

CCS 4 Contamination Control System Particle counting + Water saturation + Temperature



Instruction manual Version 1.7

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1. Safety information

1.1. Signal glossary

- Failure to observe the safety instructions in this manual implies various risks and endangerment of life and the physical condition of the operator. The notices are marked with the following **signal words:**
 - **DANGER DANGER** implies a dangerous situation which causes death or serious injuries in case of nonobservance.
 - **WARNING** WARNING implies a dangerous situation which can **cause death** or **serious injuries** in case of nonobservance.
 - **CAUTION CAUTION** implies, together with the danger symbol, a dangerous situation which can **cause light, medium, or heavy injuries** in case of nonobservance.
- Failure to observe the safety instructions in this manual, which does not cause injuries but destruction of the system and its operability, are marked with the following signal word:

NOTICE

NOTICE describes the correct way of handling the device.

The above signal words can be combined with the safety symbols or the warning symbols.



General danger

Danger caused by electricity

Danger for the environment

1.2. Dangers of maloperation

The CCS 4 underwent a safety inspection. The integrated electric and hydraulic safety elements ensure safe operation if the device is used as it is intended.

A WARNING

In cases of maloperation or abuse, as well as in cases of ignoring the application limits and safety regulations, the following threats can occur regarding the:

- Life or physical condition of the operator;
- The CCS 4 device, as well as connected machines and systems;
- The accuracy of measurements made by the CCS 4;
- The environment.

Therefore, it is necessary that everybody having to do with the operation and the maintenance of the unit strictly follows this instruction manual!

1.3. Intented applications

The CCS 4 is a mobile diagnostic system meant for continuous monitoring and condition analyses of hydraulic and lubricating systems, which enables the user to evaluate the up-to-date condition by measuring the particle contamination, water saturation and temperature.

The particle size distribution is being shown in contamination classes according to ISO 4406:99, NAS 1638 and SAE AS 4059.

Resulting out of measured saturation and temperature values, the theoretical water content in ppm (mg/kg) is being calculated and displayed for selected fluids.

By knowing these important parameters the user is able to evaluate the precise condition of the system. Having this information will help to initiate actions promptly and cost-saving measures before major failures can occur.

The unit is suitable for pressure, as well as for suction operation, i.e. it can be connected to a pressure line by a minimess connection or absorb fluids which are to be analyzed by using an integrated suction pump.

Limitation of use

The device is exclusively adequate for on-line applications in hydraulic and lubricating systems within the following limitations:

•	operation pressure (suction port):	р	=	-0,240 bar	(-2,9580 PSI)
•	operation pressure (pressure port):	р	=	1,5420 bar	(21,756090 PSI)
•	viscosity range:	ν	=	10400 mm²/s	(46,351854 SUS)
•	temperature range of the oil:	0	.70 °	C	(32158°F)
•	ambient temperature range:	0	.50 °	C	(32122°F)

The regular function of the CCS 4 and the warranty of safety are guaranteed only if it is used with INTERNORMEN Technology GmbH provided and allowed accessories.

- Before measuring with the CCS 4, the oil has to be extracted from the system and visually examined for extremely large particles that may cause undue wear to the system.
- **A CAUTION** Before connecting the CCS 4 to the system, make sure that the oil discharged out of the CCS 4 gets caught in a tank. The oil must not get released to the environment!

A DANGER A No unauthorized modifications or changes are allowed to the CCS 4!

NOTICE The terms and conditions stated in this instruction manual have to be followed strictly!

2. Operation and installation

2.1. Setup

The CCS 4 consists of the equipment case (1), the external power supply (2), the RS232 – interface cable inclusive the USB – plug adaptor (3), high pressure measuring hose (minimess hose) (4), the suction hose and the return hose (5).



2.2. General information

External factors have a huge and extensive influence on the lubricant during operation. External factors are for example forces, energies, and interactions with other materials. Pressure and shear stress also belong to the force effects. Energy influences are the supply and the removal of heat (high temperature amplitudes). A lubricant gets in contact with gases (air, nitrous gases or sulphur dioxid), liquids (water, external liquids like detergents, dissolver etc.) and solid matters (metals, ceramics, synthetic material parts and sealing materials). The contamination outcomes are very versatile for the hydraulic and lubricating system and cause a significantly higher abrasion, an increase of the failure risk of components as well as malfunctions.

The CCS 4 is for the continuous monitoring and condition analyses of hydraulic and lubricating systems. The CCS 4 can be handled in suction as well as in pressure operating mode.

The CCS 4 includes the following functions:

- Particle counting by a laser sensor for hydraulic and lubrication oils.
- Exact evaluation of contamination classes according to ISO 4406:99, NAS 1638 and SAE AS 4059.
- Measuring of.

-	Water saturation	(0 100%)
-	Temperature	(0 70 °C)

- (see also the technical data at chapter 5.1)
- Calculation and output of the theoretical water content in ppm (mg/kg) based on fluid specific saturation curves.
- Display of all measurement values on a LCD display.
- Output of current measurement values by a RS232-interface.
- Output of current measurement values by using a thermal printer.
- Internal storage of measurements. (Storage capacity of 4 x 100 measurements.)
- Output of saved measurement files by USB-interface on the USB-stick.
- Output of saved measurement data by a RS232 interface.
 For the data management using an external computer and the LabVIEW Data Manager Software (export in MS EXCEL).

2.3. Connection to the hydraulic or lubricating system

• The CCS 4 can be handled in a suction as well as in a pressure operating mode.



• Connections from the left to the right: suction port, pressure port and outlet port for the return line.

2.3.1. Connection into the pressure operating mode (max. 420 bar)

• Connect the return hose (transparent plastic hose) with the **[OUTLET PORT]** of the CCS 4 and transfer it to an oil collecting tank.

- The oil collecting tank must be dimensioned according to the time needed to perform the operation. Otherwise you must provide an empty replacement tank that may be quickly changed when the first one is full.
- > You may also circulate the measured oil back to the tank of the system.
- > **NOTICE** Never connect the recirculation to a pressurized line!



• In the **pressure operating mode** the provided high pressure hose (minimess hose) is being connected with the CCS 4 - [**PRESSURE PORT**] and the hydraulic system.

2.3.2. Connection into the suction operating mode (min. -0, 2 bar)

• Connect the return hose (transparent plastic hose) with the **[OUTLET PORT]** of the CCS 4 and transfer it to an oil collecting tank.

- The oil collecting tank must be dimensioned according to the time needed to perform the operation. Otherwise you must provide an empty replacement tank that may be quickly changed when the first one is full.
- > You may also circulate the measured oil back to the tank of the system.
- > **NOTICE** Never connect the recirculation to a pressurized line!



- In the **suction operating mode** the provided suction hose (transparent PVC-hose) is being connected with the **[SUCTION PORT]** of the CCS 4 using the quick lock coupling (two-sided locking).
- The hose has to be inserted into the tank.

NOTICE Pay attention to create a distance of minimum 15 cm from the tank bottom and the tank walls, so that no coarse particles, which are sedimented in the tank, get absorbed and choke the sensor system.

2.4. Electrical connection

- The operating voltage of the CCS 4 amount to 15 V DC.
- To create the necessary operating voltage, connect the CCS 4 with the external power supply (100 V bis 240 V AC, 50/60 Hz). The power on the power supply is visible with a



• For fuse protection use the T 5A - covering.



Switch on the CCS 4 with the "power supply" – switch to ON. (visible by the green control diode)



2.4.3. Battery operation



- The rechargeable lithium-polymer battery with internal battery charger is integrated in the CCS 4.
- It allows for an approximate continuous operating time of 3 hours without printing.
 - **NOTICE** Printing during battery operation shortens the running time extremely.
- **NOTICE** The CCS 4 switches off automatically when the internal battery is completely discharged. Then it is only possible to start the CCS 4 with the external power supply unit.
- The recharge time of the rechargeable battery is 5 hours and 15 minutes. For this recharge time it is necessary that the CCS 4 is switched to the main menu.
- Leave the main menu with [ESC] and the charge state of the rechargeable battery is displayed.



Car supply

With a special cable it is possible to connect the CCS 4 with a 12 V car plug. (Thereby a charging of the internal battery does not take place!)

2.5. Usage of the CCS 4 software

- After connecting the necessary hoses, power and switching on the CCS 4, the unit is ready for operation. (green control diode lights)
- At the start of the CCS 4 in the suction mode, press additional for some minutes the [VENT] key.



- After the starting routine the main menu appears on the display, which can be operated by using the key pad.
- The CCS 4 is, customer specific, equipped with the English or German menu display.
- An implementation of the measurement in the other language is possible at any time by finishing the current program and starting the desired program.

2.5.1. Changing the operator language

- Change the current operator language by finishing the program at the main menu.
- Leave the main menu with the [ESC] key and switch to the DOS-mode with [ENTER].



• The switch to the DOS-mode is indicated on top left now.



- Enter the desired program by using the key pad.
- Following programs are available:

E15.exe	English real version
E05.exe	English demo version

D15.exe	German real version
D05.exe	German demo version

NOTICE The demo version is operating in the same way as the real version. Instead of real measurements the computer simulates the counting and the results. You can use all functions as if in real version. The electro-hydraulic functions are disabled in the demo version operating mode!

2.5.2. Key pad



Arrow keys	for menu control
ESC	one step back in the menu
ENTER	confirm enter
F1 – F6	function keys

Keys for the description of the measuring point:

Numbers Letters F3/ F4/ F5/ F6

Explanation of functions – entering numbers and letters

- Double key configuration, i.e. numbers and letters are arranged on the same keys.
- By pressing the "number/letter" key, only the according number is used.
- For using letters it is necessary to press the function keys additionally, i.e.

First press and hold [F4] (red), [F5] (blue) or [F6] (green) plus the number key according to the letter which is intended to be used. Example:



Capital letters:

Usually everything is written in lower case. For capital letters the key [F3] has to be additionally used.



2.5.3. Main menu

- Start of the CCS 4 wait for the starting routine and for the main menu to be indicated at the display.
- The main menu enables the selection of the operating functions which the CCS 4 offers.

	CCS 4				
	contamination control system demo-version: 01.0				
	on-line particle counting				
	off-line particle counting				
	file system				
	data transfer				
data file delete					
qui L ESC	t selection confine 1 [4†] [ENTER	rm R			

Function selection:

Select the desired function with the $[\downarrow\uparrow]$ – keys. The selected function is highlighted red. Confirm the selection with [**ENTER**].

On-line particle counting

Accomplish of the measurements in pressure – or suction mode after the selection of the various measuring programs (single, continuous, cyclic), kind of report format (contamination classes) and if necessary the fluid type. The CCS 4 has to be connected to the statements under item 2.3).

Off-line particle counting

Accomplish of the measuring of bottle samples in combination with the Bottle Sampling System (BSS 2). (see chapter 2.5.3.2) Refer to the instruction manual of the BSS 2. This mode is additionally usable for performing On-line single measurements.

Data transfer

For transferring the saved and measured data files using the RS232 – interface. Output of the stored data to the USB – stick.

Data file delete

In this mode it is possible to delete complete files of saved measuring results in the file system and to set time and date.

2.5.3.1. On-line particle counting

- For the On-line measuring in the appropriate operating mode (depending upon the hydraulic connection, see chapter**Fehler! Verweisquelle konnte nicht gefunden** werden.)
- The following parameters are entered in the setup menu "contamination classes determination":
 - Name of the measuring point
 - Selection of the measure-type
 - Selection of the report format (ISO 4406:99, NAS 1638, SAE AS 4059)
 - Selection of the operation mode (pressure mode or suction mode)
 - Selection of the test fluid



 Select the desired function with the [↓↑] – keys.

 \Rightarrow The selected function is highlighted red.

- Selection of the parameter with the [← →] – keys (highlighted white) and confirm the selection with [ENTER].
- [F1] Display of the fluid selection index.
- [ESC] back to the main menu.

Measuring point:

After opening the mode "**On-line particle counting**", this function is automatically selected and highlighted red. Enter the name of your measuring point by using the key pad. (See chapter 2.5.2) In case of typing errors press the [**DEL**] – key. The maximum capacity is 20 characters.

Always use the same name for the same measuring point, so that the stored data can be systematized within the data file system. Every measurement automatically gets a new index in the data file system, also the current date and time of the current measurement is stored. Measurements are displayed depending on the data sorting.

If no identification is entered, "noname" is automatically used.

internormen - electronics				
setup - menu: contamination classes determination				
name:	measur	ing-p	oint	
test				
	up to 20 char	acters		
	1easure-	type:		
single	continu	Jous	cyclic	
report format:				
ISO 4406:99	according	638	SAE AS 4059	
operation mode:				
pressure mode suction mode				
test fluid: /				
quitfluid tableselectionconfirm[ESC][F1][←↓↑→][ENTER]				

By using the $[\downarrow\uparrow]$ – keys switch to the next selection mode. \Rightarrow The selected mode is highlighted red.

