

# Mobile Particle Counter

MPC 4614

**RE 51430-B/01.10**

Replaces: -.-  
English

## Operating instructions



The data specified above only serve to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.

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The cover page shows a sample configuration. The delivered product may thus differ from the figure.

The original operating instructions have been written in German.

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# 1 About this document

These instructions contain important information on the safe and appropriate commissioning, operation and simple troubleshooting of the MPC 4614 particle counter.

- ▶ Read these instructions completely, especially chapter “2 General safety instructions”, before working with the MPC 4614 particle counter.

## 1.1 Related documents

You can find these operating instructions as well as the related documents in the media directory under [www.boschrexroth.com/variou utilities/mediadirectory/](http://www.boschrexroth.com/variou utilities/mediadirectory/).

- ▶ Also observe the generally applicable, legal or otherwise binding regulations of the European or national legislation and the rules for the prevention of accidents and for environmental protection applicable in your country.

## 1.2 Abbreviations used

Abbreviations

| Abbreviation | Meaning                 |
|--------------|-------------------------|
| MPC          | Mobile Particle Counter |

## 2 General safety instructions

The MPC 4614 particle counter has been manufactured according to the accepted rules of current technology. There is, however, still a risk of personal injury or damage to equipment if the following general safety instructions and the warnings before the steps contained in these instructions are not complied with.

- ▶ Read these instructions completely and thoroughly before working with the MPC 4614 particle counter.
- ▶ Keep these instructions in a location where they are accessible to all users at all times.
- ▶ Always include the operating instructions when you pass the MPC 4614 particle counter on to third parties.

### 2.1 Intended use

The MPC 4614 mobile particle counter exclusively serves the measurement of mineral oils. For the use of synthetic oils, please contact the manufacturer.

- ▶ Observe the performance limits specified in the technical data (see chapter "18 Technical Data").

The MPC 4614 particle counter is a work appliance and not designed for private use.

Intended use includes having read and understood these instructions, especially the chapter "2 General safety instructions".

### 2.2 Improper use

Any use of the MPC 4614 particle counter other than described in chapter "2.1 Intended use" is considered as improper.

### 2.3 Qualification of personnel

Assembly, commissioning and operation, disassembly, service (including maintenance and repair) require basic hydraulic knowledge as well as knowledge of the appropriate technical terms. In order to ensure operating safety, these activities may therefore only be carried out by qualified technical personnel or an instructed person under the direction and supervision of qualified personnel.

Qualified personnel are those who can recognize possible hazards and institute the appropriate safety measures due to their professional training, knowledge, and experience, as well as their understanding of the relevant conditions pertaining to the work to be done. Qualified personnel must observe the rules relevant to the subject area.

## 2.4 Safety instructions in this document

In these instructions, there are safety instructions before an instruction whenever there is a risk of personal injury or damage to the equipment. The measures described to avoid these hazards must be observed.

Safety instructions are set out as follows:

| SIGNAL WORD!  | Type of risk!                 |
|---|-------------------------------|
|  | Consequences<br>▶ Precautions |

- **Safety sign (warning triangle):** Draws attention to the hazard
- **Signal word:** Identifies the degree of hazard
- **Type of danger:** Identifies the type or source of the hazard
- **Consequences:** Describes the consequences of non-compliance
- **Precautions:** States how the hazard can be prevented

The signal words have the following meaning:

Table 1: Signal words/warning signs

| Signal word  | Application  |
|--|--|
| <b>DANGER!</b><br>   | Indicates an <b>imminently</b> hazardous situation which, if not avoided, will certainly result in serious injury or even death.           |
| <b>WARNING!</b><br> | Indicates a <b>potentially</b> hazardous situation, which, if not avoided, could result in serious injury or even death.                   |
| <b>CAUTION!</b><br> | Indicates a <b>potentially hazardous</b> situation which, if not avoided, could result in minor or moderate injury or damage to equipment. |
|                     | If this information is disregarded, it may result in machine malfunction or breakdown.   |

## 2.5 Adhere to the following instructions

### 2.5.1 General instructions

- Observe the regulations for accident prevention and environmental protection for the country where the product is used and at the workplace.
- Exclusively use Rexroth products in good technical order and condition.
- Check the product for visible defects, for example cracks in the housing or missing screws/protective covers/seals.
- You must generally not modify or retrofit the product.
- Only use the product within the performance range provided in the technical data.
- Persons who assemble, operate, disassemble or maintain Rexroth products must not consume any alcohol, drugs or pharmaceuticals that may affect their ability to respond.
- The warranty only applies to the delivered configuration. The warranty will not apply if the product is incorrectly assembled, not used as intended and/or handled improperly.
- Do not expose the product to any mechanical loads under any circumstances. Never use the product as a handle or step. Do not place any objects on it.

### 2.5.2 During transport

- Observe the transport instructions on the packaging.

### 2.5.3 During assembly

- Lay the cables and lines so that they cannot be damaged and no one can trip over them.
- Before commissioning, make sure that all the seals and plug of the plug-in connection are installed correctly to ensure that they are leakproof and fluids and contamination parts are prevented from penetrating the product.

### 2.5.4 During commissioning

- Let the product acclimate itself for several hours before commissioning, as otherwise water may condense in the housing.
- Make sure that all hydraulic connections are either used or covered. Commission the product only if it is installed completely.

### 2.5.5 During operation

- Only persons who have been authorized by the operator may be granted access to the direct operating range. This also applies during any standstill of the system.

### 2.5.6 During cleaning

- Cover all openings with the appropriate protective devices in order to prevent detergents from penetrating the system.
- Never use solvents or aggressive detergents. Only clean the product using a dry, lint-free cloth.
- Do not use a high-pressure cleaner for cleaning.

### 2.5.7 During maintenance and repair

- Perform the prescribed maintenance work at the intervals specified in these operating instructions.
- Make sure that no lines, connections or components are disconnected as long as the system is under pressure and voltage. Protect the system against being switched on.

### 2.5.8 Disposal

- Dispose of the product in accordance with the currently applicable national regulations in your country.
- Dispose of the hydraulic fluid in accordance with the currently applicable national regulations in your country.
- Dispose of hydraulic fluid residues according to the applicable safety data sheets for hydraulic fluids.

## 2.6 Obligations of the operator

The operator of the Bosch Rexroth products is bound to provide for personnel training on a regular basis regarding the following subjects:

- Observation and use of the operating instructions and the legal regulations
- Intended use and operation of the Bosch Rexroth product
- Observation of the instructions from the factory security offices and of the operator's operating instructions
- How to behave in case of emergency

**Scope of delivery**

### 3 Scope of delivery

The scope of delivery includes:

- 1 particle counter
- 1 charging device 230 V , 50 Hz / 12 V, 600 mA (Germany)
- 1 multi-range charging device 90-230 V / 12 V, 600 mA (outside Germany)
- 2 m low-pressure hose DN4 for media return
- 2 m high-pressure hose DN2 with M16x2, PN400 Minimes coupling on both sides
- 1 operating instructions
- 1 end cap DN4

## 4 Product description

### 4.1 Performance description

The MPC 4614 particle counter is an optical particle counter and is used for the non-continuous detection of solid particle contamination in hydraulic and lubricating systems.

It works according to the light extinction principle. With the fluid flow, particles run through a miniature light barrier and interrupted the light beam.

They cast a shadow. The size of the shadow determines the particle size. The particle size is defined as the diameter of a coextensive circle. From the number of shadows, one determines the number of particles.

The sensor detects particles the equivalent diameter of which is greater than / equal to four micrometer ( $4 \mu\text{m(c)}$ ). By means of a flow conditioning unit, the sensor flow is kept constant within the application limits.

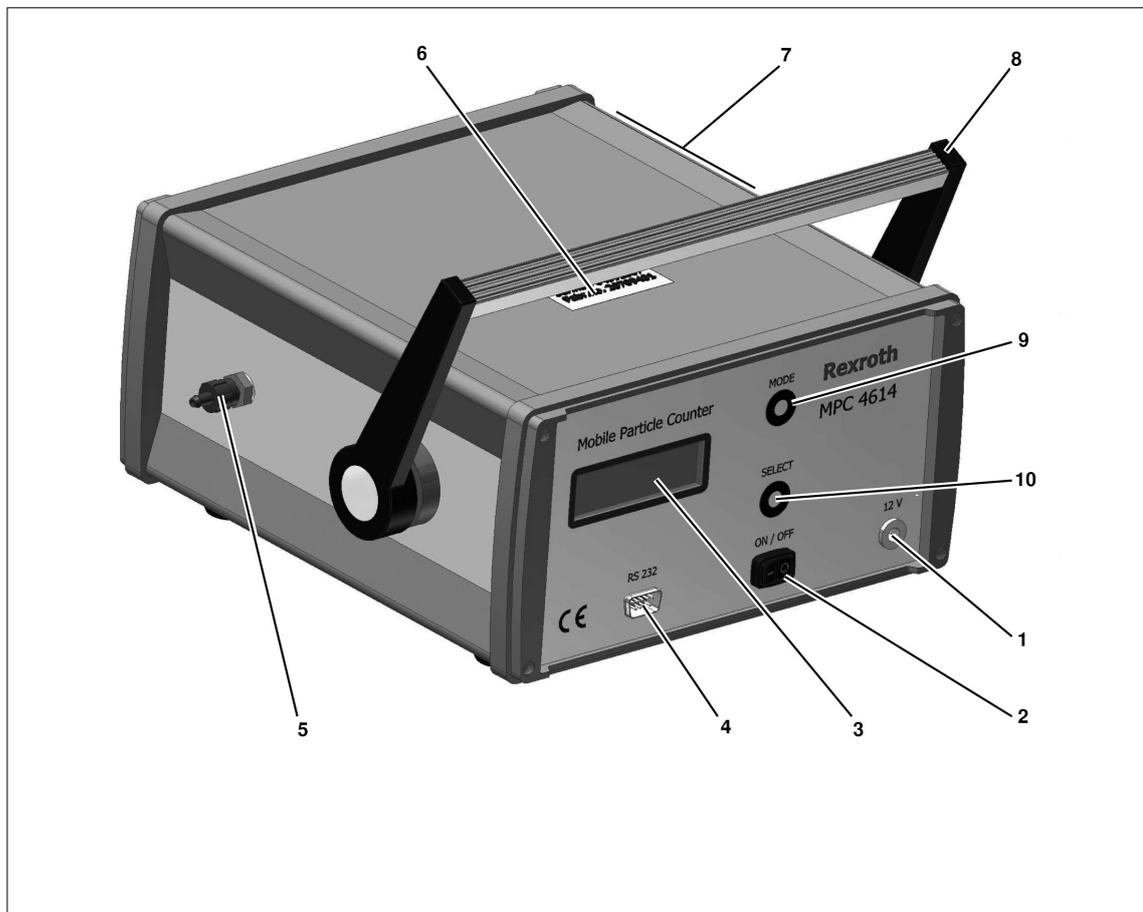
An individual measurement takes one minute. The progress of the measurement process is displayed in the two-digit LC display by means of a second counter running backwards. The degree of the solid particle contamination is calculated according to the classification types ISO 4406 and AS 4059 with regard to  $4 \mu\text{m(c)}$ ,  $6 \mu\text{m(c)}$ ,  $14 \mu\text{m(c)}$  and  $21 \mu\text{m(c)}$  equivalence diameter.

