|---|---|---|
| LED: Off<br>Status LED:<br>Display:<br><br><br>Error code: - | No display<br>No function | Check the power supply to the CFD II.<br>Contact the CV INTERNATIONAL INC. Service Department. |

| Disruption / error<br>LED<br>Status LED<br>Display<br>Error code | Status / Possible causes | Solution |
|---|---|---|
| LED: Green<br>Status LED<br><br>Display:<br>Error code: 0 | The CFD II is ready for operation. | You can take measurements. |
| LED: Red<br>Status LED:<br><br>Display:<br><br><br><br>Error code: 2 | The CFD II is below its measurement range<br>< ISO 9/8/7.<br>It is currently not possible to determine the cleanliness of the oil or its flow rate. | You can make further measurements. |
| LED: Red<br>Status LED:<br><br>Display:<br><br><br><br>Error code: 2 | It is not possible to determine the flow rate.<br>The CFD II is in an undefined state. | Switch the pump on.<br>Wait for a few measurement cycles until measured values are again shown. |
| LED: Red | The CFD II is above its range of measurement<br>> ISO 25/24/23. | Filter the oil to improve its cleanliness. |

| Disruption / error<br>LED<br>Status LED<br>Display<br>Error code | Status /<br>Possible causes | Solution |
|---|---|---|
| Status LED<br><br>Display:<br><br>Error code: 2 | It is currently not possible to determine the cleanliness of the oil or its flow rate. | |
| LED: Red<br>Status LED:<br><br>Display:<br><br><br>Error code: 3 | The installed sensors are not found. | Restart the unit. See Restarting/resetting [⟩ 92]<br>If the fault recurs, contact HYDAC service department. |
| LED: Red<br>Status LED:<br><br>Display:<br><br><br>Error code: 3 | The contamination sensor is causing a moderate error. | Restart the unit. See Restarting/resetting [⟩ 92]<br>If the fault recurs, contact HYDAC service department. |
| LED: Red<br>Status LED | The contamination sensor is causing a moderate error. | Restart the unit. See Restarting/resetting [⟩ 92] |

| Disruption / error<br>LED<br>Status LED<br>Display<br>Error code | Status / Possible causes | Solution |
|---|---|---|
| Display:<br><br>Error code: 4 | | If the fault recurs, contact Cv International Inc. service department. |
| LED: Red<br>Status LED:<br><br>Display:<br><br><br>Error code: 2 | The AquaSensor is outside of its measurement range. | Wait for a few more measurement cycles. |
| LED: Red<br>Status LED:<br><br>Display:<br><br><br>Error code: 3 | No AquaSensor is connected. | Restart the unit. See Restarting/resetting [ 92]<br>If the fault recurs, contact Cv International Inc. service department. |

| Disruption / error<br>LED<br>Status LED<br>Display<br>Error code | Status / Possible causes | Solution |
|---|---|---|
| LED: Red<br>Status LED:<br><br>Display:<br><br><br><br><br><br><br>Error code: 3 | AquaSensor is causing a moderate fault. | Restart the unit. See Restarting/resetting [› 92]<br>If the fault recurs, contact Cv International service department. |
| LED: Red<br>Status LED<br><br>Display:<br><br><br><br><br><br>Error code: 3 | No sensors are attached to the CFD II or the communication is defective. | Restart the unit. See Restarting/resetting [› 92]<br>If the fault recurs, contact Cv International Inc service department. |
| LED: Red<br>Status LED | The CFD II has a moderate fault. | Restart the unit. See Restarting/resetting [› 92]<br>If the fault recurs, contact Cv International Inc service department. |

| Disruption / error<br>LED<br>Status LED<br>Display<br>Error code | Status / Possible causes | Solution |
|---|---|---|
| Display:<br><br>Error code: 3 | | |
| LED: Red<br><br>Status LED<br><br>Display:<br><br><br>Error code: 3 | The CFD II has a major fault. | Contact the Cv INTERNATIONAL INC. Service Department. |

*Tab. 20:* List of disruptions/errors

See also

Restarting/resetting [} 92]

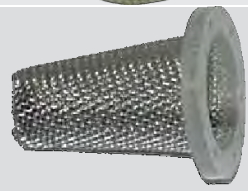
# 11 Removing / Disposal

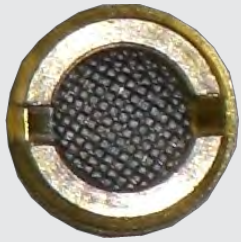
- Empty the product completely, including all of its components, before decommissioning. Disconnect or remove the electrical / hydraulic connections.
- Dispose of the packaging material in an environmentally friendly manner.
- Dispose of the fluid / operating medium that has been drained in an environmentally friendly manner.
- After dismantling the product and separating its various materials into categories, dispose of all parts in an environmentally friendly manner.