Measure-type:

Select the measure-type (single, continuous, cyclic) by using the [$\leftarrow \rightarrow$] – keys. The selected measure-type appears white.

Report format:

It is possible to display the measurements according to ISO 4406:99 or NAS 1638 or SAE AS 4059. Select the classification format with the [$\leftarrow \rightarrow$]- keys. (The selection appears white.)

Operating mode:

Select the operating mode (suction or pressure mode) using the [$\leftarrow \rightarrow$] - keys. The selected operating mode appears white. **NOTICE** When starting the measurements in suction mode, than press additional the [VENT] – key at the beginning of the measurements in the next measuring menu.

Test fluid:

For the additional display of the existing theoretical ppm water content during the measurements, the type of oil to be measured must be selected.

If no test fluid is selected then the measurements will only display the water saturation in % and not the corresponding PPM.

The selection of the system fluid from the fluid index is performed by using the [F1] – key.

	Internormen - electronics				
	Fluid Selection (loading of the saturation characteristic)				
f	luid type:	manufactor:	trade name:		
2	CL 400	shall			
3	CLP 320	Castrol	Ontigear Sup X 320		
4	CLP 320	Exxon	Mobilgear SHC XMP 320		
5	CLP 460	Castrol	Optigear Syn X 460		
6	н 68	Shell	Vitrea 68		
7	HFD 68	Quaker Chemicals B.	VQuintolubric 888-68		
8	engine lubr. oil	shell	Shell morlina 100		
9	engine lubr. oil	shell	Shell morlina 150		
10	H 150	Shell	Vitrea M		
11	HEES 46	Fuchs	Plantohyd 46 S		
12	HEES 46	Esso	Univis 46		
13	HEES 46	Condat Lubrifiants	Condat D46		
14	HEES 46	Castrol	Anvol SWX 46		
C	quit ESC 1	selection [↓†]	confirm [ENTER]		

Select the fluid using the [$\downarrow\uparrow$] – keys (selection is highlighted red) and confirm with [ENTER].

 \Rightarrow After selecting a fluid the screen will automatically change to the previous menu.

 \Rightarrow The selected fluid is indicated in the display.



After entering all the necessary measurement parameters, confirm with [ENTER] and this will take you to the next menu.

2.5.3.1.1. Measure-type: On-line single

- This mode is to accomplish a single measurement.
- Three measurements are done one after another; the average value of the three measurements are shown on the display.
- The procedure as described in detail below is performed in any selected operation mode (suction or pressure operation) and classification type (ISO 4406:99, NAS 1638, SAE AS 4059). (Example: "suction mode" and "ISO 4406:99").







NOTICE The average of the measurements will not be automatically saved. It is only possible to save with **[F1]**!

- New start with [ENTER].
- With [**ESC**] back to the previous menu "Setup: contamination classes determination".

.

NOTICE

To assure constant mode of operation of the unit and the accuracy of measurement results, it is recommended to perform a flushing of the CCS 4 with cleaned mineral oil (filtrated H22) for several minutes after finishing the measurements.

2.5.3.1.2. Measure-type: On-line continuous

- This mode is to accomplish the continuous measurements.
- After the second measurement a trend of the results will be shown on the display. **NOTICE** While measuring it is not possible to print.
- The following details describe the operational sequence that takes place in each selected operating mode (pressure or suction mode) and the kind of classification (ISO 4406:99, NAS 1638, SAE AS 4059). (Example: "Suction mode "and "ISO 4406:99 ")



 New start with [ENTER].
 ⇒ All existing saved measurements were deleted in the file continuous register before it will start a new continuous measurement.

internormen - electronics	
contamination classes determination mode: suction / continuous / ISO 4406 ATTENTION! The data recorded in the file "continuous" are deleted in case of new start!	 Start with [F1] will create a continuation of the measurements in the file system. ⇒New measurements are
number of particles: >4µm >6µm >10µm >14µm >21µm >37µm * * * * * * * * quit print continue new start ENTER 1 interpartmen e clostropics continue new start	saved after the existing data files in the data system.
contamination classes determination mode:pressure / continuous / ISO 4406	 An automatic flushing starts before the first measurement is diaplayed
number of particles: >4µm >6µm >10µm >14µm >21µm >37µm * * * * * * * water saturation: 48% at 51°C / 124°F test fluid: */ no selected fluid	 The first measurement starts after 12 flushing cycles.
break print continue new start [ESC] [F2] [F1] [ENTER]	
mode: suction / continuous / ISO 4406	 The operating mode selected in the preceding menu, the classification type, and the measuring mode are shown in the headline. Both the water saturation and
number of particles: >4µm >6µm >10µn >14µm >21µn >37µm 1000000 100000 10000 1000 100 100 contamination classes: 24 / 20 / 14 22 / 14 24 / 20 / 14 22 / 14 water saturation: 48.3% at 51.0°C cal. ppn: 22 cal. ppn: 22 date of start: 25.02.2010 10:54 numbers of measurements: 1 quit print continue new start [ESC] [F2] [F1] [ENTER]	the temperature are shown with each measurement. When a fluid type is also selected, then the ppm water content is also displayed.

internormen - electronics contamination classes determination mode: suction / continuous / ISO 4406 CC 20 15 10 5 0 1 -cc 4pm(c) _cc 6pm(c) _cc 14pm(c) measure-no. number of particles: >4pm >6pm >10pm >14pm >21pm >37pm 1000000 1000000 10000 1000 100 100 contamination classes: 24 / 20 / 14 water seture: 10,24 et 51,00°C contamination classes: 24 / 20 / 14 water seture: 10,24 et 51,0°C contamination classes: 24 / 20 / 14 water seture: 10,24 et 51,0°C date of start: 25, 02, 2010 10:54 numbers of neasurements: 2 break print continue I F1 I I IEW Start ESC I IF2 I F1 I IEW Start IEW Start	• The numbers of each measurement and the date of start is displayed.
internormen - electronics contamination classes determination mode: suction / continuous / ISO 4406 CC 20 15 10 5 0 1 2 3 CC) 4µm(c) = CC) 6µm(c) = CC) 14µm(c) measure-no. Number of particles: >4µm >6µm >10µm >14µm >21µm >37µm 1000000 100000 10000 1000 100 100 contamination classes: 24 / 20 / 14 water saturation: 48.3% at 51.0°C test fluid: HLP 22 / Tellus 22 date of start: 25.02.2010 10:54 numbers of measurements: 3 Quit print continue new start [ESC] [F2]] continue new start [ESC] [F2]] continue new start	 The measurements are continued until they get stopped with [ESC]. The interruption takes place after the end of the current measurement. ⇒ Visible by the change from black to highlighted white of the function display.

- Once the unit has finish last measurement and the function keys are highlighted white, then the user can chose to print the results by using the [F2] key.
- The **continuation of the measurements** takes place with **[F1**]. The new measurements are added to the existing data at the data storage. (see chapter 2.5.3.3)
- With [ENTER] a new start is made. The data storage of the measuring type "continuous" is completely deleted and afterwards new measurements are written!! (see chapter 2.5.3.3)
- With the [**ESC**] key back to the previous menu "Setup: contamination classes determination".
- Furthermore the measurements are continuously shown by the RS232 interface during the measurement procedure and can be displayed and read by a communication software like MS HyperTerminal or the provided Data Manager Software (under Terminal) (see chapter 2.5.3.4.2.1)

NOTICE

To assure constant mode of operation of the unit and the accuracy of measurement results it is recommendable to perform a flushing of the CCS 4 with cleaned mineral oil (filtrated H22) for some minutes after finishing the measurements.

2.5.3.1.3. Measure-type: On-line cyclic

- This mode is to accomplish the cyclic measurements.
- The procedure as described in detail below is performed in any selected operation mode (suction or pressure operation) and classification type (ISO 4406:99, NAS 1638, SAE AS 4059). (Example: "suction mode" and "ISO 4406:99").

internormen - electr	onics
setup - menue: cyclic me format according to I	asurement SO 4406
	0.50
cycle period lin nj;	0.00
cycle number:	2
automatic storage:	off
automatic print out:	off
quit [ESC] [←↓↑→]	confirm [ENTER]

- Selection of the parameter for the cyclic measuring.
- Select the desired position with then [↑↓] - keys. (The selected position is highlighted red.)
- Change the value of the red highlighted postion by using the [← →] keys. The possible values are predetermined.

Cycle periode in h

The time between one measurement and the next one can be selected between 0,5 hours to 24 hours in half hour steps.

Cycle number

The total number of measurements can be chosen two-steps wise from 2 to 100.

Automatic storage

Optionally every cyclic measurement can be saved automatically by setting the automatic storage to "ON".

Automatic print out

When chosen automatic print out: "ON", then every average value is saved after the measuring cycle.



• Confirm the parameter selection with [ENTER].





 With the [ESC] key it will take you back to the previous menu "Setup: contamination classes determination".

NOTICE

To assure constant mode of operation of the unit and the accuracy of measurement results it is recommendable to perform a flushing of the OCM 01 with cleaned mineral oil (filtrated H22) for some minutes after finishing the measurements.

2.5.3.2. Off-line Particle Counting

- For the Off-line measuring in the appropriate operating mode (depending upon the hydraulic connection, see chapter 2.3)
 - Measuring of bottle samples in combination with the Bottle Sampling System BSS 2.
 - o Accomplishment of single measurements.



•	Select the desired function with the
	$[\downarrow\uparrow]$ – keys. (highlighted red)

- Confirm the selection with [ENTER]
- int<u>ernormen electron</u>ics Bottle Sampling sample name: noname operation mode: pressure mode dilution factor: 1 presentation mode:current single value K2:> 6 µm (a) K1:> 4µm... K4:>14µm. K3:>10µm∞ K5:>21µm K6:>37µm_{ce} Code: ISO 4406 Code: NAS 1638 Code: SAE AS 4059 temperature: 51 °C o selected fluid 32 cal. ppm: lųid name/dilution: [1] start flushing: [2 1 average 4 start counting: E 3 1 quit ESC [F1] print E F2 save з

inte	ernorm Bott	<mark>en -</mark> le S	<mark>ele</mark> ampl	<mark>etron</mark> i ing	cs—		
sample name: noname operation mode: pressure mode dilution factor: 1 presentation mode:current single value					lue		
K1:> 4µm			к2:>	6 µm			
K3:>10µm			к4:>	14µm			
K5:>21µm			к6:>	37 µm			
Code: ISO 4406			Code NAS	1638			
Code: SAE AS 405	9						
water saturation: 32 test fluid: HL	2 % tem _P 22 / Tell	perature: lus 22	51 °C /	′32 °F c∘	al. ppm	: 320	2
fluid	паме/с	lilut	ion:		Ι	1]
average	start	flus	hing	:	I	2	1
	start	coun	ting	:	1	3	1
L ESC 1	save	E F	1]	print	E	F2]

- After the measurement are displayed:
 - the determined contamination classes according to ISO 4406:99, NAS 1638 and SAE AS 4059,
 - the temperature,
 - the water saturation.
- If the fluid type is chosen, the water content in ppm is additionally displayed.

• Select the fluid type with [↑].

internormen – electronics Fluid Selection Content of the saturation characteristic I CL 460 1 CL 460 2 CLP 220 3 CLP 320 4 CLP 320 5 CLP 460 6 H 68 7 engine lubr. oil 5 CLP 460 6 H 68 7 engine lubr. oil 5 Shell 0 HEES 46 6 Fuchs 10 HEES 46 11 HEES 46 12 HEES 46 13 HEES 46 14 HLP 22 14 HLP 22 15 Shell 14 HLP 22	 Select the fluid using the [↑↓] – keys (selection is highlighted red) and confirm with [ENTER]. ⇒ Automatically changes to the previous menu.
internormen - electronics Bottle Sampling sample name: noname operation mode: pressure mode dilution factor: 1 presentation mode:current single value K1:> 4µm(c) K2:> 6µm(c) K3:>10µm(c) K4:>14µm(c) K5:>21µm(c) K4:>14µm(c) K5:>21µm(c) K6:>37µm(c) Code: Code: Code: 638 Code: 150 4406 SAE AS 4059 Water saturation: 32 × temperature: 51 °C / 32 °F cal. pon: 320 test fluid name/dilution: [1] start flushing: 1 2 J start flushing: 1 3] start counting: [3] save [F1] print [F2]	 The selected fluid is being indicated at the display. Change to the menu "name/ dilution" with [1] key.
internormen - electronics Bottle Sampling setup menue: sample name: noname (up to 15 characters) operation mode: pressure mode [+ +] dilution factor: 1 [+ +] dilution factor: 1 [+ +] confirm: [enter] quit: [ESC] temperature:51.0/12 [Enter the sample name, the dilution factor and the operating mode by using the [← →] and the [↓↑].

Sample name:

- If no identification is entered, "noname" is automatically used. •
- Delete the existing identification name with [DEL] and enter the new sample name by • using the key pad. (see chapter 2.5.2) The maximum capacity is 15 characters.
- •

NOTICE Always use the same sample name for the same measuring point, so that the stored data can be systematized within the data file system. Every event automatically gets a new index in the data file system, also the current date and time of the current measurement is stored. Measurements are displayed depending on the date.