During the measurements, the results can be output on a printer. Irrespective of the measurement value output (on the display and/or the printer), the results are written to a non-volatile data memory in the device (data logger function).

After completion of all measurements, the results can be printed out or transferred to a PC.

## Product description

## 4.2 Device description



**Fig. 1: Device overview MPC 4614 particle counter**

- 1 Socket 12 V voltage supply
- 2 On / off switch
- 3 LC display
- 4 RS232 plug-in connector
- 5 Media output (low-pressure connection DN4)
- 6 Name plate
- 7 Media input (Minimess M16x2)
- 8 Handle/base, rotatable
- 9 MODE button
- 10 SELECT button

### 4.3 Product identification

A name plate is attached to the particle counter showing the exact designation, the serial number as well as the fabrication number.

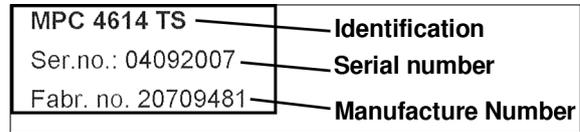


Fig. 2: Example of a name plate

## 5 Transport and storage

There are no special transport instructions for this product.

- ▶ However, please observe the instructions in chapter “2 General safety instructions”.
- ▶ For storing and transporting the product always observe the ambient conditions specified in the technical data (see chapter “18 Technical data”).

A suitcase is offered as accessory for the safe transport of the MPC 4614 particle counter, as described in chapter “16 Extension and Conversion”.

## 6 Assembly

### 6.1 Unpacking

- ▶ Dispose of the packaging in accordance with the currently applicable national regulations in your country.

### 6.2 Assembling the MPC 4614 particle counter

---

#### CAUTION!



#### Danger of damage to property and personal injuries!

Assembly of the product requires basic hydraulic knowledge.

- ▶ The product may only be assembled by qualified personnel (see chapter "2.3 Qualification of personnel").
- 

#### 6.2.1 Establishing the hydraulic connection of the MPC 4614 particle counter

- ▶ A system pressure of at least 12 bar is required for operating the device.
- ▶ If no 12 bar are available, the device is to be operated with an additional pump (see chapter "10 Pump (optional)")

If necessary, remove the end caps at the media input and output. Connect the Minimesh hose at the media input and fasten it by means of the fitting. With its opposite end, the hose is connected to a pressure line with a system pressure of at least 12 bar.

Assemble the low-pressure hose DN4 at the media output in the same way and lead it into a tank for collecting the medium.

---

#### WARNING!



#### Risk of injuries when assembling under pressure!

If you do not switch off the pressure before assembling the product, you might get injured and damage the device or system components.

- ▶ Connect the MPC 4614 particle counter first and then the pressure line.

- ▶ After completion of the measurement, first of all disconnect the hose end from the pressure line and then from the MPC 4614 particle counter.
- 

---

#### CAUTION!



#### Missing seals and caps will lead to non-compliance with protection class IP 54!

Liquids and contamination parts may penetrate and damage the product.

- ▶ Prior to assembling make sure that all seals and plugs of the plug-in connections are tight.
- 

---

#### CAUTION!



#### Damage to the product!

When assembling hydraulic lines and hoses under mechanical stress, they are exposed to additional mechanical forces during operation which could reduce the service life of the MPC 4614 particle counter and the entire machine and/or system.

- ▶ Assemble hydraulic lines and hoses without mechanical stress.
-

### 6.2.2 Installing the electrical system

If you want to operate the device in battery operation, ensure that the battery is charged (see chapter "8.2 State display").

For mains operation, the power pack must be connected to the 12 V voltage supply socket (see chapter "4.2 Device description" item 1) and the mains plug of the power pack must be connected to the 230 V power supply.

---

**CAUTION!****Short-circuit due to missing seals and caps!**

Fluids may enter the product and cause a short-circuit.

- ▶ Before commissioning, ensure that all seals and plugs of the plug-in connection are leak-proof.
-

## 7 Commissioning

---

**CAUTION!****Damage to the product!**

Commissioning the product requires basic hydraulic knowledge.

- ▶ Only qualified personnel (see section "2.3 Qualification of personnel") is authorized to commission the product.
- 

---

**CAUTION!****Danger of damage to property and personal injuries!**

If the product is not mounted correctly, persons could be injured or the product or system could be damaged when commissioning the product.

- ▶ Make sure that the product has been mounted correctly by qualified personnel before commissioning the product.
- 

---

**CAUTION!****Missing seals and caps will lead to non-compliance with protection class IP 54!**

Liquids and contamination parts may penetrate and damage the product.

- ▶ Before commissioning, ensure that all seals and plugs of the plug-in connection are leak-proof.
- 

### 7.1 First commissioning

#### 7.1.1 Commissioning the MPC 4614 particle counter

Proceed as follows to commission the product:

- Connect the low-pressure hose first (see chapter "6.2.1 Establishing the hydraulic connection of the MPC 4614 particle counter").
- Then connect the high-pressure hose (see chapter "6.2.1 Establishing the hydraulic connection of the MPC 4614 particle counter").
- If applicable, connect the 12 V DC supply voltage next (see chapter "6.2.2 Installing the electrical system").

#### 7.2 Re-commissioning after extended standstill

Proceed as follows to re-commission the product:

- Connect the low-pressure hose first (see chapter "6.2.1 Establishing the hydraulic connection of the MPC 4614 particle counter").
- Then connect the high-pressure hose (see chapter "6.2.1 Establishing the hydraulic connection of the MPC 4614 particle counter").
- If applicable, connect the 12 V DC supply voltage next (see chapter "6.2.2 Installing the electrical system").

## 8 Operation

### 8.1 Switching the device on

The device is switched on by pressing the ON/OFF switch (“-” switch position). After switch-on, the following display message appears on the MPC 4614 particle counter:

```
--MPC 4614--
Initialization
```

### 8.2 State display

After the initialization phase – the display flashes for ca. 10 seconds – the measurement data memory reserve and the battery reserve are displayed.

```
12 Memory : 92%
Battery : 75%
```

This message appears in the display for about 5 seconds.

If a printer is orderly connected to the MPC 4614, the heading “- - MPC 4614 - -” is printed out.

- ▶ For the connection of a printer see chapter “16 Extension and Conversion”.

If a longer measuring process is to be performed, check whether it is necessary to delete the measurement data memory in advance (see chapter “8.6.3 Deleting the measurement data memory”).

The memory capacity is enough for a total measurement period of ca. 30 hours.

In case of operation independent of the power pack, the battery should be sufficiently charged in advance. For this purpose, the MPC 4614 particle counter is connected to the power pack connected to the mains (see page 12 fig.1 item 1).



**Fig. 3: Power pack**

The charging control LED at the charging device (1) serves the control of the charging process.

At the beginning of the charging process, the LED is brightly illuminated if the battery is flat. In the course of the charging process, the brightness of the LED decreases more and more, in proportion to the increasing battery capacity.

As soon as the charging control LED goes out complete, the charging process is completed (max. 14 hours).

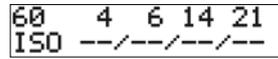
If it is completely charged, the battery is sufficient for a measurement period of ca. 15 hours.

The battery cannot be overcharged.

Permanent charging using the supplied charging device is not detrimental to the battery. It rather ensures the permanent readiness for operation of the MPC 4614.

### 8.3 Classification display

The display automatically changes into measurement operation.



The measurement always starts with an ISO 4406 coding.

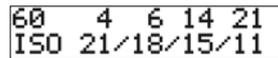
After completion of the first measurement, time, date and measurement point are written into the measurement data memory.

If a printer is connected, they are printed out automatically.

- ▶ For the connection of a printer see chapter "16 Extension and Conversion".
- ▶ For changing the measuring classes, see chapter "8.5 Selecting the measuring classes"

After completion of the measurement, the result is shown in the display.

The measuring time is 60 seconds and shown in the upper left corner of the display, whereas there is a countdown from 60 to 0 seconds.



In the upper line, the measuring time countdown is displayed on the left side. Beside it, the equivalent diameters are specified from left to right.

In the lower line, the classification is displayed on the left side. Beside it, the pertaining class numbers are specified from left to right.