# 12 Attachment

## 12.1 Finding spare parts / accessories

You receive the following spare parts for the CFD II.

| Designation | p/no. | Image |
|---|---|---|
| High-pressure hose with screwed joint, for measurement point type 1620, color: black, L = 2 m | 349150 |  |
| Suction hose with opend, color: clear-transparent, Length = 0.3 m | 3297276 |  |
| Return hose, opend, transparent, length = 2 m | 349151 |  |
| Suction strainer, 400 µm (for INLET port) | 278475 |  |
| Seal ring for measurement point union INLET (Ø 21 mm, according to DIN3869) | 607755 |  |
| High-pressure adapter, complete | 3364502 |  |

| Designation | p/no. | Image |
|---|---|---|
| Suction strainer, 400 µm for high pressure adapter | 3152786 |  |
| Flow control valve for high pressure adapter | 710389 |  |
| Cover seal for case | 3455429 | |
| Attachable bag for hoses, cables and accessories | 3335656 | |
| Document bag | 3377173 | |
| Operating and Maintenance Instructions (this document) | 3371346 | |
| Power adapter (without connector cable)<br>Primary: 100-240 V AC<br>Secondary: 24 V DC, 5A,<br>Cable with 3-pole connector,<br>Length = 1.6 m | 6059933 |  |

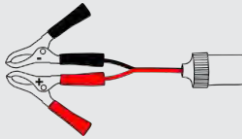
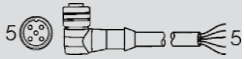
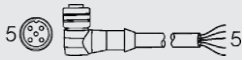
| Designation | p/no. | Image |
|---|---|---|
| Connection cable for power adaptor<br>European plug, Length = 2 m | 6008448 | |
| Connection cable for power adaptor<br>plug for England (UK),<br>Length = 2 m | 6008447 | |
| Connection cable for power adaptor<br>plug for USA,<br>Length = 2 m | 6008446 | |
| Connection cable for power adaptor<br>plug for Australia (AUS),<br>Length = 2 m | 6008449 | |

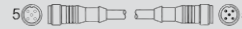
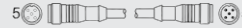
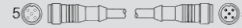
*Tab. 21:* Locating spare parts

### 12.1.1 Finding accessories

You will receive the following accessories for the CFD II.

| Designation | p/no. | Image |
|---|---|---|
| Suction hose, opend, color: transparent, length = 1.5 m | 3325744 |  |
| 12V/24 V DC cable with universal plug, including 8A fuse, Length = 10 m | 3306236 |  |
| 12V/24 V DC cable with universal plug, including 8A fuse, Length = 1 m | 3524138 |  |
| Fuse 8 A for universal plug<br>(Ø 6 x 25 mm, according to DIN 72581) | 6052824 | |

| Designation | p/no. | Image |
|---|---|---|
| Battery adapter for 12 / 24 V DC with coupling for universal plug, Length = 0.3 m | 6051653 |  |
| Tool to change the flow control valve in the high pressure adaptor | 3209986 |  |
| USB Memory stick | 3442973 | |
| CD with FluMoS Professional | 3371637 | |
| Connection cable, screened, with 5-way elbow female connector, opca- ble end, length 2 m (ZBE 08S-02) | 6019455 | |
| Connection cable, screened, with 5-way elbow female connector, opca- ble end, length 5 m (ZBE 08S-05) | 6019456 |  |
| Connection cable, screened, with 5-way elbow female connector, opca- ble end, length 10 m (ZBE 08S-10) | 6023102 |  |

| Designation | p/no. | Image |
|---|---|---|
| Connection cable with 5-pole female connector <-> 5-pole male connector, Length 2 m (ZBE 30-02) | 6040851 |  |
| Connection cable with 5-pole female connector <-> 5-pole male connector, Length 3 m (ZBE 30-03) | 6053924 |  |
| Connection cable with 5-pole female connector <-> 5-pole male connector, Length 5 m (ZBE 30-05) | 6040852 |  |

*Tab. 22:* Finding accessories

## 12.2 Finding a Customer Service team

The contact data such as the telephone numbers, e-mail and mailing addresses for the hotline, product support, customer service, branch offices, service partners for servicing, repair and spare parts can be found, always updated, at our home-page www.cvintlcom

CV INTERNATIONAL INC. 20680 Carmen Loop, Bend , Oregon, 97720, USA

| | |
|---|---|
| Phone: | +1 541 205 0195 |
| E-mail: | info@cvintl.com |
| Homepage: | www.cvintl.com |


## 12.3 EC declaration of conformity

The CE declaration of conformity can be found in the Technical Documentation that is part of the scope of delivery for the product.

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# Glossary

## Equipotential bond

Equipotential bonding refers to a connection with good electrical conductivity that minimizes different electrical potentials. The equipotential bonding is also commonly referred to as grounding.

## CFD II

Abbreviation for "Contaminated Fluid Detector Unit"

## Flash point

In accordance with DIN V 14011, the flash point of a substance is the lowest temperature at which an ignitable vapor-air mix can form over a substance.

## General Terms and Conditions

The General Terms and Conditions are available at our home page www.Cv International Inc..com -> General Terms and Conditions.

## High-pressure adapter

Adapter required for measurement with the CFD II for pressures of 15 - 345 bar.

## Load dump

Load dump is the switching off of network load for the purpose of load control in the power system. Given that this generally represents an unplanned event, the switch-off is triggered by automatic devices, e.g. network protection when certain preset measured values are reached, and carried out in automatic sequences by the opening of circuit breakers in transformer stations. This measure will lead to a power failure for the parts of the network affected by the load dump and the consumers connected to them.

## Load dump

Load Dump is the term used to describe the occurrence of a voltage peak on a motor vehicle generator after the shedding of a load.

## Viscosity range

Is the range in which the viscosity of a pressurized fluid meets the requirements that have beset.

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