Operation mode:

Depending on the hydraulic connection, select the operation mode (pressure mode or suction mode) with the [→ ←] – keys.

Dilution factor:

- The factor 1 is used automatically. This means, that the original sample is measured without a dilution.
- For measuring diluted oil samples changing of the factor stepwise with the [$\uparrow\downarrow$] keys.

		Mixing proportion		
dilution	dilution factor	Volume oil sample	Volume filtrated mineral oil H22	
	1	200 ml		
1:1	2	100 ml	100 ml	
1:2	3	70 ml	140 ml	
1:3	4	50 ml	150 ml	
1:4	5	40 ml	160 ml	
1 : 5	6	30 ml	150 ml	
1:9	10	20 ml	180 ml	

internormen - Bottle 3	electronics Sampling
setup	menue:
sample name: (up	test o to 15 characters)
operation mode: 🖪	uction mode [← →]
dilution factor: 🔳	3 [+ +]
confirm: [enter]	quit: [ESC]
temperature:51.0/12	water saturation:48
name/dilution:	[1]
start flushing:	[2]
start counting:	[3] quit
save [F1] prim	t [F2] [ESC]

- Deletion of the inputs by using [ESC].
- Confirmation of the changed inputs by using [ENTER].
 ⇒ Automatically changes to the previous menu.

in	ternormen	- ele	ctronic	·c
	Petrale	Same 1		
	BUILTE	sampr	TIN	
sample na	me:	noname	2	
operation	mode:	pressu	ire mod	e
dilution	factor:	1		
presentat	ion mode:	currer	nt sing	le value
K1:> 4µma	2)	<u>K2:></u>	6 µm _(e)	
K3:>10µм₀	2)	K4:>	14µm	
		100.00		
К5:>21 µм К6:>37			37 PMco	
Lode:		NAS	638	
Code:				
SAE AS 40	159			
water saturation: test fluid:	32 % temperatu HLP 22 / Tellus 22	ıre: 51 °C /	' 32 °F cal	. ppm: 320
fluid	name/dilu	ution:		
average	start flu	Jshing	:	[2]
[4]	start cou	unting	:	31
[ESC]	save [F1]	print	[F2]

- Start to flush with [2].
- Make approximately 3 4 flushing cycles.

internormen - electronics Bottle Sampling				
sample name: test operation mode: suction mode dilution factor: 1 presentation mode:current single value				
System flushing in operation number of flushing cycles:	2			
ISO ² :406 NAS ² i638 SAE ² : 4059				
temperature:51.0/12 water saturation:48				
name/dilution:	average			
stop flushing: [5]	[4]			
start counting: 31	quit			
save [F1] print [F2]	I ESC 1			

- At the beginning of the flushing the number of finished flushing cycles are displayed.
- Stop the flushing with [5].

internormen - electronics Bottle Sampling				
sample name: noname operation mode: pressure mode dilution factor: 1 presentation mode:current single value				
K1:> 4µm	e)	K2:> 6µм.	,	
K3:>10µma	e)	K4:>14µm	,	
K5:>21µm	e)	К6:>37рмс	,	
Code: ISO 4406		Code: NAS 1638		
Code: SAE AS 40)59			
water saturation: test fluid:	32 % temperatum HLP 22 / Tellus 22	re: 51 °C / 32 °F	cal. ppm: 320	
fluid	name/dilu	tion:	[1]	
average	start flu	shing:		
[4]	start cou	nting:	[[3]]	
	save [F1] print	t E2	

- Start counting with [3].
- One measurement is accomplished.

internormen Bottle	 electroni Sampling 	es-		
sample name: test operation mode: suction mode dilution factor: 1 presentation mode:current single value				
K1:> 4µm _{co} 1000300	K2:> 6µм	100100		
K3:>10µmc, 10400	K4:>14µm	1100		
K5:>21µm _{co} 10	K6:>37µm _{co}	1		
Code: ISO 4406 24/21/14	Code: NAS 1638	14/ 8/ 4		
Code: SAE AS 4059	13/12/ 8/	4/3/-		
temperature:51.0/12 51.0°C / 123.8°	water saturation:48	48.3 %		
name/dilution:	[1]	average		
start flushing:	[2]	[4]		
start counting:	[3]	quit		
save [F1] pri	nt [F2]	I ESC 1		

Bottle Sampling

presentation mode:current average [2]

10400

51°C / 124°F

[F1] print

10

test

electronics

100100

15/ 8/ 4

quit ESC

1100

suction mode

K2:> 6µm.

K4:>14µm...

K6:>37µm

Code: NAS 1638

[1]

[2]

[3]

[F2]

13/12/ 8/ 4/ 3/

<u>internormen -</u>

sample name: operation mode: dilution factor:

<mark>КЗ:}10µ</mark>м⊛

K5:>21µm_{co}

Code: SAE AS 4059

K1:> 4µmco 1000300

Lode: ISO 4406 24/21/14

name/dilution:

start flushing:

start counting:

After the completion, the measurement can be saved by using [F1], print by using [F2],

or

averaged by using [4]. (Select the measurement for the averaging)

NOTICE If the measurement is saved with [**F1**], this measurement can't be use for the averaging.

internormen - Bottle	electronics Sampling			
sample name: test operation mode: suction mode dilution factor: 1 presentation mode:current average [1]				
K1:> 4µm _{co} 1000300	K2:> 6µm(a) 100100			
K3:>10µm _{co} 10400	K4:>14µm(c) 1100			
K5:>21 Jm	K6 : >37 µm(a)			
Code: ISO 4406 24/21/14	Code: NAS 1638 14/ 8/ 4			
Code: SAE AS 4059	13/12/ 8/ 4/ 3/ -			
temperature:51.0/12 51°C / 124°F	water saturation:48 32 %			
name/dilution:	[1] <mark>average</mark>			
start flushing:	[2] [4]			
start counting:	[3] quit			
save [F1] prim	nt [F2] [ESC]			

Select the measurement for the averaging with [4].

⇒ The current average and the actual average measurements are displayed.

 The displayed average can be print with [F2], save with [F1].

NOTICE The saved average results are marked with an "M" in the file system and the number of averaged measurements is showing by an index. (see chapter 2.5.3.3.4)

• Afterwards it is possible to measure once more by using [3] and select the measurement for the averaging by using [4].

NOTICE Pay attention

- to select similar measurement data to create the average value!
- that there is sufficient volume in the bottle before starting the measurement avoid any air access!
- Back to the main menu with [ESC].

NOTICE

To assure constant mode of operation of the unit and the accuracy of measurement results it is recommendable to perform a flushing of the CCS 4 with cleaned mineral oil (filtrated H22) for some minutes after finishing the measurements.

2.5.3.3. File system



• Using this menu point the stored measurement data can be accessed, printed and deleted.

- The measurements in the permanent data storage persist until they are deleted manually
 or the maximum quantity of the storage data is exceeded.
 - Max. 100 measurements of each measure-type can be saved in the data storage. Thereafter, at each subsequent measurement, the data that is on the first place in the data strorage is being deleted and overwritten by new data.
 First out - Last in.
 - You may delete a single measurement with the [F1] key in the "File System".
 - You may delete the complete data set from the measured data storage in the mode "data file delete" and this removal of data is irreversible (see chapter 0)!
- The stored measurements can be forwarded to an external computer using the RS232 interface and administrated by the provided Data Manager software and transferred to MS EXCEL. (see chapter 2.5.3.4.1).
 - And / or transferred, as a TXT file using the USB interface to USB stick (memory capacity:<2 GB, FAT:16) (see chapter 2.5.3.4.2)
- The procedure as described in detail on the next page is always the same with all measuring modes (single, continuous, cyclic, bottle sampling).

For illustration purposes the procedure is shown in one measuring mode only.

internormen - electronics
File System
data management and recording
mode: on-line single
mode: on-line continuous
mode: on-line cyclic
mode, off-line bottle sampling
quit [ESC]selection [↓↑]confirm [ENTER]

File System mode:on-line-continuous measurement

/01

/03

/04

/05

/06

/07

/08

/09

delete [F1]

electronics[.]

date

/02 02.03.2010 13:03

02.03.2010 13:03

02.03.2010 13:03

02.03.2010 13:03

02.03.2010 13:03

02.03.2010 13:03

02.03.2010 13:03

02.03.2010 13:03

02.03.2010 13:03

E

open ENTER

time

internormen -

selection

name/measuring-point:

noname

noname

noname

noname

noname

noname

noname

noname

noname

quit ESC 1 Select the measuring type with ther [↑↓] – keys and confirm with [ENTER].

 \Rightarrow The selected menu point is highlighted red.

- The saved files will be indicated according date and time.
- The saved measurements can be selected with the [↑↓] – keys and/ or deleted from the data storage with [F1]. (Irreversible!)

internor	men - ele	ctronics	
F mode:on-line-	ile Syste continuou	m s measur	ement
name/measuring	-point:	date	time
¹ noname	/01	02.03.2	2010 13:03
² noname	/02	02.03.2	2010 13:03
³ noname	/03	02.03.2	2010 13:03
4 noname	/04	02.03.2	2010 13:03
⁵ noname	/05	02.03.2	2010 13:03
° noname	/06	02.03.2	2010 13:03
⁷ noname	/07	02.03.2	2010 13:03
° noname	/08	02.03.2	2010 13:03
° noname	/09	02.03.2	2010 13:03
quit selec [ESC] [↓↑	tion del L E	ete 1 J [E	open NTER J

 Select the saved measurement with [↑↓] and open the data set with [ENTER].

in	ternormen - <mark>electron</mark> i	cs
	File System	
mode: on	-line-continuous meas	urement
	report format:	
	ISO 4406:99	
	NAS 1638	
	ISO 4406:87	
	SAE AS 4059	
auit	selection	confirm
L ESC 1		ENTER]

- electronics[.] internormen File System 150 4406:99 mode: continuous cc 20 10 24 20 14 O 4 µm.... 6 µm 😡 14µm 😡 3 Σ particles per 1 Um(c) 100000. 0 Pm(c) 10000.0 6 n **NUM(** nn. n ō ō aphic Fl 1 5 " ration: 48% 51°C⁄ 124°F quit ESC
- internormen _ electronics File System mode: continuous / ISO 4406:99 ee 20 10 24 20 14 O >6 µm.... 14µm (a) μ_M (e) 4 particles per lµm(c 00000. п O 0000. 6 Um (c 0 ō D O quit ESC graphic [F1] ration: 48% 51°C/ 124°F print 3 F2 03.2010 13:03

 Select the report format by using the [↑↓] – keys. (highlighted red)

 \Rightarrow the selected data displayed.

• Display of the measuring data, the sample name, the date/ time, the temperature and the water saturation.

The water content in ppm is additionally displayed when a fluid type is chosen.



- Print the measurement file with [F2].
- Graphical presentation of the measurement results with
 [F1].



- Graphical presentation of the measurement results.
- Back to the previous menu with [ESC].

 Back to the previous menu with [ESC].

2.5.3.3.4. Display of the average (Off-line mode)



Select the "off-line bottle sampling" by using the
[↑↓] – keys and confirm with
[ENTER].

int mode: o	ernormen - File S off-line -	ele yste bott	etronics m le sampl	ling
name/meas	uring-poin	t:	date	time
¹ test(M 2	>	/01	25.02.2	010 11:42
2		/0	00.00.2	000 00:00
3 🔳		70	00.00.2	000 00:00
4 🔳		70	00.00.2	000 00:00
5 🔳		70	00.00.2	000 00:00
6 🔳		70	00.00.2	000 00:00
7 💼		70	00.00.2	000 00:00
8 🔳		70	00.00.2	000 00:00
⁹ ■		/0	00.00.2	000 00:00
quit [ESC]	selection [↓†]	del [F:	ete o 1] [E	pen NTER J
int	ernormen -	ele	etronics	
mode:bo	File S ttle sampl	yste ing	M ∕SAE AS	4059

8

<mark>›4µm،، ›6µm،،›14µm،،››21µm،،››38</mark>µm،،›

graphic

particles pe

4

3

ation: 32% 51°C/ 124°E

12

13

- The saved average value is displayed with "M" and the quantity of the measurements with "2".
- As per this example the average value had been created and saved from 2 measurements.
- The selection of the saved average confirm with [ENTER].

 The average of both measurements will be displayed through the selected classification.

• With the [ESC] key it will take you back to the previous menu.

2.5.3.4. Data transfer

CC 10 5

O

000

In this mode the saved measurement results from the CCS 4 can be transferred to an external computer. The data can be transferred using the RS232 - interface and the provided RS232 - interface cable and can be displayed and administrated using the data manager software or other evaluation software.

During the measurement the current measurement data are available and presentable by using the data manager software or terminal software like MS HyperTerminal. A transfer of the storage data can be done using a USB-stick. The data transferred in this way are transferred as TXT – Files.