The result remains in the display until the measurement result of the following measurement is received.

### 8.4 Switching the display illumination on/off

After switch-on of the MPC 4614 particle counter, the display illumination is switched on.

- ▶ By pressing the SELECT button, the display illumination is switched off.
- ▶ By pressing the SELECT button again, the display illumination is switched on again.

The display illumination can only be switched on and off using the SELECT button in the state and classification display.

By switching the display illumination off, the operating time can be considerably increased in battery operation.

## 8.5 Selecting the measuring classes

In order to change the measuring class, press the MODE button before or during measuring operation so often until the desired measuring class appears on the display.

From the next measurement, the measuring values will be displayed according to this set class.

The following measuring classes can be selected:

At the beginning of the measurement (default selection):

Classification according to ISO 4406:

```
60 4 6 14 21
ISO 21/18/15/11
```

- ▶ Press MODE button

Classification according to AS 4059:

```
60 4 6 14 21
AS 11/10/ 9/ 8
```

- ▶ Press MODE button

Classification according to NAS 1638:

```
60 5-15 15-25
NAS1638 12/ 10
```

- ▶ Press MODE button

State display (see chapter "8.2 State display"):

```
12 Memory : 92%
Battery : 75%
```

- ▶ Press MODE button

Operating menu (see chapter "8.6 Operating menu"):

```
2
Control Menu: no
```

- ▶ Press MODE button

Classification according to ISO 4406 (default selection / see above).

## 8.6 Operating menu

Within the operating menu, the user can select the measurement point and print and/or delete the measuring data memory.

While the settings are made in the operating menu, no measurement / particle count is performed.

- ▶ The operating menu is called using the MODE button (see chapter “8.5 Selecting the measuring classes”)

```
2
Control Menu: no
```

- ▶ Using the SELECT button, you can switch between “yes” and “no”.

```
2
Control Menu: yes
```

- ▶ If using the MODE button, you confirm the selection “no” in the operating menu, you will be taken back to the selection of the measuring classes (see chapter “8.5 Selecting the measuring classes”).
- ▶ If using the MODE button, you confirm the selection “yes” in the operating menu, you will be taken to the “Select measurement point” menu (see chapter “8.6.1 Selecting the measurement point”).

```
Measurem. Points
```

- ▶ If you press the SELECT button once again, you are taken to the “Print data” menu (see chapter “8.6.2 Printing the measuring data memory”).

```
Print Data
```

- ▶ If you press the SELECT button once again, you are taken to the “Delete memory” menu (see chapter “8.6.3 Deleting the measuring data memory”).

```
Delete Memory
```

- ▶ By pressing the SELECT button again, you return to the “Selecting the measurement point” menu.

### 8.6.1 Selecting the measurement point

8 different measurement points can be selected. The measurement point are stored in the memory with time stamp so that the measuring data can afterwards be assigned to the relevant measurement points.

```
Measurem. Points
```

- ▶ Using the MODE button, the selection of the measurement point is confirmed.

```
Choose
Meas. Point1
```

- ▶ By pressing the SELECT button repeatedly, all eight implemented measurement points can be selected.

Operation

This selection method is cyclical and returns to the “Measurement point 1” display.

- ▶ The selected measurement point is determined by means of the MODE button. The default measurement point is measurement point 1.

The display automatically switches back into the operating menu. In the upper left corner, the current measurement point (M) is displayed.

```
Meas.Point:1
Control Menu:yes
```

### 8.6.2 Print the measuring data memory

- ▶ Using the SELECT button, the “Print data” menu is selected.

```
Print Data
```

- ▶ Using the MODE button, the printer is started.

If the MPC 4614 particle counter is connected to a printer (see chapter “9 Printer (optional)”), the data from the measuring data memory is printed out on the printer after the MODE button has been pressed.

The display automatically switches back into the operating menu.

```
2
Control Menu:yes
```

If no printer is connected to the MPC 4614 particle counter, the display automatically switches back into the operating menu after some seconds.

### 8.6.3 Deleting the measuring data memory

- ▶ Using the SELECT button, the “Delete memory” menu is selected.

```
Delete Memory
```

- ▶ After pressing the MODE button, the safety prompt appears.

```
Delete
Memory? no
```

- ▶ Using the SELECT button, you can switch between “yes” and “no”.

```
Delete
Memory? yes
```

- ▶ Using the MODE button, the memory is deleted.

```
Memory deleted
```

The display automatically switches back into the operating menu.

```
2
Control Menu: no
```

## 9 Printer (optional)

For recording the measuring values of the MPC 4614 particle counter, the latter can be connected to an optionally available printer.

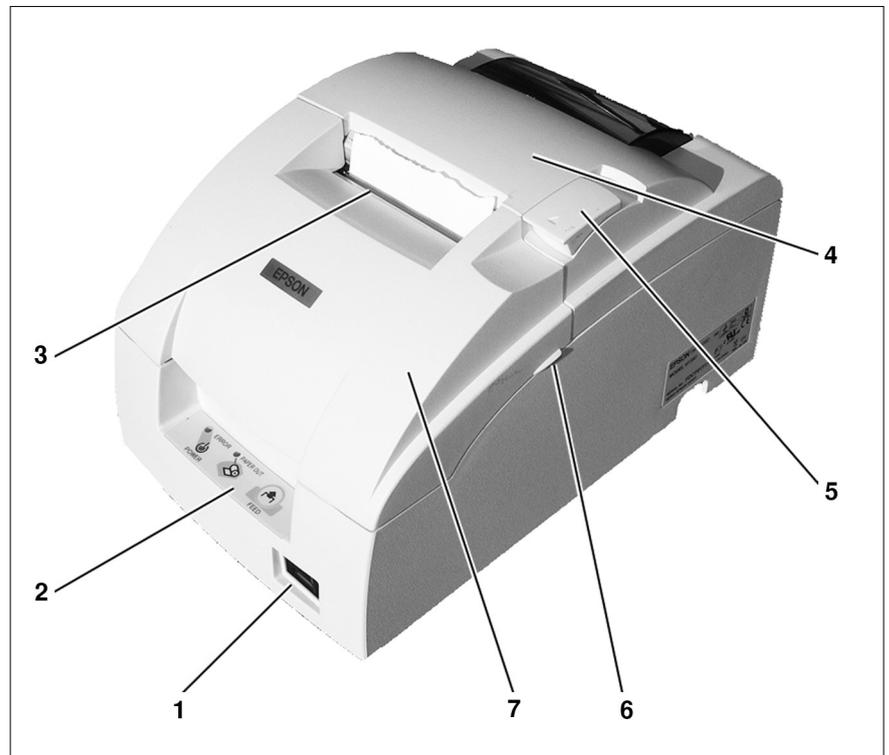


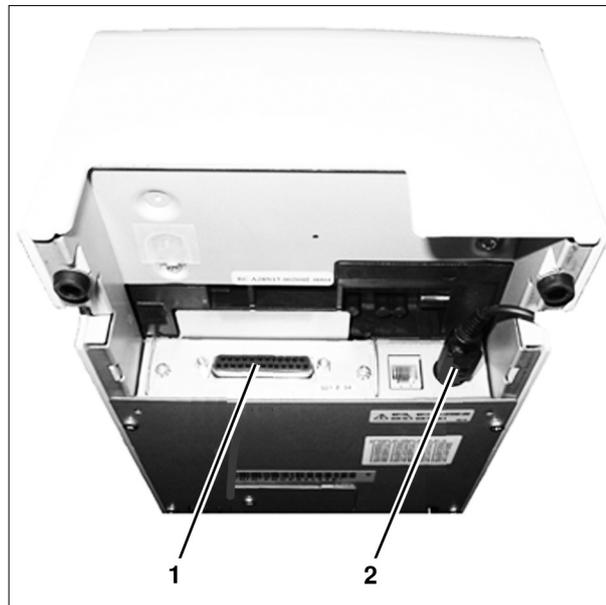
Fig. 4: Printer

- 1 On / off switch
- 2 Operating panel
- 3 Paper cutter
- 4 Paper roll cover
- 5 Opening lever
- 6 Clip ribbon cartridge cover
- 7 Ribbon cartridge cover

## Printer (optional)

## 9.1 Commissioning

The printer is connected to the MPC 4614 particle counter using a serial printer cable V.24 (see chapter "16.1.8 Printer connection cable V.24 / RS 232").



**Fig. 5: Printer bottom side**

- 1 Printer connection
- 2 Power pack connection

- ▶ For this purpose, the socket of the cable is connected with the RS232C plug-in connector at the device front of the MPC 4614 particle counter (see page 12 fig. 1 item 4) and the plug-in connector of the cable with the corresponding socket (1) on the bottom side of the printer.
- ▶ The 24 V plug-in connector of the power pack is plugged into the corresponding socket (2) on the bottom side of the printer and the mains plug is connected with a Schuko socket 100 - 230 V.

## 9.2 Operating panel

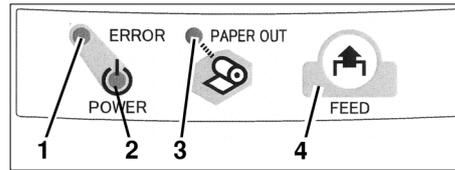


Fig. 6: Operating panel

- 1 Error display (ERROR)
- 2 Operating display (POWER)
- 3 Paper end display (PAPER OUT)
- 4 Paper feed button (FEED)

The error display (ERROR) (1) is illuminated if the printer is offline. This is the case if either no more paper is available or if the paper roll cover (see page 23 fig. 4 item 4) is open.

The operating display (POWER) (2) is illuminated if the device is switched on.

The paper end display (PAPER OUT) (3) is illuminated if the paper roll is almost or completely used up.

The paper feed button (FEED) (4) is used for the paper feed.

### 9.2.1 Switching the printer on/off

The printer is switched on and off using the on/off switch (see page 23 fig. 4 item 1).

Printer (optional)

### 9.3 Exchanging the ribbon cartridge

- ▶ Open the ribbon cartridge cover. In order to do so, lift it at the laterally attached clips (see page 22 fig. 4 item 6) simultaneously.

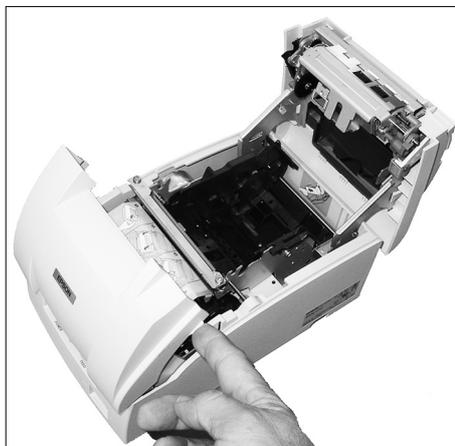


Fig. 7: Opening the ribbon cartridge cover

- ▶ For removal out of the device, the ribbon cartridge is firstly lifted at the left side and then also on the right side.

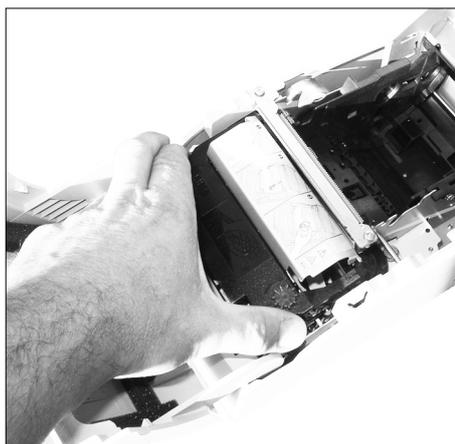


Fig. 8: Removing the ribbon cartridge

- ▶ By turning the button in the direction of the arrow two to three times, the ribbon is tensioned.

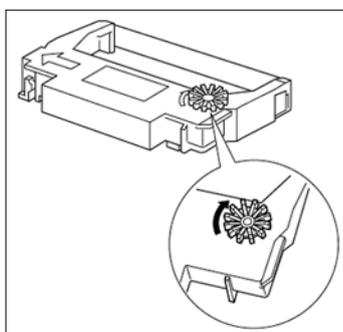


Fig. 9: Tensioning the ribbon cartridge

- ▶ The ribbon cartridge is re-installed in the device according to page 25 fig. 8. In this connection it has to be made sure that the ribbon between the print head and the pressure plate is smooth and wrinkle-free.
- ▶ The ribbon cartridge is pressed downwards until it noticeably locks in place.
- ▶ The ribbon cartridge cover is closed.

#### 9.4 Inserting the paper roll

- ▶ The paper roll cover (see page 22 fig. 4 item 4) is opened by pressing the opening lever (see page 22 fig. 4 item 5) in the direction of the housing backside and simultaneously lifting the cover.



Fig. 10: Opening the paper roll cover

- ▶ The paper roll compartment is now accessible. The paper roll is inserted according to fig. 11.

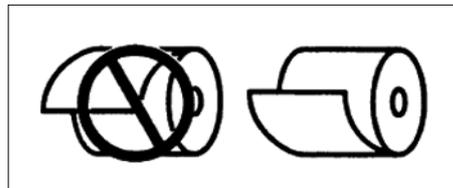


Fig. 11: Position of the paper roll

- ▶ After insertion of the paper roll into the paper roll compartment, the paper roll cover can be closed and the protruding paper strip can be torn off at the paper cutter (see page 22 fig. 4 item 3), if necessary.

## Pump (optional)

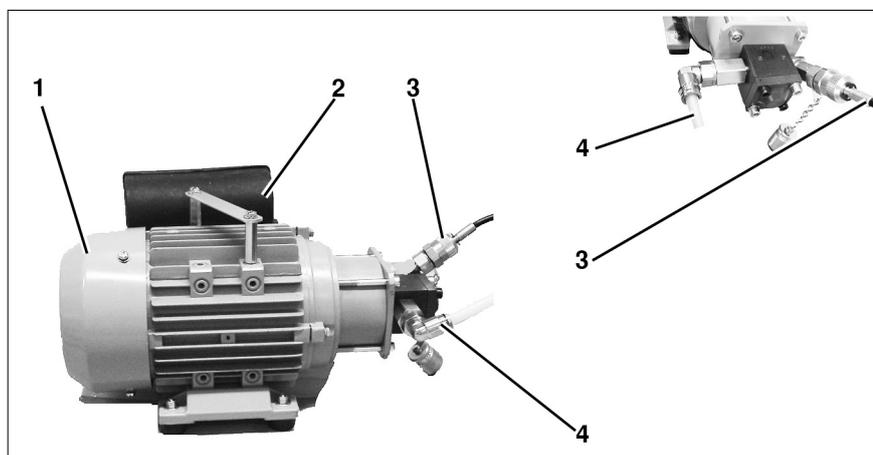
## 10 Pump (optional)

If the pressure at the media input of the MPC 4614 particle counter is smaller than 12 bar (see chapter "18 Technical data"), an optionally available pump can be installed between the withdrawal point (oil barrel, etc.) and the MPC 4614 particle counter as pressure amplifier. This increases the pressure to the required system pressure.

### 10.1 Technical data

**Table 2: Device data**

|                                     |               |
|-------------------------------------|---------------|
| Power                               | 0.18 kW       |
| Current consumption                 | 1.52 kW       |
| Voltage                             | 230 V, 50 Hz  |
| Speed                               | 1,354 U/min-1 |
| Protection class EN 60259 / IEC 529 | IP55          |

**Fig. 12: Pump**

- 1 Pump
- 2 Connection box with on/off switch and mains plug 230 V
- 3 Media output
- 4 Media input

## 10.2 Commissioning

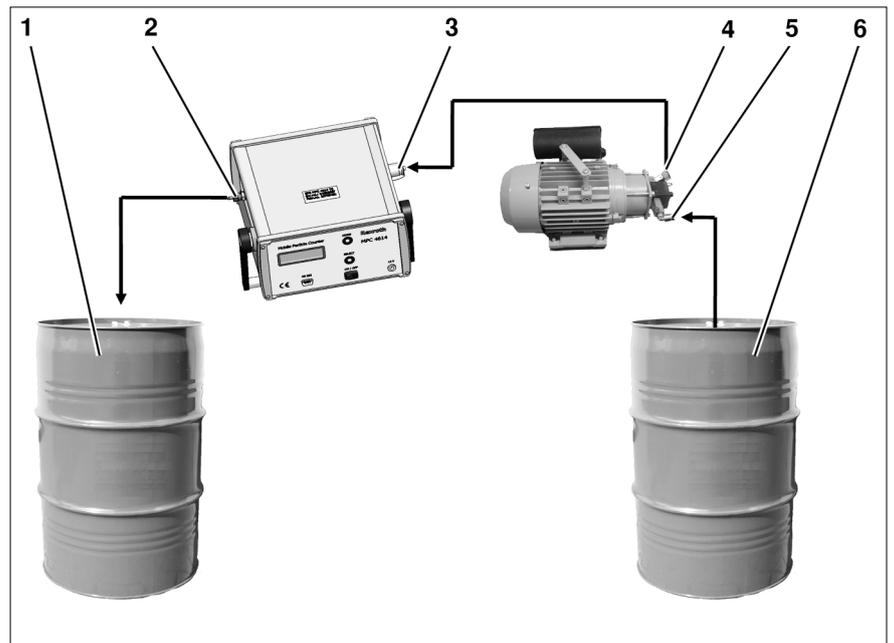


Fig. 13: Connecting the pump

- 1 Media collection tank
- 2 Media output MPC 4614 particle counter
- 3 Media input MPC 4614 particle counter
- 4 Media output pump
- 5 Media input pump
- 6 Media withdrawal tank

- ▶ The mains plug of the pump is connected to the voltage grid (230 V, 50 Hz).
- ▶ The suction line is led into the tank with the medium to be tested (6) and connected with the media input of the pump (5).
- ▶ The pressure line is connected to the media output of the pump (4) and the media input of the MPC 4614 particle counter (3). (see also chapter "6.2.1 Establishing the hydraulic connection of the MPC 4614 particle counter").
- ▶ The pump is switched on by pressing the On/Off button.



The pump is equipped with a thermal circuit breaker. In case of overload or overtemperature, this switch will be triggered. The pump is switched off.

Allow the pump to cool down and remove any blocking on the suction and pressure side, if applicable.

After cooling down, the pump can be switched on again by pressing the On/Off button.

## 11 Software (optional)

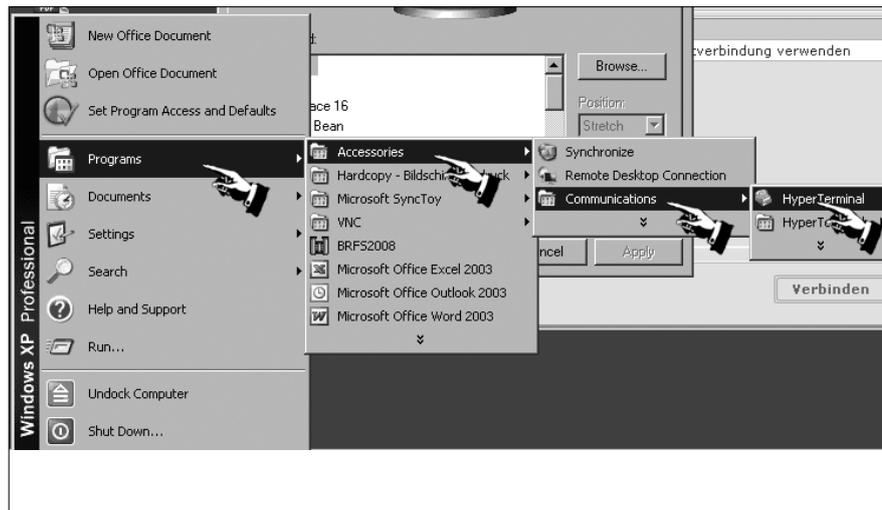
### 11.1 HyperTerminal

The transfer of the data from the MPC 4614 into a text file on the PC is completed by means of the “HyperTerminal” program as follows.