2.5.3.4.1. Transfer of the saved data by RS232

- Transfer of stored measurement data by the RS232 interface using the data manager software.
- (1) Connect the CCS 4 with the external computer



Connect the CCS 4 with the external computer using the RS232 – interface cable.

(2) Start the data manager software on the external computer.





Select the COM - port at the main menu of the data manager.
NOTICE Pay attention that the selected COM –

port is consistent with the COM – port indication of the computer. (see in Windows at the device manager in data links "COM and LPT1")

(3) Checking the connection or data transfer for processing the data

- a) Checking the connection between the CCS 4 and the external computer by using the button "**Terminal**" at the **main menu of the data manager software**.
- b)

	🙀 CCS 4 Terminal	
	CCS 4 - Terminal	internormen electronics
😨 CC54 Data Manager 📃 🖂 🔀		
CCS 4 <i>internormen</i> electronics	Read	A
COM - Port Baud - Rate % COM: Data Manager Terminal Exit Exit		
Open "Terminal".		z
	STOP	CLOSE

<u>Oder</u>

	СС	S	4				inte	ern e	IO lectr	r m ronic	en s		
\langle	COM - Po ¹ % COM1 Data I	ort Mana	Jer	Baud	- Rate 500	Termi	nal]		E×	it		
CCS Save File	5 4 - Da	ata Ma	anage	er	and the second sec				Load File from	in		ICAD	
Save File Save File 1 tode Country Bessurement 0.	5 4 - Da as 150 ++06:91 t Measurement Poor	NAS 1630	anage	59 040	Partcle 4µm(c)	Particle fear(c)	Particle 10µm(c)	Particle 14µm(c)	Load File from	Particle 38 µm(c)	Particle 4.5 um(c)	Particle 6,4 µm(c)	
Save File 3 tole County b.	5 4 - Da es 150 4406:91	nta Mi	anage sec eseo	99 040	Particle 4µm(c)	Particle 6um(c)	Particle 10µm(c)	Particle 14jan(c)	Load File from	Particle 38 µm(c)	Particle 4.5 µm(c)	ronics LOAD	
Save File	5 4 - Da as 120 4406:91	nas 1630	anage SAE ASHO Date	97 OFC	Particle 4µm(c)	Particle Gam(c)	Particle 10µm(c)	Particle 14jun(c)	Load File from	Particle 38 µm(c)	Pericle 4,6 LHC(c)	ronics LOAD Particle 6.4 µm(c)	
Save File	5 4 - Da as 19 150 +40.91 Parc	ata Ma Nasses Pade Pade Pade	anage sec aseo Date	97 OFC	Partole 4µm(c)	Particle func(c)	Particle 10µm(c)	Particle 14µm(c)	Load File from	Particle 38 µm(c)	Periode A function	Particle 6,4 µm(c)	
CCCS Save File N ticle Course assumement	5 4 - Da 66 19 150 +406-99 10 feasurement Port	Ata Mi	anage set aseo bete	97 OIO	Partile 9am(c)	Particle Gure(c)	Particle I Gun(c)	Particle 14pm(c)	Load File from	Particle 38 µm(c)	Periode Assum(c)	Particle 6,4 µm(c)	

 Clicking the button "Data Manager" allows the data transfer and the processing of the transmitted values.

(4) Start of the data transfer at the CCS 4

	-internormen - electronics
	CCS 4
G	ontamination control system demo-version: 01.0
	on-line particle counting
	off-line particle counting
	file system
	data transfer
	data file delete
quit E ESC	selection confirm [↓↑] [ENTER]

• With the [↓↑] – keys select in the main menu of the CCS 4 the mode "data manager" and confirm with [ENTER].

.

internormen - electronics data transfer directory transfer of measured values via RS232 transfer of stored data via RS232 transfer of stored text files via USB	 With the [↓↑] – keys switch to the menu for data transfer of the saved values by using the RS232-interface and confirm with [ENTER].
quit I Selection I +↑ Jconfirm CONFIRM I ENTER Jinternormen - electronicstransfer of stored data via R\$232	 Select the measuring type by
data: single measurement data: continuous measurement data: cycle measurement data: bottle sampling Connection parameters of the R5232: 9600, 8, no, 1 Attention: Before starting the data transfer please cable the CCS4 with the COM-interface of the external PC and activate the COM or start the CCS4-datamanager.	 Select the measuring type by using the [↓↑] – keys. (Selection is highlighted red.) Start the data transfer at the CCS 4 by using [F1]. ⇒ Measuring data of the chosen mode are transferred. Stop the data transfer at the
quit selection start stop	CCS 4 with [F2] .

(5) Display of the transferred data in the data manager

 Übertragene Daten werden je nach Auswahl unter Punkt (3) in "Terminal" oder in "Data Manager" des Datenmangerprogramms angezeigt.

a) <u>Terminal</u>



NOTICE If an empty terminal window appears, the correct COM-port has to be selected. After changing the COM-port the terminal connection has to be checked again.

 The inspection can be stopped with "STOP" and brought back to the main menu of the data manager with "CLOSE".

b) Data Manager

Save File a	4 - Da	ata M	anag	er					Load File from			
rticle Countin	150 4406:99	NAS 163	8 SAE AS40	059 Oil C	ondition	4.000			1			1
deasurement lo.	Measurement Point	Fluid Type	Date	Time	Particle 4µm(c)	Particle 6µm(c)	Particle 10µm(c)	Particle 14µm(c)	Particle 21 µm(c)	Particle 38 µm(c)	Particle 4,6 µm(c)	Particle 6,4 µm(c)
_				_								
				_				-	-	-		-
					-							
										-		
		-		_								
								_			_	
		-			-							-
								_				
										_		
				_								
		1	1	1	5	1	- N.	1				5 C

- Start of the data transfer by using the button "START TRANSFER".
 - Select the data path and indicate the file name for the measurements which should be saved. Confirm with "OK".

Speichern unter					? ×
Spejchern in:	🔁 Datenmanage	er	•	🗢 🗈 💣 🎫	•
2	🛅 Installation				
Recent					
Desktop					
🤌 Eigene Dateien					
Sin Arbeitsplatz					
S					
Netzwerkumgeb	Datei <u>n</u> ame:	Test single		•	OK
	Dateityp:	CCS 3 Data Manager (*.ccs)		▼	Abbrechen

- After that the data transfer starts
 - The counted particles, ISO 4406:99, NAS 1638, SAE AS 4059, oil condition can be indicated and processed dependent on the register selection.

Save File a	9 ISO 4406:99	ta M	anage	r 010	ondition	,			Load File from	n Produkte\CC		ronics
feasurement	Measurement	Fluid	Date	Time	Particle	Particle	Particle	Particle	Particle	Particle	Particle	Particle
10.	Point	Туре	2000	11110	4µm(c)	6µm(c)	10µm(c)	14µm(c)	21 µm(c)	38 µm(c)	4,6 µm(c)	6,4 µm(c)
1000	Test	*	22.01.2010	14:03	5511.0	555.5	71.5	16.5	0.5	0.1	5494.5	544.5
	Test	*	24.01.2010	11:21	5511.0	555.5	71.5	16.5	0.5	0.1	5494.5	544.5
1	Test	*	25.01.2010	15:59	5511.0	555.5	71.5	16.5	0.5	0.1	5494.5	544.5
	Test	*	25.01.2010	17:05	5511.0	555.5	71.5	16.5	0.5	0.1	5494.5	544.5
5	Test		25.01.2010	17:11	5511.0	555.5	71.5	16.5	0.5	0.1	5494.5	544.5
	Test	*	25.01.2010	17:14	5511.0	555.5	71.5	16.5	0.5	0.1	5494.5	544.5
1	Test	*	25.01.2010	17:15	5511.0	555.5	71.5	16.5	0.5	0.1	5494.5	544.5
1	Test	*	26.01.2010	09:37	5511.0	555.5	71.5	16.5	0.5	0.1	5494.5	544.5
	Doname	*	26.01.2010	08:01	100000.7	10000.8	1000.0	100.0	10.0	10.0	199980.0	19980.0
0	noname	*	26.01.2010	08.11	100000.7	10000.8	1000.0	100.0	10.0	10.0	199980.0	19980.0
1	Dopame		26.01.2010	08.11	100000.7	10000.0	1000.0	100.0	10.0	10.0	399960.0	39960.0
2	noname	*	05.03.2010	08:08	5511.0	555.5	71.5	16.5	0.5	0.1	5494.5	544.5
3	Dopame	*	05.03.2010	08-09	5511.0	555.5	71.5	16.5	0.5	0.1	5494 5	544 5
4	tect	HIP22	04.03.2010	15:17	5511.0	555.5	71.5	16.5	0.5	0.1	5494 5	544 5
5	tect	HIP22	04.03.2010	15:12	5511.0	555.5	71.5	16.5	0.5	0.1	5494 5	544.5
6	testccs4nr:4003	*	03.03.2010	12:44	749.4	192.2	15.9	4.6	1.8	1.5	547.3	175.9

The transferred data can be:

- I. presented graphically,
- II. exported in a MS EXCEL-chart,
- III. printed as a report.

I. For graphic presentation use the button "GRAPH".

Depending on the presentation modes, which have been selected in the data manager menu, these are presented graphically. For example:

Selection: particle counting



- Display of all counted particles each channel of the selected measuring mode.
- The graph can be saved as PNG- or BMP file.
- Back to the previous menu by using "CLOSE".

Selection: NAS 1638



Diagram of the counted particles/ 100 ml



Diagram of the contamination class according NAS 1638.

II. For export into a MS Excel data sheet use the button "EXCEL"

For further processing the data all standard functions in MS EXCEL are available.

8	Start E	nfügen Seiter	layout	Formein	Daten	Überprüfen	Ansicht	enmanager Tes Entwicklerte	it, single.xlsx - ools Add-	Microsoft Exce	I					0
A	Farben	ten * Seiten- O ränder *	rientieru	ng Größe Dr	uckbereich U	Jmbrüche Hint	ergrund Druckt	tittel	ite: Automat he: Automat lierung: 100%	tisc Gittern tisc An Tabe	etzlinien Übe sicht 🔽 ucken 🗐	Ansicht Drucken] In den Vorder I In den Hinter Auswahlberei	rgrund × 臣 A grund × 臣 C ch 品 E Anordnen	Susrichten * Gruppieren * Drehen *	
) - (* - 🕞 🛛	2 🛆 🛍 🖬 👻														
_	A25	• (6	f _x													
	A	В	С	D	E	F	G	н	1	J	К	L	М	N	0	Р
1						CCS 4 Data I	Manager									
2																
	Aeasurement	Measurement	Fluid	Date	Time	Particle	Particle	Particle	Particle	Particle	Particle	Particle	Particle			
3 1	10.	Point	Type *	22.01.2010	14.03	4µm(c)	6μm(c)	10µm(c)	14µm(c)	21µm(c)	37µm(c)	4,6µm(c)	6,4µm(c)			
4	1	Test	*	22.01.2010	14:03	5511	555 5	71,5	10,5	0,5	0,1	5494,5	544,5			
6	3	Test	*	25.01.2010	15:59	5511	555.5	71,5	16,5	0,5	0,1	5494.5	544.5			
7	4	Test	*	25.01.2010	17:05	5511	555.5	71,5	16,5	0,5	0,1	5494,5	544.5			
8	5	Test		25.01.2010	17:11	5511	555,5	71,5	16,5	0,5	0,1	5494,5	544,5			
9	6	Test	*	25.01.2010	17:14	5511	555,5	71,5	16,5	0,5	0,1	5494,5	544,5			
10	7	Test	*	25.01.2010	17:15	5511	555,5	71,5	16,5	0,5	0,1	5494,5	5544,5			
11	8	Test	•	26.01.2010	09:37	5511	555,5	71,5	16,5	0,5	0,1	5494,5	544,5			
12	9	noname	*	26.01.2010	08:01	100000,7	10000,8	1000	100	10	10	199980) 19980			
13	10	noname	*	26.01.2010	08:11	100000,7	10000,8	1000	100	10	10	199980	19980			
14	11	noname	*	26.01.2010	08:11	100000,7	10000,8	1000	100	10	10	399960	39960			
15	12	noname	*	05.03.2010	08:08	5511	555,5	71,5	10,5	0,5	0,1	5494,5	544,5			
17	13	test	HI P22	04.03.2010	15:17	5511	555.5	71,5	16,5	0,5	0,1	5494.5	544.5			
18	15	test	HLP22	04.03.2010	15:18	5511	555.5	71.5	16.5	0,5	0,1	5494.5	544.5			
19	16	testccs4nr:4003		03.03.2010	12:44	749,4	192,2	15,9	4,6	1,8	1,5	547,3	175,9			
20																
21																
22																
23																
24																
25																
27																
28																
29																
30																
31																
32																
33																
34																
30	N Dauticle (ounting / TCO 44	AC / 14	C 1620 / CA	E AC40E0	Oil Condition	(\$ 1 /			1.4						
14.4	Parucle	ounting. 2 150 44	<i>70 </i>	13 1000 / SA	L M24023 X	on condition 2	_ لها								J 100 % 🕞	

III. For printing the report use the button "PRINT"



Selection of the printer.

CCS 4	Report				INTERNORMEN Technology Gr						
Measure- ment No.	Measure- ment Point	Fluid Type	Date	Time	Particle/100 ml 5-15µm	Particle/100 ml 15-25µm	Particle/100 ml 25-50µm	NAS 1638 5-15 <i>µ</i> m	NAS 1638 15-25 μm	NAS 1638 25-50 μm	
1	Test		22.01.2010	14:03	52800	1600	0	8	6	00	
2	Test		24.01.2010	11:21	52800	1600	0	8	6	00	
3	Test		25.01.2010	15:59	52800	1600	0	8	6	00	
4	Test		25.01.2010	17:05	52800	1600	0	8	6	00	
5	Test		25.01.2010	17:11	52800	1600	0	8	6	00	
6	Test		25.01.2010	17:14	52800	1600	0	8	6	00	
7	Test		25.01.2010	17:15	52800	1600	0	8	6	00	
8	Test		26.01.2010	09:37	52800	1600	0	8	6	00	
9	noname		26.01.2010	08:01	1988000	9000	0	12	8	00	
10	noname		26.01.2010	08:11	1988000	9000	0	12	8	00	
11	noname		26.01.2010	08:11	3986000	9000	0	12	8	00	
12	noname		05.03.2010	08:08	52800	1600	0	8	6	00	
13	noname		05.03.2010	08:09	52800	1600	0	8	6	00	
14	test	HLP22	04.03.2010	15:17	52800	1600	0	8	6	00	
15	test	HLP22	04.03.2010	15:18	52800	1600	0	8	6	00	
16	testccs4nr:4 03	0*	03.03.2010	12:44	17100	300	0	7	3	00	

• Report printing.

(f) For exiting the data manager software use button "CLOSE".

Save File as		la Ma	nayei						Load File fron	, 💻	electr	onics
8									웜 X:\Geräte,	Produkte\CC	5 👝 🗌	LOAD
rticle Counting	150 4406:99	NAS 1638	SAE AS4059	Oil C	ondition							
Measurement	Measurement Point	Fluid Type	Date	Time	Particle 4µm(c)	Particle 6µm(c)	Particle 10µm(c)	Particle 14µm(c)	Particle 21 µm(c)	Particle 38 µm(c)	Particle 4,6 µm(c)	Particle 6,4 µm(c)
1	Test	*	22.01.2010	14:03	5511.0	555.5	71.5	16.5	0.5	0.1	5494.5	544.5
2	Test	*	24.01.2010	11:21	5511.0	555.5	71.5	16.5	0.5	0.1	5494.5	544.5
3	Test	*	25.01.2010	15:59	5511.0	555.5	71.5	16.5	0.5	0.1	5494.5	544.5
4	Test	*	25.01.2010	17:05	5511.0	555.5	71.5	16.5	0.5	0.1	5494.5	544.5
5	Test	*	25.01.2010	17:11	5511.0	555.5	71.5	16.5	0.5	0.1	5494.5	544.5
5	Test	*	25.01.2010	17:14	5511.0	555.5	71.5	16.5	0.5	0.1	5494.5	544.5
7	Test	*	25.01.2010	17:15	5511.0	555.5	71.5	16.5	0.5	0.1	5494.5	544.5
8	Test	*	26.01.2010	09:37	5511.0	555.5	71.5	16.5	0.5	0.1	5494.5	544.5
9	noname	*	26.01.2010	08:01	100000.7	10000.8	1000.0	100.0	10.0	10.0	199980.0	19980.0
10	noname	*	26.01.2010	08:11	100000.7	10000.8	1000.0	100.0	10.0	10.0	199980.0	19980.0
11	noname	*	26.01.2010	08:11	100000.7	10000.8	1000.0	100.0	10.0	10.0	399960.0	39960.0
12	noname	*	05.03.2010	08:08	5511.0	555.5	71.5	16.5	0.5	0.1	5494.5	544.5
13	noname	*	05.03.2010	08:09	5511.0	555.5	71.5	16.5	0.5	0.1	5494.5	544.5
14	test	HLP22	04.03.2010	15:17	5511.0	555.5	71.5	16.5	0.5	0.1	5494.5	544.5
15	test	HLP22	04.03.2010	15:18	5511.0	555.5	71.5	16.5	0.5	0.1	5494.5	544.5
16	testccs4nr:4003	*	03.03.2010	12:44	749.4	192.2	15.9	4.6	1.8	1.5	547.3	175.9
								-				

2.5.3.4.2. Data transfer of the saved data as TXT-file via USB

Transfer of the stored measuring data on USB – stick (memory capacity: < 2 GB, FAT 16).



Load the main menu and then insert the USB – stick in the USB-connection port of the CCS 4.

NOTICE Otherwise the stick has a wrong initialization. ⇒ No data transfer and eventually crash of the CCS 4 software! If a crash occurs, restart it by switching the CCS 4 off and on.

internormen - electronics CCS 4 contamination control system demo-version: 01.0 on-line particle counting off-line particle counting file system data transfer data file delete guit selection [++] confirm	 At the main menu of the CCS 4 select the menu "data transfer" with the [↓↑] – keys and confirm with [ENTER].
internormen - electronics data transfer directory transfer of measured values via RS232 transfer of stored data via RS232 transfer of stored text files via USB	 With the [↓↑] – keys switch to the menu for transferring of the stored TXT-Files via USB.
internormen - electronics transfer of stored data to USB-stick contamination classes codes, water saturation, temperature file name: 	 Input a name as "file name ". Pay attention: with the file name the file format (.txt) has to be indicated, too. For example: test.txt

internormen - electronics	
transfer of stored data to USB-stick contamination classes codes, water saturation, temperature	
file name: test.txt data: single measurement data: continuous measurement data: cycle measurement data: bottle sampling	 Select data which are to be transferred with the [↓↑] – keys. (The selection is highlighted red.)
Attention! Before starting the data transfer please connect the USB-Stick to the USB interface of the CCS3.quitselectionstart[ESC][+ t][F1]	
internormen - electronics	
transfer of stored data to USB-stick contamination classes codes, water saturation, temperature	
file name: test.txt	- Ctart the data transfer with
data: single measurement data: continuous measurement data: cycle measurement data: bottle sampling	• Start the data transfer with [F1].
Attentiont Before starting the data transfer please connect the USB-Stick to the USB interface of the CCS3.	
quitselectionstart[ESC][↓↑][F1]	

• The text file is generated, stored on the USB-stick and can be transferred and displayed by using the data manager software.

Save File a	5		y						Load File from	1		LOAD
ticle Countin	g 150 4406:99	NAS 163	8 SAE AS40	59 OI C	ondition							
easurement	Measurement Point	Fluid Type	Date	Time	Particle 4µm(c)	Particle 6µm(c)	Particle 10µm(c)	Particle 14µm(c)	Particle 21 µm(c)	Particle 38 µm(c)	Particle 4,6 µm(c)	Particle 6,4 µm(c)
				_								
				_								
									_			
				-								

2.5.3.4.2.1. Data transfer from the USB – stick to the computer by using the data manager software

(1) Insert the USB-Stick in the USB – connection port of the computer.

(2) Start the data manager software on the external computer.

• Access the installed data manager software at the external computer. (one-time installation of the data manager software in chapter 2.8)

	Windows-Katalog	•	WSTM01 Data Manager 🔹 🕨	
		J.	Adobe Reader 9	
1	Bluetooth-Umgebung	8	Bluetooth-Umgebung	
		m	CCS4 Data Manager 🔹 🕨	CCS4
i 💼	Programme •		*	

- No COM port selected at the main menu of the data manager.
- Chose the button "**Data Manager**" allows the data transfer and the processing of the transmitted values.

😭 CCS4 Data Manager		4
CCS 4	electronics	No COM-Port
COM - Port Baud - F	kate	
Data Manager	Terminal Exit	select COM Data Analysis

(3) Start the data transfer by using the button [USB].

Save File	as		anag	-1					Load File from		electi	LOAD
rticle Countir	ng ISO 4406:99	NA5 163	B SAE AS40	59 Oil C	ondition							10
Measurement	Measurement	Fluid	Date	Time	Particle	Particle	Particle	Particle	Particle	Particle	Particle	Particle
40.	Point	Type		-	4µm(c)	6µm(c)	10µm(c)	14µm(c)	21 µm(c)	38 µm(c)	4,6 µm(с)	6,4 µm(c)
	-	+		_					-		-	
		-		-	+			-	-		-	-
										1		
		-							-	-	-	
		-		-	+			-	-		-	-
											1	
	5 G.	-		-	-			-	-	-	-	
	-											
											1	
		-		-				-	-	-	-	
		-		-	+			-			-	-
											1	
	-	-		_	+			-		-	-	
		-		-	+	-			-	1		-
										1		
		<i></i>	<u>,</u>			1	1	10	10	1	20	2

(4) Löschung der aktuellen Daten mit "OK" bestätigen.



(5) <u>Select the data path, chose the TXT – file from the USB-stick and confirm with</u> "OK".

eben Sie den D	ateipfad an.				? ×
<u>S</u> uchen in:	🗀 USB-Datei		•	+ 🗈 💣 📰 •	
Zuletzt verwendete D	CC54.txt				
Desktop Eigene Dateien					
Arbeitsplatz					
Netzwerkumgeb	J Datei <u>n</u> ame:	CCS4.txt		-	OK
ung	Dateityp:	Alle Dateien (*.*)		•	Abbrechen

- (6) After that the data transfer starts.
 - ISO 4406:99, NAS 1638, SAE AS 4059, Oil Condition should be displayed and processed dependent on the register selection.
 Attention: The counted particles are not displayed.

	4 - Da	ata I⊻	lanage	er							elect	ronics
Save File a	s								Load File from	n	Cicou	011100
8									8			LOAD
article Counti	g ISO 4406:99	9 NAS 16	38 SAE AS405	9 Oil C	ondition)						
Measurement No.	Measurement Point	Fluid Type	Date	Time	Particle/ml >4µm(c)	Particle/ml >6µm(c)	Particle/ml >14µm(c)	Particle/ml >21µm(c)	ISO 4406:99 > 4µm	ISO 4406:99 > 6µm	ISO 4406:99 > 14µm	ISO 4406:99 > 21µm
1	spuelen nr.:208	HLP 22	15.12.2011	15:16	1			1 2 12	20	18	14	1 80
2	spuelen nr.:208	HLP 22	15.12.2011	15:17	1			-	20	18	13	
3	spuelen nr.:208	HLP 22	15.12.2011	15:17		1			20	17	13	
4	spuelen nr.:208	HLP 22	15.12.2011	15:18			0		19	17	13	
5	spuelen nr.:208	HLP 22	15.12.2011	15:18	~				19	17	13	
6	spuelen nr.:208	HLP 22	15.12.2011	15:18					19	17	13	
7	spuelen nr.:208	HLP 22	15.12.2011	15:19		1			19	17	12	
8	spuelen nr.:208	HLP 22	15.12.2011	15:19	-		-	-	19	17	13	
9	spuelen nr.:208	HLP 22	15.12.2011	15:20	~				19	17	12	
10	spuelen nr.:208	HLP 22	15.12.2011	15:20					19	17	12	
11	spuelen nr.:208	HLP 22	15.12.2011	15:21		1			19	17	12	
12	spuelen nr.:208	HLP 22	15.12.2011	15:21					19	17	13	
13	spuelen nr.:208	HLP 22	15.12.2011	15:21	1			-	19	16	12	
14	spuelen nr.:208	HLP 22	15.12.2011	15:22					19	16	12	
15	spuelen nr.:208	HLP 22	15.12.2011	15:22		-			18	16	12	
16	spuelen nr.:208	HLP 22	15.12.2011	15:23					18	16	12	
17	spuelen nr.:208	HLP 22	15.12.2011	15:23		-			18	16	12	
18	spuelen nr.:208	HLP 22	15.12.2011	15:24					18	16	12	
19	spuelen nr.:208	HLP 22	15.12.2011	15:24			1		18	16	11	
20	spuelen nr.:208	HLP 22	15.12.2011	15:24			1		18	16	11	
21	spuelen nr.:208	HLP 22	15.12.2011	15:25			1		18	15	11	
22	spuelen nr.:208	HLP 22	15.12.2011	15:25					19	16	12	
20 21 22	spuelen nr.:208 spuelen nr.:208 spuelen nr.:208	HLP 22 HLP 22 HLP 22	15.12.2011 15.12.2011 15.12.2011	15:24 15:25 15:25	GRAPH		EXCEL		18 18 19	16 15 16	11 11 12	CLOS