This program has already been pre-installed on most PCs with MS Windows®. If this is not the case, please contact your system administrator.

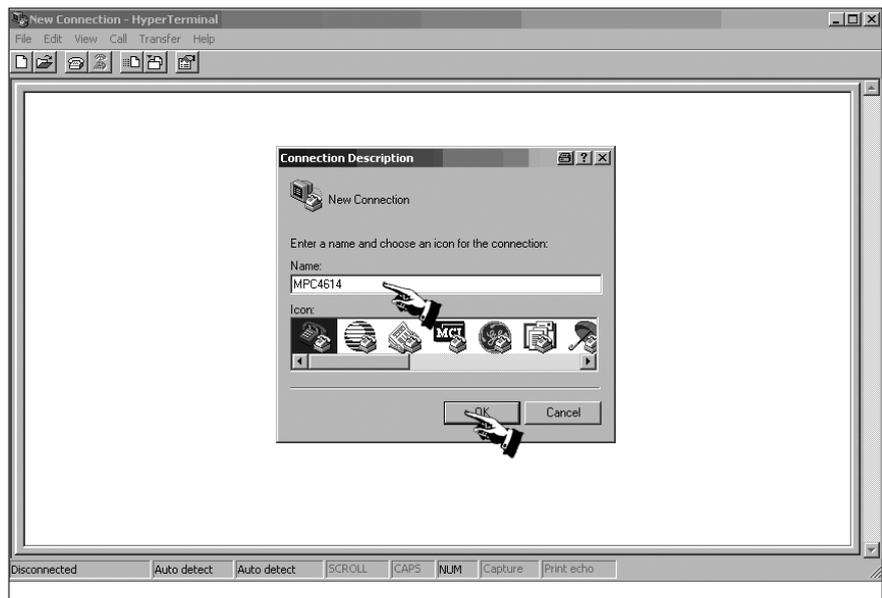
#### Step 1: Start HyperTerminal:

- ▶ Start - Programs - Accessories - Communication - HyperTerminal



#### Step 2: Enter the name of the connection:

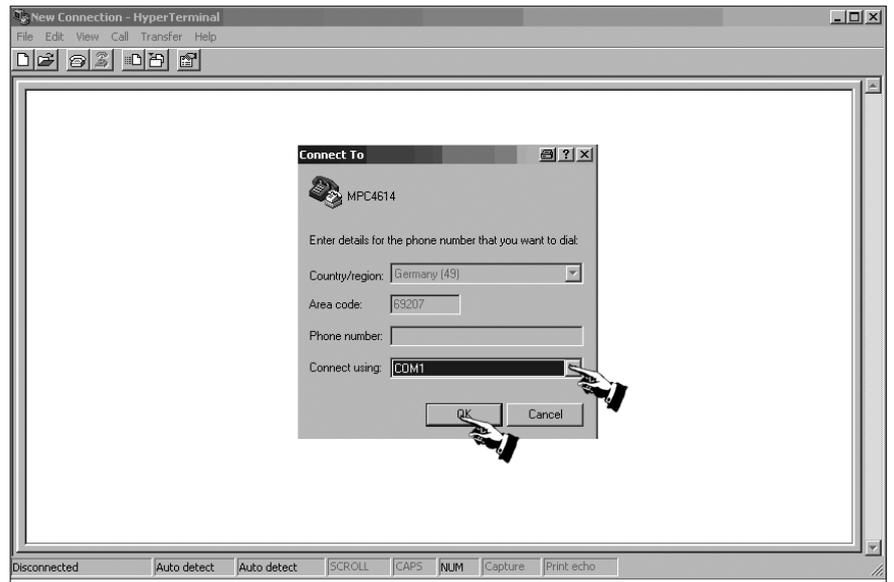
- ▶ Enter “MPC4614”
- ▶ Select an arbitrary symbol
- ▶ Press “OK”



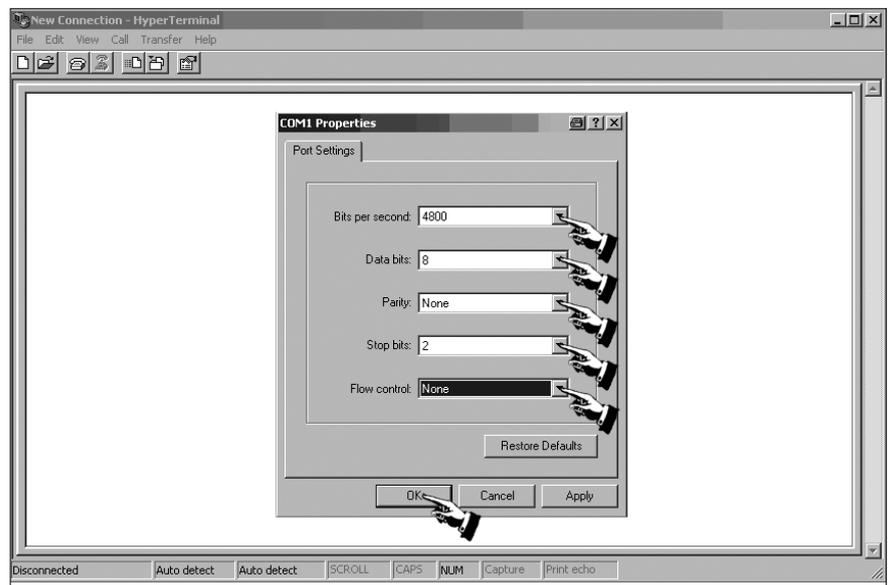
**Step 3: Select the COM port:**

This is the port at the computer, at which the cable to the MPC has been connected.

- ▶ Press “OK”.

**Step 4: Configure the COM port:**

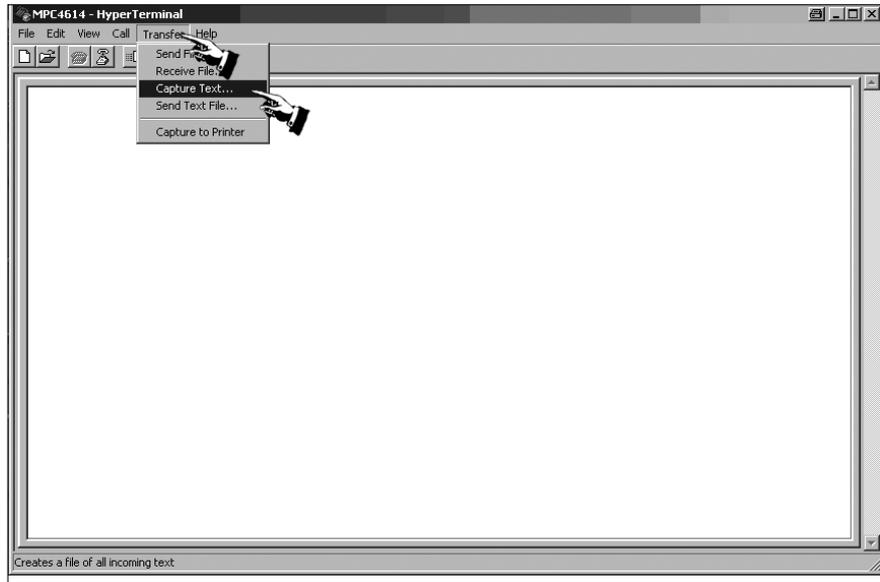
- ▶ Make the settings (as shown in the figure)
- ▶ Press “OK”



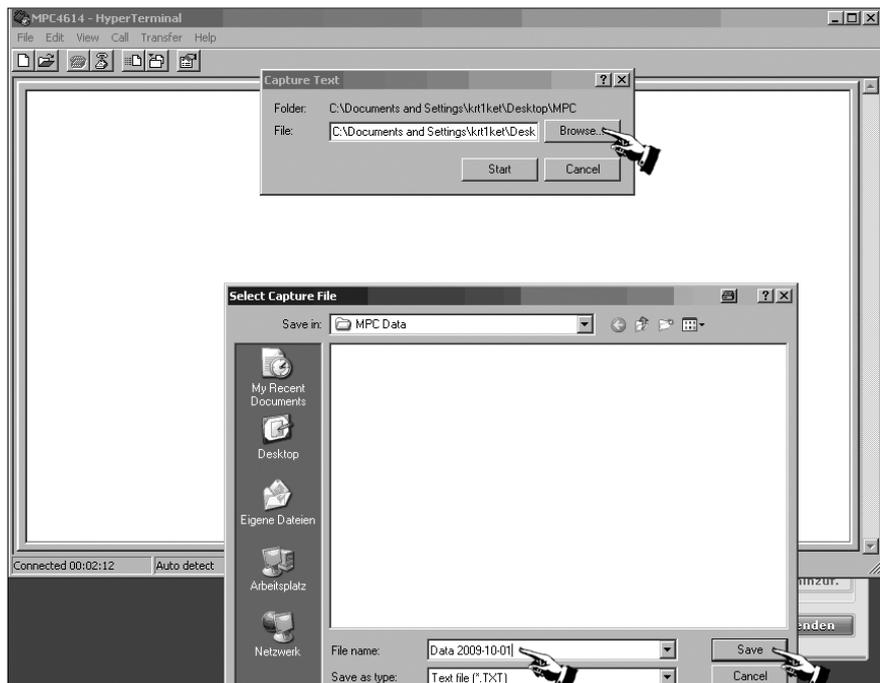
## Software (optional)