CC5	H - Dala I	Manager						electronics
Save File as						Load File	from	
8						8		LOAD
1961				_				
			Oil Condition					
article Counting	150 4406:99 NAS I	1638 SAE A54059	Oli Condidon					
				•				
		Let a t	D.L.	1.7		1 × 1		
Measurement No.	Point	Type	Date	lime	Temperature [⁰⊂]	[oe]	5aturation	Content [nom]
1	couelen pr. (2087	HID 22	15 12 2011	15:16	22	71.6	[/0]	144
2	spuelen nr. (2087	HID 22	15.12.2011	15:17	22	71,0	55	142
3	spuelen nr. 2087	HLP 22	15 12 2011	15:17	22	71,6	54	142
4	spuelen nr. :2087	HLP 22	15.12.2011	15:18	22	71.6	54	142
5	spuelen pr.: 2087	HLP 22	15.12.2011	15:18	23	73.4	53	140
6	spuelen pr.:2087	HLP 22	15.12.2011	15:18	23	73,4	53	138
7	spuelen pr.:2087	HLP 22	15,12,2011	15:19	23	73.4	52	137
8	spuelen pr.: 2087	HLP 22	15.12.2011	15:19	23	73.4	52	137
9	spuelen nr.:2087	HLP 22	15.12.2011	15:20	23	73.4	52	138
10	spuelen nr.:2087	HLP 22	15.12.2011	15:20	23	73,4	51	136
11	spuelen nr.:2087	HLP 22	15.12.2011	15:21	23	73,4	51	135
12	spuelen nr.:2087	HLP 22	15.12.2011	15:21	23	73,4	50	133
13	spuelen nr.:2087	HLP 22	15.12.2011	15:21	23	73,4	49	132
14	spuelen nr.:2087	HLP 22	15.12.2011	15:22	24	75,2	49	132
15	spuelen nr.:2087	HLP 22	15.12.2011	15:22	24	75,2	49	130
16	spuelen nr.:2087	HLP 22	15.12.2011	15:23	24	75,2	48	129
17	spuelen nr.:2087	HLP 22	15.12.2011	15:23	24	75,2	47	127
18	spuelen nr.:2087	HLP 22	15.12.2011	15:24	24	75,2	47	127
19	spuelen nr.:2087	HLP 22	15.12.2011	15:24	24	75,2	47	127
20	spuelen nr.:2087	HLP 22	15.12.2011	15:24	24	75,2	47	127
21	spuelen nr.:2087	HLP 22	15.12.2011	15:25	24	75,2	47	127
22	spuelen nr.:2087	HLP 22	15.12.2011	15:25	24	75,2	46	125
		1	1	1	U	1		1

The transferred data can be:

- I. Presented graphically
- II. Exported in a MS EXCEL chart
- III. Printed as a report
- I. For graphic presentation use the button "GRAPH".
 - Depending on the presentation modes, which have been selected in the data manager menu, these are presented graphically.
 For example:

Selection: Particle counting



- Particles per counter channel of all measurements of the selected measurement mode <u>are not displayed</u>
- Back to the previous menu by using **"CLOSE**".

Selection: ISO 4406:99



<u>No display</u> of the counted particles per 1 ml.



Display of the contamination classes according to ISO 4406:99.

II. Export in a Excel – data sheet by using the button "EXCEL"

• For further processing the data all standard functions in MS EXCEL are available.

	.) + (+ +	<u>a</u> 17					Mappe2 - Micr	osoft Excel						0
Datei	Start	Einfügen Seitenlayd	out Formein	Daten	Uberprüfen	Ansicht	Entwicklertools	Add-Ins	m a		. Findinger a		۵ (1
	8	Calibri * 11	• A A =	= = >>-		Standard	*	55	1		Lässban v	2	(Ph)	
Einfüge	n	F K U ·	<u>⊗</u> • <u>A</u> • ≡	王王 法	建 國•	- % 000	10 +00 I	Bedingte Als T	abelle Zellenfor	matvorlagen	Loschen +	Sortieren	Suchen und	
* Turischan	blace 5	Schriftart	-	Auszichtung		Zabi	For	matierung = formal	tieren *		Zellen	Z * und Filtern *	Auswählen *	
	A.9	- (a C		Harmonding		2011		1911	natronagen		estrett.	Desident		1
	AI	• (- J*												
	٨	P	C	0	E	E	G	ш	1	1	v	1		N D
1	~	1	C C	0		CCS 4 Data M	lanager			· • • ;	~		141	14 14
2		•				<u></u>	anoger							
Me	surement	Measurement	Fluid	Date	Time	Particle/ml	Paricle/ml	Particle/ml	Particle/ml	ISO 4406:99	ISO 4406:99	ISO 4406:99	150 4406:99	
3 No.		Point	Type			>4 µm (c)	> 6µm (c)	> 14 µm (c)	> 21 µm (c)	> 4µm	> 6µm	> 14µm	> 21µm	
4	1	spuelen nr.:2087	HLP 22	15.12.2011	15:16					2	0 1	8 14		
5	2	spuelen nr.:2087	HLP 22	15.12.2011	15:17					2	0 1	8 13		
6	3	spuelen nr.:2087	HLP 22	15,12,2011	15:17					2	0 1	7 13		
7	4	spuelen nr.:2087	HLP 22	15.12.2011	15:18					1	9 1	7 13		
8	5	souelen nr.:2087	HLP 22	15.12.2011	15:18					1	9 1	7 13		
9	6	spuelen nr.:2087	HLP 22	15.12.2011	15:18					1	9 1	7 13		
10	7	spuelen nr.:2087	HLP 22	15.12.2011	15:19					1	9 1	7 12		
11	8	spuelen nr.:2087	HIP 22	15 12 2011	15:19					1	9 1	7 13		
12	9	spuelen nr :2087	HIP 22	15 12 2011	15.20					1	9 1	7 13		
13	10	souelen or -2087	HIP 22	15 12 2011	15.20					1	9 1	7 13		
14	11	spuelen nr :2087	HIP 22	15 12 2011	15.21					1	9 1	7 13		
15	12	souelen nr :2087	HID 22	15 12 2011	15.21					-	9 1	7 13		
16	13	souelen or :2087	HIP 22	15 12 2011	15.21					1	9 1	6 13		
17	14	souelen nr -2087	HIP 22	15 12 2011	15.22					1	9 1	6 13		
18	15	souelen or :2087	HLP 22	15 12 2011	15.22					1	8 1	6 13		-
19	16	souelen nr :2087	HIP 22	15 12 2011	15.22					1	8 1	6 13		
20	17	souelen or :2087	HIP 22	15.12.2011	15:23					1	8 1	6 12		
21	18	spuelen pr :2087	HID 22	15 12 2011	15-24					-	e 1	6 13		
22	19	souelen or 2087	HIP 22	15 12 2011	15.24					1	8 1	6 11		
23	20	spuelen nr.:2087	HLP 22	15.12.2011	15-24						8 1	6 11		
24	20	souelen nr :2097	HLP 22	15.12.2011	15-25					1	8 1	5 11		
25	21	spuelen nr :2087	HLP 22	15.12.2011	15:25					1	9 1	6 12		
26	23	souelen nr :2087	HIP 22	15 12 2011	15-26					1	8 1	6 11		
27	23	souelen or :2087	HIP 22	15 12 2011	15-26					1	8 1	6 11		
28	25	souelen nr :2087	HID 22	15 12 2011	15.26					1	8 1	6 11		
29	26	souelen nr :2087	HID 22	15 12 2011	15.27					1	8 1	5 11		
30	20	spuelen nr :2027	HIP 22	15 12 2011	15-37						9 1	6 11		
31	20	souelen nr :2097	HLP 22	15 12 2011	15-20						8 1	5 11		
32	20	souelen nr -2087	HIP 22	15 12 2011	15-28						8 1	5 11		
22	20	souelen nr -2087	HIP 22	15 12 2011	15-20					1	e 1	5 11		
2.4	30	souelen nr :2097	HLP 22	15 12 2011	15-29					-	0 1	5 10		
25	27	spuelen nr :2097	HLD 22	15 12 2011	15-29					1	0 1	5 10		
	Particle C	Counting ISO 4406	NAS 1638 SAE A	AS4059 OB1	Condition	2/			4		11			•

III. Print the report by using the button "PRINT"

🛱 CC5 4 Data Manager	
Select a printer and the number of copies. Available Printer	
Microsoft XPS Document Writer FreePDF XP Adobe PDF \\dc1\HPLJ2200PS_TF \\dc1\HPLJ2200PS_TF \\dc1\OKIC5650N_PCL_TF	
Print Abort	

• Selection of the printer.

CCS 4 Report

INTERNORMEN Technology GmbH

n	leasure- ient No.	Measure- ment Point	Fluid Type	Date	Time	Particle/m >4µm(c)	lParticle/m >6µm(c)	IParticle/ml >14µm(c)	Particle/m >21µm(c)	IISO 4406:99 ≻4µm	ISO 4406:99 > 6µm	ISO 4406:99 > 14µm	ISO 4406:99 > 21µm		
	1	spuelen nr.:2087	HLP 22	15.12.201	11 15:16					20	18	14			
:	2	spuelen nr.:2087	HLP 22	15.12.201	11 15:17					20	18	13			
;	3	spuelen nr.:2087	HLP 22	15.12.201	11 15:17					20	17	13			
	4	spuelen nr.:2087	HLP 22	15.12.201	11 15:18					19	17	13			
1	5	spuelen nr.:2087	HLP 22	15.12.201	11 15:18					19	17	13			
	ô	spuelen nr.:2087	HLP 22	15.12.201	1115:18					19	17	13			
1	7	spuelen nr.:2087	HLP 22	15.12.201	1 15:19					19	17	12			
1	3	spuelen nr.:2087	HLP 22	15.12.201	1 15:19					19	17	13			
-	9	spuelen nr.:2087	HLP 22	15.12.201	1 15:20					19	17	12			
1	0	spuelen nr.:2087	HLP 22	15.12.201	1 15:20					19	17	12			
1	1	spuelen nr.:2087	HLP 22	15.12.201	1 15:21					19	17	12			
1	2	nr.:2087	HLP 22	15.12.201	1 15:21					19	17	13			
1	3	nr.:2087	HLP 22	15.12.201	1 15:21					19	16	12			
1	4 5	nr.:2087	HLP 22	15.12.201	1 15:22					19	16	12			
1	6	nr.:2087	HLP 22	15.12.201	1 15:22					18	16	12		•	Report-
1	7	nr.:2087	HLP 22	15 12 201	1 15:23					18	10	12			printing
1	, B	nr.:2087	HLF 22	15 12 201	1 15-24					18	10	12			printing
1	9	nr.:2087	HIP 22	15 12 201	1 15:24					10	10	12			
2	n	nr.:2087	HIP 22	15 12 201	1 15:24					10	10	11			
2	1	nr.:2087		15 12 201	1 15:25					10	10	11			
2	>	nr.:2087	HLP 22	15 12 201	115:25					10	10	11			
2	3	nr.:2087	HLP 22	15 12 201	1 15:26					18	16	12			
2	1	nr.:2087	HLP 22	15 12 2011	1 15:26					18	16	11			
2!	5	nr.:2087	HIP 22	15 12 2011	1 15:26					18	16				
26	5	nr.:2087 spuelen	HIP 22	15 12 2011	1 15:27					18	15	11			
2	,	nr.:2087 spuelen	HLP 22	15.12.2011	1 15:27					19	16	11			
- 28	3	nr.:2087 spuelen	HLP 22	15.12.2011	1 15:28					18	15	11			
29		nr.:2087 spuelen	HLP 22	15.12.2011	1 15:28					18	15	11			
30)	nr.:2087 spuelen	HLP 22	15.12.2011	1 15:29					18	15	11			
31		nr.:2087 spuelen	HLP 22	15.12.2011	1 15:29					18	15	10			
5		nr.:2087								10	15	10			

1 of 2

(7)	For exiting	the data	manager	software use	Button	"CLOSE".
• •						

CCS	9 4 - Da	ata I	lanage	:1							elect	ronics
Save File a	15								Load File from	n		
8									8			LOAD
rticle Countir	ng ISO 4406:99	NAS 16	38 SAE A5405	9 Oil C	ondition					/		
Measurement No.	Measurement Point	Fluid Type	Date	Time	Particle/ml >4µm(c)	Particle/ml >6µm(c)	Particle/ml >14µm(c)	Particle/ml >21µm(c)	ISO 4406:99 > 4µm	ISO 4406:99 > 6µm	ISO 4406:99 > 14µm	ISO 4406:99 > 21µm
1	spuelen nr.:208	HLP 22	15.12.2011	15:16	1 20 202			1 2 2	20	18	14	Î ^{se}
2	spuelen nr.:208	HLP 22	15.12.2011	15:17					20	18	13	-
3	spuelen nr.:208	HLP 22	15.12.2011	15:17	1	1			20	17	13	
4	spuelen nr.:208	HLP 22	15.12.2011	15:18	4	-	2		19	17	13	-
5	spuelen nr.:208	HLP 22	15.12.2011	15:18	4				19	17	13	
6	spuelen nr.:208	HLP 22	15,12,2011	15:18	-		-	-	19	17	13	
7	spuelen nr.:208	HLP 22	15.12.2011	15:19	4		-		19	17	12	-
8	spuelen nr.:208	HLP 22	15,12,2011	15:19	-		-		19	17	13	
9	spuelen nr.:208	HLP 22	15.12.2011	15:20	+		-	-	19	17	12	
10	spuelen nr.:208	HLP 22	15,12,2011	15:20			-		19	17	12	
11	spuelen pr.:208	HIP 22	15.12.2011	15:21	1		-		19	17	12	
12	spuelen nr.:208	HLP 22	15,12,2011	15:21	+		-		19	17	13	
13	spuelen nr.:208	HLP 22	15.12.2011	15:21	+		-		19	16	12	
14	spuelen pr.:208	HIP 22	15.12.2011	15:22	1				19	16	12	
15	spuelen pr.:208	HLP 22	15.12.2011	15:22	1		-		18	16	12	
16	spuelen nr.:208	HLP 22	15.12.2011	15:23	1				18	16	12	
17	spuelen nr.:208	HLP 22	15.12.2011	15:23	1				18	16	12	1
18	spuelen nr.:208	HLP 22	15,12,2011	15:24	1	-	-		18	16	12	1
19	spuelen nr.:208	HLP 22	15.12.2011	15:24	1				18	16	11	1
20	spuelen nr.:208	HLP 22	15.12.2011	15:24	1				18	16	11	
21	spuelen nr.:208	HLP 22	15.12.2011	15:25	1				18	15	11	1
22	spuelen pr.:208	HIP 22	15,12,2011	15:25	+	-	-		19	16	12	
						-	2		1			

2.5.3.4.3. Continuous transfer of the current measurement values

During the measurements, the actual measured values can be continuously transferred from the CCS 4 to an external computer. In order to do so, the CCS 4 has to be connected to the external computer by using the RS232-interface cable and the format for the data transfer has to be defined in the mode **"data transfer – transfer of measured values via RS232**". The output results can be displayed on the computer by a communication program ("HyperTerminal by Microsoft") or "Terminal" of the data manager software.

2.5.3.4.3.2. HyperTerminal

The HyperTerminal is a communication program, which is starting with the version 2.0, provided with the Windows operating system. The HyperTerminal connections can be made between a computer and a measuring unit, which are connected by serial interfaces (for example between a computer and the CCS 4). In Windows Vista, HyperTerminal is no longer included. **Initial configuration of HyperTerminal see chapter 2.7.**

2.5.3.4.3.3. Definition of the data transfer rate

internormen - electronics CCS 4 contamination control syst demo-version: 01.0 on-line particle countin off-line particle countin file system data transfer data file delete quit c ESC 1 selection [++ 1 c ESC	 In the main menu of the CCS 4 select the menu "data transfer" by using the [↑↓] – keys and confirm with [ENTER].
internormen - electronics data transfer directory transfer of measured values via transfer of stored data via transfer of stored text files of transfer of stored text files of transfer of stored text files of	• With the [↓↑] – keys switch to the menu "transfer of measured values via RS232" and confirm with [ENTER].
internormen - electronics setup menu: transfer of current measurement results name / date particle numbers contamination classes code saturation / temperature / ppm reading by CCS4 datamanager	internormen - electronics setup menu: transfer of current measurement results name / date particle numbers contamination classes code saturation / temperature / ppm reading by CCS4 datamanager

• Select with the $[\downarrow\uparrow]$ – keys, which parameters are to be shown and activate with the $[\leftarrow \rightarrow]$ – keys. (The selected parameter appears white.)

2.5.3.4.3.4. Procedure

- Connect the CCS 4 with the external computer (RS232).
- Select and start the measuring mode (on-line or off-line) in the main menu of the CCS 4.
- The current measured data are provided at the RS232-interface and are displayed in the terminal program according to "data transfer – transfer of measured values via RS232" defined notation after a few seconds.

"noname" 0	5. 03. 2010	15:35		
particles per > 4 μm(c):: > 4,6μm(c): > 6 μm(c):	- 1ml: L00000.0; 99990.0; 1000.0;	> 10µm(c): > 14µm(c): > 21µm(c):	1000.0; 100.0; 10.0;	
> 6,4µm(c):	99990.0;	> 37µm(c):	10.0;	
-				
	I.			

• Notation of "data transfer – transfer of measured values via RS232" selection of single parameters.

CCE 4 Towninal

2CS4-Hyperferminal Des Besteht Ander Ubgtrogung 2 し 違う う 多 い ひ 合	CCS 4 - Terminal
Smeasure: test :08:03:2010:10:41: 5551.0; 555.5; 71.5; 16.5; 0.5; - <td>Read Bineasure(test;08;03;2010;10;46; 5511.0; 555.5; 71.5; 16.5; 0.5; 0.1; 5494.5; 544.5;-31; 48;*</td>	Read Bineasure(test;08;03;2010;10;46; 5511.0; 555.5; 71.5; 16.5; 0.5; 0.1; 5494.5; 544.5;-31; 48;*
Verbunden 00:01:32 /Auto-Ehlernn. 1960/1946-1 RF GR033 NUM Aufzeichnen Druckerecho //	STOP

• Notation of "data transfer – transfer of measured values via RS232" selection of "reading by CCS 4 data manager".

<u>Attention:</u> No data transfer if in "data transfer – transfer of measured values via RS232" no selection has been made! Minimum 1 parameter needs to be selected (visible as white font).

internormen - electronics	internormen - electronics
setup menu:	setup menu:
transfer of current measurement results	transfer of current measurement results
name / date	name / date
particle numbers	particle numbers
contamination classes code	contamination classes code
saturation / temperature / ppm	saturation / temperature / ppm
reading by CCS4 datamanager	reading by CCS4 datamanager
quit selection confirm	quit selection confirm
[ESC] [←↓↑→] [ENTER]	[ESC] [↔↓↑→] [ENTER]

2.5.3.4.3.5. Protocol of the continuous data transfer

The data telegrams are generally constructed as follows: **\$cmd(;par;par)%**

- \$ Marks the beginning of a data telegram
- cmd Instruction
 - ; Separator
- par Parameter for the instruction
- * Marks the end of the data telegram

Measurement results are displayed dependent on the selected notation as follows:

 a) If "reading by CCS 4 data manager" has been selected in the "data transfer – transfer of measured values via RS232" (see chapter 2.5.3.4.3.3 also), the following parameters are displayed in the HyperTerminal:



\$measure;P;dd;mm;yyyy;HH;MM;a.aa;b.bb;c.cc;d.dd;e.ee;f.ff;g.gg;i.ii;ww.w;pp;tt.t; F;*

Meaning:	
\$measure:	Display the beginning of a new data field
P:	Measuring point indication
dd:	Day (Date)
mm:	Month (Date)
уууу:	Year (Date)
HH:	Hour (Time)
MM:	Minute (Time)
a.aa:	Particle per 1 ml (\geq 4 μ m _(c))
b.bb:	Particle per 1 ml (\geq 6 μ m _(c))
c.cc:	Particle per 1 ml (\geq 10 µm _(c))
d.dd:	Particle per 1 ml (\geq 14 μ m _(c))
e.ee:	Partikel pro 1 ml (\geq 21 μ m _(c))
f.ff:	Particle per 1 ml (\geq 37 μ m _(c))
g.gg:	Particle per 1 ml (\geq 4,6 μ m _(c))
i.ii:	Particle per 1 ml (\geq 6,4 μ m _(c))
ww.w:	Water saturation (%)
pp:	ppm water content
tt.t:	Temperature (°C/ °F)
F:	Kind of fluid
*	Indicates the end of a data field.

 b) In case of selecting separate parameters in the menu "data transfer – transfer of measured values via RS232" (see chapter 2.5.3.4.3.3 too) only the selected parameters will be displayed in HyperTerminal:

Example: Selection of name/ date, particle numbers

🏀 CC54 - HyperTerminal		
Datei Bearbeiten Ansicht Anrufen Übertragung ?		
		1
<pre>"noname" 05. 03. 2010 15:35 particles per 1ml:</pre>	θμπ(c): 1000.0; μμπ(c): 100.0; μμπ(c): 10.0; /μπ(c): 10.0; /μπ(c): 10.0;	
I		
Verbunden 00:00:43 Auto-Erkenn. 9600 8-N-1	RF GROSS NUM Aufzeichnen Druckerecho	

Measurement values are indicated in a report format,

here: measuring point, date, time, particles / 1 ml

2.5.3.5. Data file delete and setting of date/ time



 Select in the main menu of the CCS 4 the menu "data file delete" by using the [↑↓] – keys and confirm with [ENTER].

2.5.3.5.4. Delete files

By using this function you will be **deleting the complete data files from the specific** storage of the measuring type and this deleting is irreversible!

CCS 4	
contamination control syste demo-version: 01.0	em
If you want to delete the data of a measurement file please p the according numbert	i iress
single measurement file:	[1]
cyclic measurement file: bottle sampling file:	[3] [4]
dat dat	e∕time

Select

[1] to delete the complete single measurment files.

[2] to delete the complete continuous measurement files.

[3] to delete the complete cyclic measurement files.

[4] to delete the complete bottle sampling file.

• With [ESC] back to the main menu.

2.5.3.5.5. Date/ time

- This function is meant for setting the real time clock integrated within the device. Through the battery backup it continues to run even if the power supply is switched off.
- Day, month, hour and minute are separately adaptable and are getting transferred to the real time clock.

internormen - electronics
CCS 4
contamination control system demo-version: 01.0
If you want to delete the data of a measurement file please press the according number!
single measurement file: [1] continuous measurement file: [2]
bottle sampling file: [4]
quit [ESC] date/time [F1]
internormen - electronics

day:

month:

minute:

year:

hour:

quit ESC 1 • With the [**F1**] switch to the menu "date / time".

- Select the parameter to be changed with the [↓↑] – keys. (The selected parameter is highlighted red.)
 - Set the parameter with the
 [←→] keys to the current
 date and / or time.
- After all parameters are set, confirm the selection with [ENTER].
 ⇒ An automatic alteration to the previous menu will occur.

fluid table selection confirm [F1] [←↓↑→] [ENTER]

25

02

03

12

2010

2.6. Printer

2.6.1. Installation of new paper rolls

• Open the front side of the printer and remove the empty printer paper roll.





Place a new roll in.





• Close the cover of the printer.





2.7. Set up of the HyperTerminal

 One time set up of the HyperTerminal: START / PROGRAMS / ACCESSORIES / COMMUNICATION / HYPERTERMINAL





• Select a symbol, enter any name (for example CCS 4) and confirm with **OK**.

) er of er er '		
-		
	Verbinden mit	<u>? ×</u>
	🦓 0CS4	
	Geben Sie die Ruhrummer ein, die gewählt	werden soll:
	Land/Region: Deutschland (49)	X
	Ortskennzaht 0049	
	Ruhummer:	
	Verbindung herstellen über: 00M1	
	ОК	Abbrechen

• Select COM-port interface and press **OK**.

Eiger	nschaften von COM	L		<u>? ×</u>	
An	schlusseinstellungen				
	Bjts pro Sekunde:	9600		•	
	<u>D</u> atenbits:	8		•	
	<u>P</u> arität:	Keine		•	
	S <u>t</u> oppbits:	1		•	
	<u>F</u> lusssteuerung:	Kein		•	
			<u>W</u> iederl	nerstellen	
OK Abbrechen Übernehmen					

• Set up the transfer conditions at the computer as follows:

Bits per second:	9600 Bits
Data bits:	8
Parity:	none
Stop bits:	1
Flow control:	hardware
	or none

2.8. Installation of the Data Manager Software at an external PC

The CCS 4 DATA MANAGER software was especially developed for the CCS 4 and is provided on the included CD-ROM.

The **one-time installation** of the data manager software from the CD-ROM to the external computer is necessary. The data manager enables the data transfer to a MS Excel data sheet.

2.8.1. One-time program installation

- Execute CCS 4 data manager program installation (setup.exe) from the provided CD-ROM. The setup.exe is located in the following folder on the CD-ROM: setup\ Volume\ setup.exe
- Execute the installation as instructed and wait until the installation has been completely finished.
- In the Windows START-menu, the folder "CCS 4 data manager" will be generated. In this folder the data manager program "CCS 4 Data Manager" is saved.
- Start the data manager program from an external computer with: CCS 4_Datamanager.



2.9. CCS 4 - software update (filelink)

The DOS-program "**filelink**" is needed to install a new program version on the CCS 4. The program is provided on the CD-ROM of the data manager. Installation of this program at the computer which is intended for the data transfer.