**Step 5: Prepare HyperTerminal for the data transfer:**

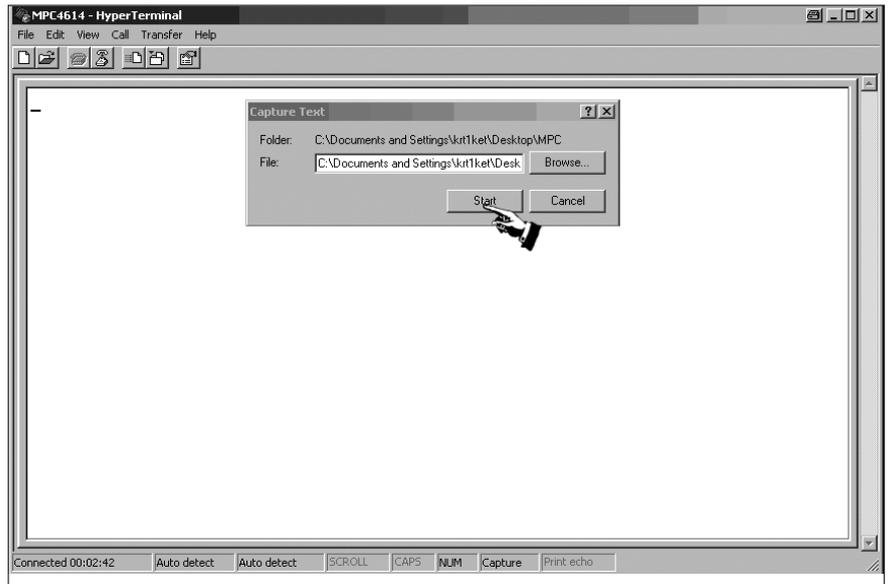
- ▶ Select “Transfer” in the tool bar
- ▶ Select “Capture text”



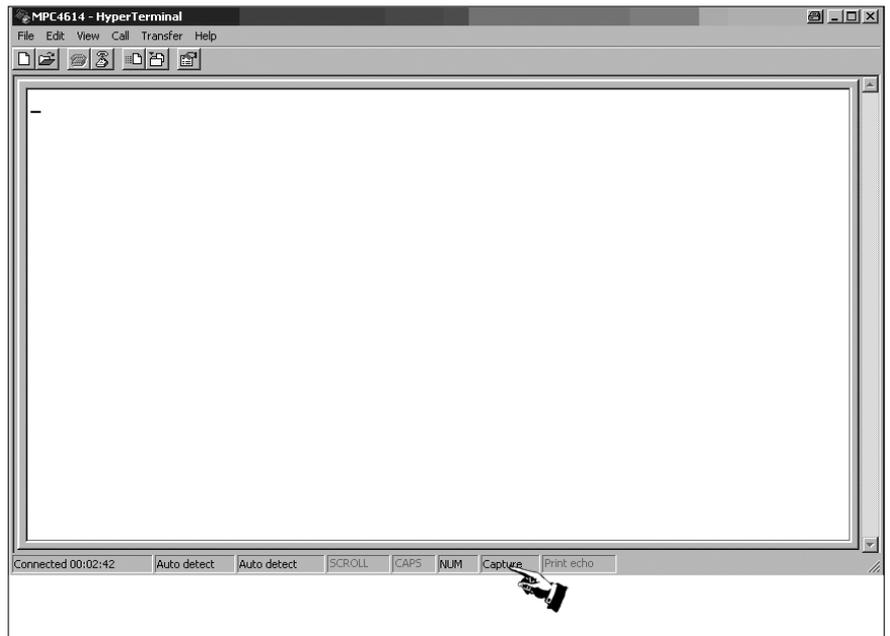
- ▶ Specify the storage location
- ▶ Press “Save”



► Press "Start".



► In the lower part of the HyperTerminal, "Capture" is now shown in black.



## Software (optional)

The program is ready for the data transfer.

**Step 6: Start the data transfer at the MPC 4614:**

- ▶ Press the MODE button several times until the following display appears:

```
2
Control Menu: no
```

- ▶ By pressing the SELECT button, switch to "yes":

```
2
Control Menu: yes
```

- ▶ If you press the MODE button, the following display will appear:

```
Measurem. Points
```

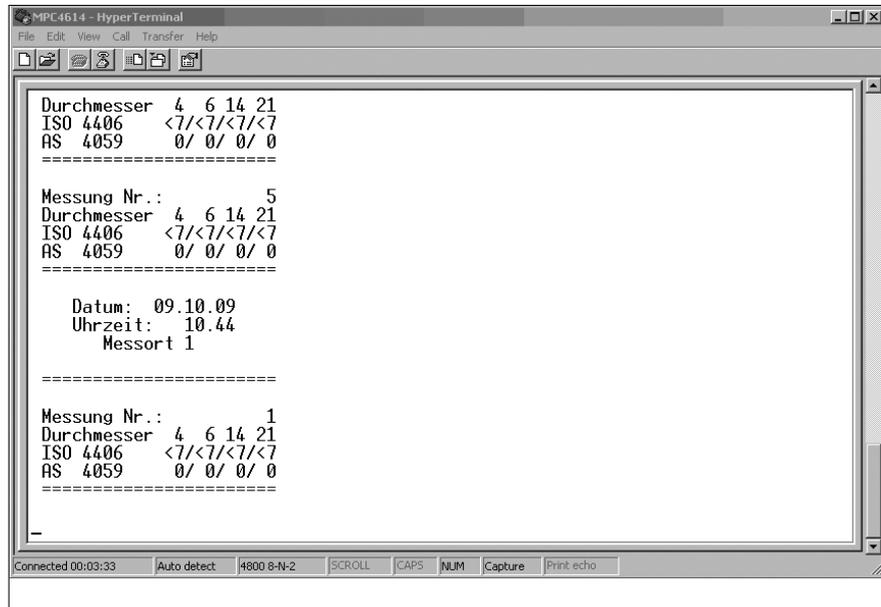
- ▶ By pressing the SELECT button, select "Print data":

```
Print Data
```

- ▶ Start the transfer process by pressing the MODE button:

```
Print...
```

- ▶ At the PC, the transfer of the data can be tracked in HyperTerminal:



After completion of the transfer process, the following message appears in the display of the MPC 4614:

```
2
Control Menu: yes
```

- ▶ By pressing the SELECT button, switch to “no”:

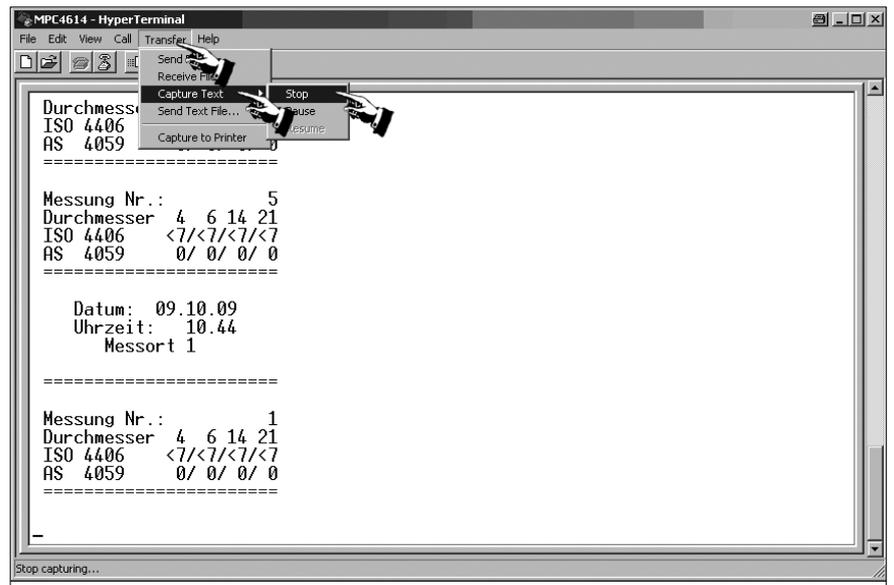
```
2  
Control Menu: no
```

- ▶ Using the MODE button, go back to the default display:

```
60 4 6 14 21  
ISO 21/18/15/11
```

Terminating the data capture in HyperTerminal:

- ▶ “Transfer” - “Capture text” - “Stop”

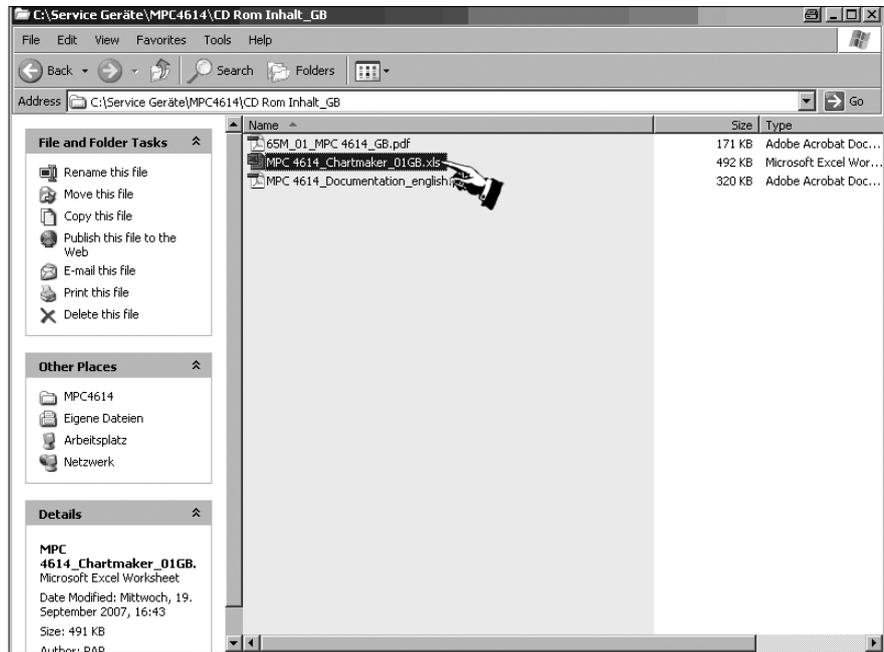


The “HyperTerminal” program can now be closed.