Data transfer:

- Switch on the CCS 4.
- Leave the main menu with [ESC].

internormen -	electronics				
CCS 4					
contamination control system					
Do you really want to finish the program "EO5.exe" ?					
Exit to DOS-level: Exit to filelink.exe Back to main menue:	CENTER] : CF1] CESC]				
Charge state of the accu remaining term: 108.0min					
back filelin [ESC] [F1]	k DOS-level [ENTER]				

- Start the "filelink" program with [F1].
- Access the first site with [ENTER].
- Select **slave** and confirm.
- Allow the system to overwrite the old data.
- Connect the CCS 4 and the computer through the RS232 interface cable.
- Start the computer in the DOS- mode.
- Copy the new CCS 4 program into the same path where the **filelink.exe** is saved.
- Start filelink.exe at the computer.
- Confirm the first site with [ENTER].
- Select the main menu and confirm.
- Check the current settings. The correct serial access is necessary (COM1 or COM2) and the baud rate must be adjusted at 115200. If necessary correct the settings. Go back to the previous monitor.
- Confirm the Master Mode.
- Select the new program for the CCS 4 on the left side (on computer) and mark the according files with [SPACE] or mouse click (left mouse key).
- Copy the files to the CCS 4 with [ALT] + [C].
- Wait until all files are copied.
- If all files are copied, leave the "**filelink**" program at the computer and switch off the CCS 4 with the main switch.
- You can restart the CCS 4 regularly with the main switch (ON) now.

3. Evaluation of measurement results

3.1. Water sensor

3.1.1. Display in % water saturation

• If no kind of fluid was selected, only the water saturation in % is being displayed.



(0...70% Saturation)

The presence of free water is unlikely. A danger of dissolved water in oil does not exist!

(70...90% Saturation)

The presence of free water is **likely** in a low volume. The initiation of actions to reduce the water content can be recommended!

(90...100% Saturation)

There is water in free form and is therefore a potential danger for the hydraulic and lubricating system.

The initiation of actions to reduce the water content in the fluid is urgently necessary!

A conversion in mg/kg (ppm) – water content is only possible when a fluid generated saturation characteristic line is specifically made for your type of fluid. Saturation characteristic lines for special oils can be provided on request.

3.1.2. Display of the fluid type and ppm water content

• If a fluid type is selected, the ppm water content for this fluid is automatically calculated from the deposited saturation function and is displayed.



The relation to the detected saturation values and the data, after Karl Fischer method accounted ppm (mg/kg), is calculated then evaluated by the detected and deposited 100% saturation curve (100% saturation = f(T)) and the simultaneously measured fluid temperature and is indicated at the display.

<u>Attention:</u> It is essential to select the correct kind of oil, or the display of the water content will not be equivalent with the effective value for this fluid.

Saturation characteristic curves for special oils can be created and implemented by INTERNORMEN Technology GmbH. (Add-on program)

Example of a provided saturation characteristic curve:



4. Calibration

- The laser sensor is calibrated according to ISO 11171 with ISO MTD fluid and is delivered with a calibration certificate.
- The water sensor is calibrated on delivery as well.
- **NOTICE** The validity of the calibration certificate is 12 months.
- **CAUTION** A A INTERNORMEN recommends a calibration interval of one year. For the secondary calibration the CCS 4, the unit is to be sent to **INTERNORMEN Technology GmbH** in Altlußheim or another authorized **INTERNORMEN** lab.
- The calibration and maintenance package for the CCS 4 contains the following benefits:
 - maintenance of the device,
 - control of consumption items,
 - a function test of the sensors,
 - calibration with a calibration certificate,
 - 24 hour functioning test.

5. Appendix

5.1. Technical data

Measuring principle laser sensor: Measuring range laser sensor: Particle counting according to:

Particle sizes:

Representation of cc: Measuring accuracy: Calibration laser sensor: Max. particle concentration: Sensor flowrate:

Measuring principle water sensor:

Measuring range water sensor:

Suction operating range: Pressure operating range: Viscosity range: Operating temperature range: Ambient temperature range: Internal temperature range: Fluid connections:

Fluid compatibility:

Power supply: External power supply unit: Internal rechageable battery: Fuses: Protection class:

Measuring type:

Cycle interval: Display - output:

Printer - output:

Storage capacity:

Further serial equipment:

Display:

particle counting to the light barrier principle for particle sizes of: 4...450 μ m ISO 4406:99, ISO 4406:87, NAS 1638, SAE AS 4059 > 4 μ m(c), > 4,6 μ m(c), > 6,0 μ m(c), > 6,4 μ m(c), > 10 μ m(c), >14 μ m(c), > 21 μ m(c), > 37 μ m(c). ISO 4 – 24, NAS 00 – 12, SAE AS 000 – 12 ± 1 (contamination class) ISO MTD in oil (ISO 11171:2000) 24000 particle / ml (sensor) 50 ml / min

determination of the water saturation based on the change of capacitance saturation: 0 - 100 %

temperature: -30...+ 70 °C / -22 ...+ 158 °F

-0,20,2 bar	/ -2.92.9 PSI					
1,5420 bar	/ 226,000 PSI					
10400 mm²/s	/ 451854 SUS					
070°C /	32158 °F					
050°C /	32122 °F					
045°C /	32113 °F					
1 x mini measurii	ng screwed joint M 16x2,					
2 x plug-in coupling for hose DN 6						
hydraulic and lubricating fluids based on						
mineral oil (also see on separate list of						
compatibility (5.5))						



15 V DC 100...240 V AC/ + 15 V DC/ 3,5 A, 50-60 Hz 15 V (Automatic with main connection) T 5A IP 67 (with closed cover)

on-line: single, continuous, cyclic tank samples with internal pump off-line options with the BSS 2 (Bottle Sampling System) up to 0,5...24 h, adjustable contamination classes, number of particle, saturation, temperature, diagrams, graphics contamination classes, number of particle, saturation, temperature, graphics 4 x 100 measurements (100 per kind of measuring type) external power supply unit, high pressure hose, PVC – discharge hose, PVC – suction hose, data manager (CD- ROM with software) 5,6" LCD-colour display





5.2. Hydraulic plan



5.3. Measurement principle

5.3.1. Laser sensor – PFS 01



The laser sensor operates based on the light-blockade principle and generates an output signal depending on the particles' sizes. This is received, processes and classified by corresponding electronics.

The monochromatic light emitted by the laser diode is being received by a photo diode and then converted into an electric voltage. If a particle blocks this "light-blockade", the photodiode will detect a decrease in received light depending on the particle's size and the electric voltage of the photodiode will decrease as well.

Troubles or faulty measurements by:

- Dark fluids

0

- The laser light cannot permeate the fluid column of the section measurements.
- \Rightarrow no decrease of the light \Rightarrow it is not possible to detect the particles.
- Contamination too high
 - Numbers of particles > 24000 P/ ml.
 - High chance of measuring from multiple less particles as one great particle.
- Conglomeration of fewer particles to one great particle through static electrical attractive forces or additives ⇒ faulty measurement and the sensor is blocked!
 - It is not applicable during the off-line measurement by processing of the oil sample in the ultrasonic bath and sufficient homogenization (shaking) of the fluid before the measurement.
- Free water and air bubbles
 - Falsification of the measurement results.
 - Description of the water particle and air bubbles as great particles.

- The measuring of HFA, HFB, HFC and aqueous cooling emulsion is not possible.
- Automatic flushing processes in all programs shall prevent false measurements. Therefore the CCS 4 gets flushed completely with the new oil before the next measurement is done.
 - (a) Single measurements:
 - Automatic flushing before the first measurement.
 - Automatic flushing before following measurements, when more than 10 minutes are gone since the last measurement or when changing the measuring point.
 - (b) Continuous measurements:
 - Automatic flushing when starting the measurement.
 - (c) Cyclic measurement:
 - Automatic flushing before each measurement.
 - (d) Off-line measurement:
 - Manual start of flushing process.
- The measuring and display of the temperature, the water saturation and the water content of the fluid in all measuring programs should be prevent from alterations of the measurement results.



5.3.1.1. 8 – channel particle counting

5.3.2. Water sensor

The **water sensor** is a **capacitive sensor**. As a dielectric between two electrodes a polymer film is used, which is able to absorb water molecules and by doing so it changes the capacity of the sensor element. This capacity is changed in a sensor output signal of **4... 20 mA**. As a measurement output the **saturation condition** (water saturation) of the fluid is displayed in **percent**.



In addition, a temperature sensor is installed for precise temperature measurement of the fluid during the measurement.

As opposed to the absolute water content determination by the **Karl Fischer method**, in which the total mass fraction of free water and bound **water in mg / kg of oil** is stated, the **water sensor** evaluates the saturation condition of the fluid with water in percent. The specification **100%** stands for a <u>complete saturation</u> of the fluid. The saturation values are temperature dependent!

A relation to the detected saturation values and the data, after the Karl Fischer method accounted ppm (mg/kg), is calculated by the detected and deposited 100% saturation curve (100% saturation = f(T)) and the simultaneously measured fluid temperature, and is indicated at the display.

5.4. Overview of the data storage and measurement results



5.5. Cleanliness classes according to ISO 4406:99

According to ISO 4406 (year 1999) the number of particles sized > 4 μ m_(c), > 6 μ m_(c) and > 14 μ m_(c) is being used to determine the cleanliness class. The determination of the cleanliness class doesn't depend on the particle size.



Cleanliness class	Number of particles	Up to and including
26	320000	640000
25	160000	320000
24	80000	160000
23	40000	80000
22	20000	40000
21	10000	20000
20	5000	10000
19	2500	5000
18	1300	2500
17	640	1300
16	320	640
15	160	320
14	80	160
13	40	80
12	20	40
11	10	20
10	5	10
9	2,5	5
8	1,3	2,5
7	0,6	1,3
6	0,3	0,6

5.6. Cleanliness classes according to NAS 1638

Analysis volume: 100 ml

Class	5 - 15 µm	15 - 25 µm	25 - 50 µm	50 - 100 µm	> 100 µm
00	0,125	0,022	0,004	0,001	0
0	0,250	0,044	0,008	0,002	0
1	0,5	0,089	0,016	0,003	0,001
2	1	0,178	0,032	0,006	0,001
3	2	0,356	0,063	0,011	0,002
4	4	0,712	0,126	0,022	0,004
5	8	1,425	0,253	0,045	0,008
6	16	2,85	0,506	0,090	0,016
7	32	5,7	1,012	0,18	0,032
8	64	11,40	2,025	0,36	0,064
9	128	22,8	4,05	0,72	0,128
10	256	45,6	8,1	1,44	0,256
11	512	91,2	16,2	2,88	0,512
12	1024	182,4	32,4	5,76	1,024

Particle number x 10³

5.7. Cleanliness classes according to SAE AS 4059

Analysis volume: 100 ml

	Particle per 100 ml					
Size, ISO 11171 Calibration or Electron Microscope	> 4 µm _(c)	> 6 µm _(c)	> 14 µm _(c)	> 21 µm _(c)	> 38 µm _(c)	> 70 µm _(c)
Size Code	Α	В	С	D	E	F
000	195	76	14	3	1	0
00	390	152	27	5	1	0
0	780	304	54	10	2	0
1	1560	609	109	20	4	1
2	3120	1220	217	39	7	1
3	6250	2430	432	76	13	2
4	12500	4860	864	152	26	4
5	25000	9730	1730	306	53	8
6	50000	19500	3460	612	106	16
7	100000	38900	6920	1220	212	32
8	200000	77900	13900	2450	424	64
9	400000	156000	27700	4900	848	128
10	800000	311000	55400	9800	1700	256
11	1600000	623000	111000	19600	3390	512
12	3200000	1250000	222000	39200	6780	1020

Fields of application – compatibility 5.8.

Applicable for:

- hydraulic oils H, HL, HLP, and HV
- gear oils C, CL, CLP
- motor oils, gas oils •
- MIL-H-5606 E •
- vegetable based oils (HTG, triglycerides) •
- synthetic esters (HEES, HFD-U, HFD-R (without Skydrol)

5.9. Trouble shooting

No settings of the CCS 4 are done by the operator.

Malfunctions, which could be eliminated by the operator, are limited to checking cables for

breaks.

NOTICE Any other cases require sending the CCS 4 to INTERNORMEN Technology GmbH in order to recover the functions.

A brief description of the problem would expedite the trouble shooting and the repair process. To check your warranty and to answer questions by phone we need the serial number and the date of purchase of the instrument.

5.10. Shipment, parts list



- article no.: CCS 4 (1) (2) Power supply unit, inclusive power cable RS232 – interface cable (3)
- (4) RS232 – adaptor plug to USB
- High pressure hose (5)
- PVC hose DR. 8x1 (6)
- (7) Quick connector Rectus 21K KO08 MPX
- (8) 4 rolls print-out paper
- (9) Data manager CD
- (10) Instruction manual
- USB stick (11)
- Calibration certificate (12)

calibration at INTERNORMEN Technology GmbH

North America — HQ 70 Wood Ave., South, 2nd Floor Iselin, NJ 08830 Toll Free: (800) 656-3344 (North America Only) Voice: (732) 767-4200

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Visit us online <u>eaton.com/filtration</u> for a complete list of Eaton's filtration products.

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