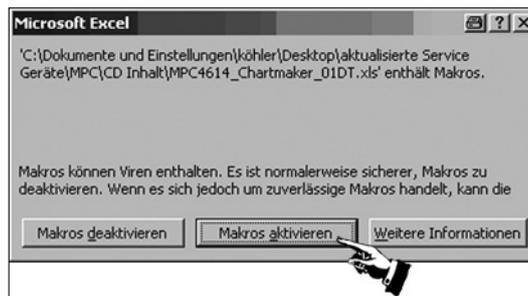
## 11.2 REXROTH Chartmaker tool

This program serves the analysis and graphical presentation in MS Excel®.

### Step 1: Start “Chartmaker”:



- A selection window appears. Here, you have to select “Activate macros”.



If this selection window does NOT appear, your macro security in MS EXCEL® is presumably set to “high”. In this case, it is unfortunately NOT possible to use the Chartmaker tool! Your EDP administrator can surely help you. The macro security must be set to “medium”.

After the start, the following display appears:

### MPC 4614 Chartmaker 01GB

**Rexroth**  
Bosch Group

Path

C:\Documents and Settings\krt1\ket\Desktop\MPC Data

Load file

Attach Data

Data analysis

30.10.09 : 15,37 - Meas.Point 1

Delete Data

**Measurement from 30.10.09 : 15,37 - Meas.Point 1 - ISO 4406**

| Number of measurements | Oil cleanliness code ISO 4406 |
|------------------------|-------------------------------|
| 1                      | 7                             |
| 2                      | 7                             |
| 3                      | 7                             |
| 4                      | 7                             |
| 5                      | 7                             |
| 6                      | 7                             |
| 7                      | 7                             |
| 8                      | 7                             |
| 9                      | 7                             |
| 10                     | 7                             |
| 11                     | 7                             |
| 12                     | 7                             |
| 13                     | 7                             |
| 14                     | 7                             |
| 15                     | 7                             |
| 16                     | 7                             |
| 17                     | 7                             |
| 18                     | 7                             |
| 19                     | 7                             |
| 20                     | 7                             |
| 21                     | 7                             |
| 22                     | 7                             |
| 23                     | 7                             |
| 24                     | 7                             |
| 25                     | 7                             |
| 26                     | 7                             |

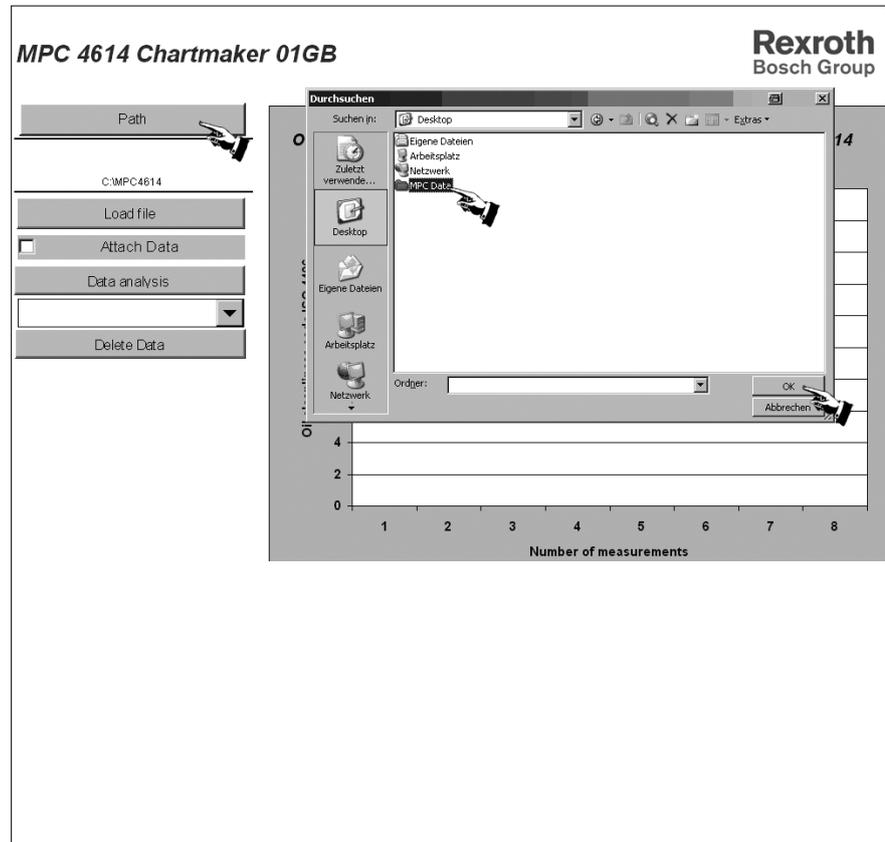
## Software (optional)

**Step 2: Select the storage location of the data:**

- ▶ Click on the "Path" pushbutton
- ▶ Select the storage location of the data

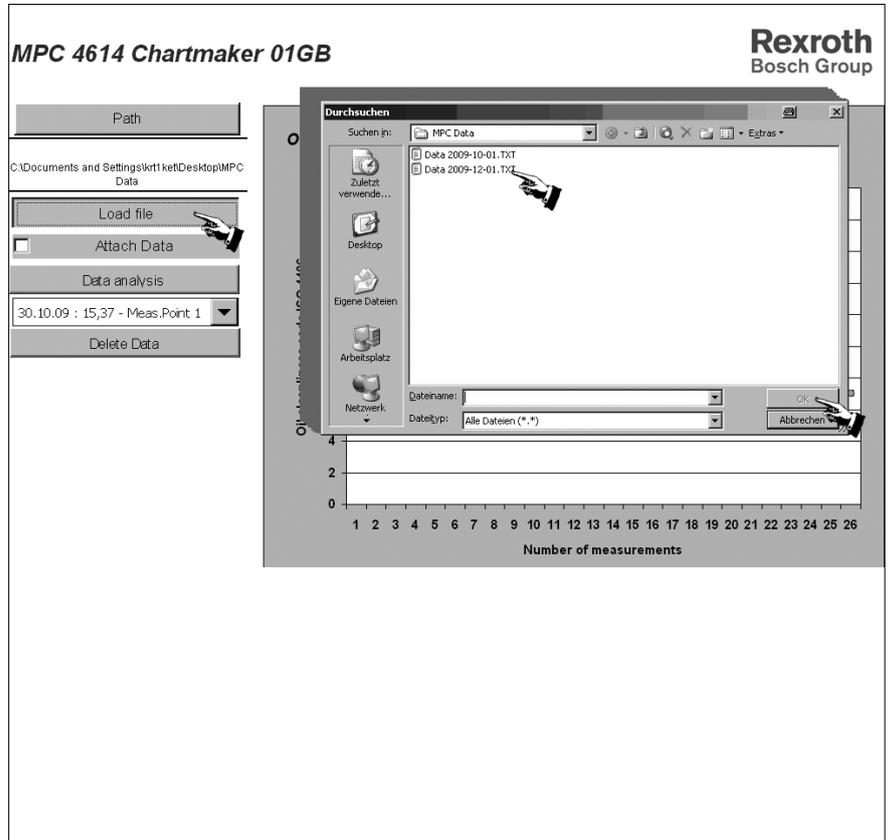
**ATTENTION! The files are NOT displayed. Only the directory is selected!**

- ▶ Press "OK"



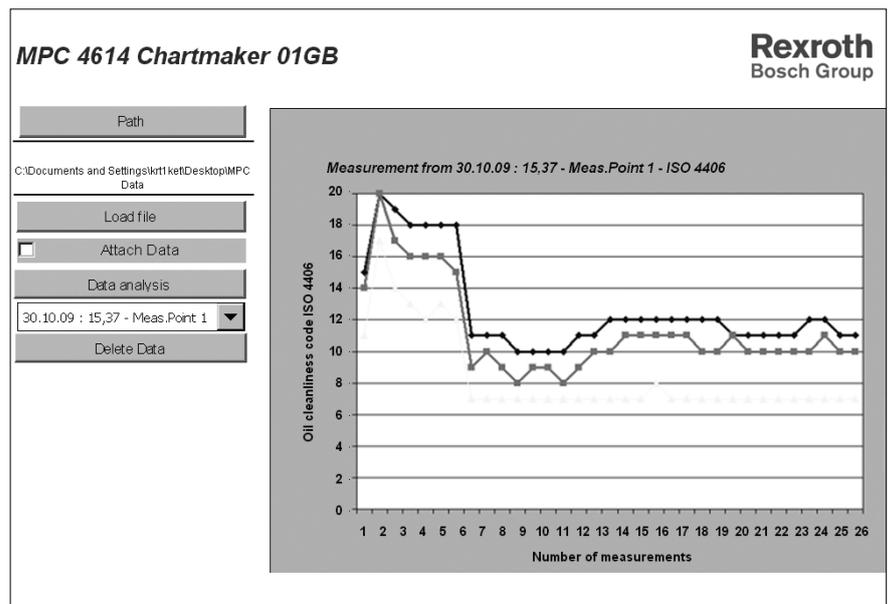
**Step 3: Load data from path:**

- ▶ Click on the “Load file” pushbutton
- ▶ Select the .txt file saved using HyperTerminal (see chapter “11.1 HyperTerminal”)
- ▶ Press “OK”
- ▶ Press the “Load file” pushbutton



The data is now being imported and analyzed.

Then, the following display appears:



Software (optional)

On the left side, you can now select and display different measurement points:

**MPC 4614 Chartmaker 01GB**


Path

C:\Documents and Settings\skrt1\kett\Desktop\MPC Data

Load file

Attach Data

Data analysis

30.10.09 : 15,37 - Meas.Point 1

**30.10.09 : 15,37 - Meas.Point 1**

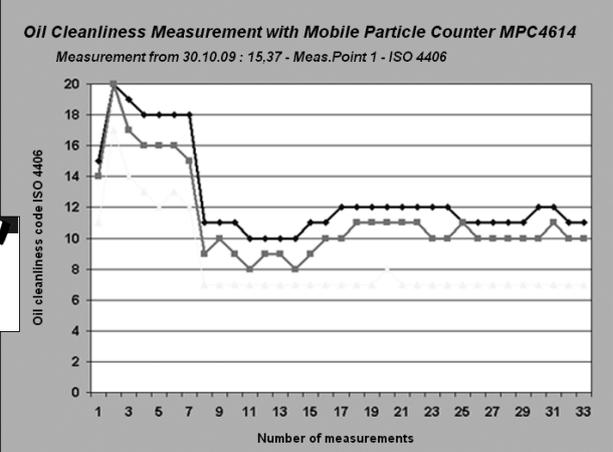
03.11.09 : 12,43 - Meas.Point 1

05.11.09 : 15,17 - Meas.Point 1

06.11.09 : 3,32 - Meas.Point 1

06.11.09 : 3,33 - Meas.Point 1

06.11.09 : 3,35 - Meas.Point 1



**Oil Cleanliness Measurement with Mobile Particle Counter MPC4614**  
Measurement from 30.10.09 : 15,37 - Meas.Point 1 - ISO 4406

If more data is to be loaded, you can connect and simultaneously display several files by clicking on the “Attach Data” pushbutton BEFORE loading:

**MPC 4614 Chartmaker 01GB**


Path

C:\Documents and Settings\skrt1\kett\Desktop\MPC Data

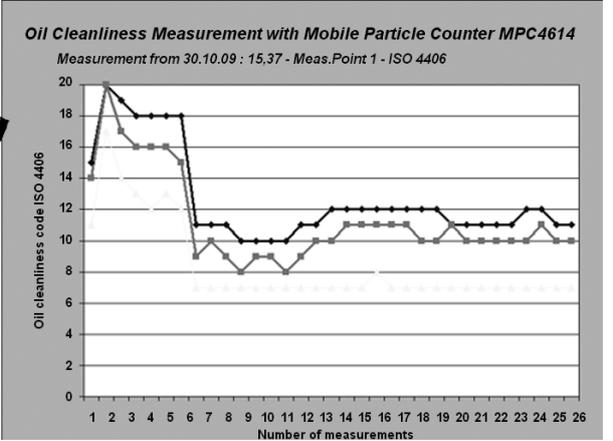
Load file

**Attach Data**

Data analysis

30.10.09 : 15,37 - Meas.Point 1

Delete Data



**Oil Cleanliness Measurement with Mobile Particle Counter MPC4614**  
Measurement from 30.10.09 : 15,37 - Meas.Point 1 - ISO 4406

## 12 Maintenance and repair

### 12.1 Cleaning and care (maintenance)

---

**CAUTION!****Any dirt or liquids penetrating the device lead to malfunctions!**

Safe function of the MPC 4614 particle counter is no longer ensured.

- ▶ Always provide for utmost cleanness when working on the hydraulic system.
  - ▶ Do not use a high-pressure cleaner.
- 

**CAUTION!****Damage to the surface caused by solvents and aggressive detergents!**

Aggressive detergents may damage the seals of the MPC 4614 particle counter and let them age faster.

- ▶ Never use solvents or aggressive detergents.
  - ▶ Do not use a high-pressure cleaner for cleaning.
- 

**CAUTION!****Damage to the hydraulic system and to the seals!**

A high-pressure cleaner's water pressure could damage the hydraulic system and the seals of the MPC 4614 particle counter. The water displaces the oil from the hydraulic system and seals.

- ▶ Do not use a high-pressure cleaner for cleaning.
- 

Cover all openings with the appropriate protective caps/devices.

Check that all seals and plugs for the plug-in connections are firmly fitted so that no humidity can penetrate the MPC 4614 particle counter.

Only clean the MPC 4614 particle counter using a dry, lint-free cloth.

## 12.2 Maintenance

If used as intended the MPC 4614 particle counter is maintenance-free.



Please note that the device must be subjected to an annual calibration by the manufacturer. If this calibration is not performed, the warranty will forfeit.

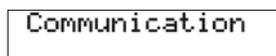
### 12.2.1 Setting the time

If it is necessary to reset the time, proceed as follows:

1. Via the optional connection cable, connect the RS232 interface at the MPC4614 with the corresponding interface at the PC (see page 12 fig. 1 item 4).
2. Switch on the MPC4614. Select the "Selecting the measurement point" menu item of the operating menu (see chapter "8.6.1 Selecting the measurement point")
3. At the PC, start the program PZTIME.EXE (on the software CD)



4. The current PC time and the current PC date are now displayed.
5. Press the "Send to particle counter" pushbutton.
6. "Communication" shortly appears in the display of the MPC4614.



7. Afterwards, the MPC4614 has automatically saved the time and quit the operating menu. The time has been set.
8. Close the PC program.
9. Switch off the MPC 4614.
10. Separate the connection.

## 12.3 Repair

Bosch Rexroth offers a wide range of repair services for the MPC 4614 particle counter.

Repairs at the MPC 4614 particle counter may only be performed by the manufacturer or their authorized dealers and branches. No warranty is accepted for independently performed repairs.

## 12.4 Spare parts

### CAUTION!



#### Damage to property and personal injuries due to faulty spare parts!

Spare parts that do not meet the technical requirements specified by Bosch Rexroth may cause personal injuries and damage to property.

- ▶ Only use genuine spare parts from Bosch Rexroth.

- ▶ Order spare parts in writing. In urgent cases you can also order by phone, but are kindly requested to confirm your order in writing, e.g. by fax.
- ▶ Please send your spare parts order to the Bosch Rexroth service next to you or directly to the headquarters.
- ▶ When ordering spare parts, please indicate the following information from the name plate:
  - The serial number
  - The order number
- ▶ Please indicate the following details from the parts list:
  - The drawing number
  - The item number
  - The exact denomination
  - The material number
- ▶ Additionally indicate:
  - The desired number of spare parts
  - The desired type of dispatch (e.g. as parcel, freight, air freight, by courier service, etc.).

The following spare parts are available for the MPC 4614 particle counter:

Table 3: Spare parts

| Component                 | Material number |
|---------------------------|-----------------|
| <b>DN4 end cap</b>        | R928035584      |
| <b>Cap nut</b>            | R928035583      |
| <b>DN4 hose, 2 m</b>      | R928035582      |
| <b>Minimesh hose, 2 m</b> | R928035581      |
| <b>DN6 end cap</b>        | R928035588      |

Please refer to the Internet at [www.boschrexroth.com](http://www.boschrexroth.com) for addresses of foreign subsidiaries.

## 13 Decommissioning

The MPC 4614 particle counter is a component that does not require decommissioning. As a result, this chapter of the instructions does not contain any information.

## 14 Disassembly and replacement

This chapter does not contain any information for your device.

## 15 Disposal

### 15.1 Environmental protection

Careless disposal of the MPC 4614 particle counter and the hydraulic fluid could lead to pollution of the environment.

- ▶ Thus, dispose of the MPC 4614 particle counter and the hydraulic fluid in accordance with the currently applicable national regulations in your country.
- ▶ Dispose of hydraulic fluid residues according to the respective safety data sheets valid for these hydraulic fluids.
- ▶ Dispose of the lead accumulators in accordance with the currently applicable national regulations in your country.

## 16 Extension and conversion

Do not retrofit the MPC 4614 particle counter.



The Bosch Rexroth warranty applies to the delivered configuration and extensions considered in this configuration. After an extension or a conversion exceeding the conversions and extensions described here, the warranty will be forfeit.

Unauthorized conversions or extensions that are not described in this chapter will invalidate the CE mark.

### 16.1 Optional accessories

#### 16.1.1 Suitcase for MPC 4614 particle counter

For the transport of the MPC 4614 particle counter, a cushioned suitcase can be used.

Order number: R928019608

#### 16.1.2 Printer

For documenting the measuring data, a printer can be connected to the MPC 4614 particle counter (see chapter "9 Printer (optional)").

Order number: R928019602

#### 16.1.3 Suitcase for printer

For the transport of the optional printer, a cushioned suitcase can be used.

Order number: R928019609

#### 16.1.4 Pump

If the pressure at the media input is smaller than 12 bar (see chapter "18 Technical data"), the use of a pump for counting tank and bottle samples is recommended (see chapter "10 Pump (optional)").

Order number: R928019603

#### 16.1.5 Suitcase for pump

For the transport of the optional pump, a cushioned suitcase can be used.

Order number: R928019610

**Extension and conversion****16.1.6 Software**

For analyzing the measuring data, a software especially adjusted to the requirements of the MPC 4614 particle counter can be used (see chapter "11 Software (optional)").

For connection to a PC, a connection cable is required which must be ordered separately (see chapter "16.1.7 Connection cable PC serial" or chapter "16.1.9 Connection cable USB").



System requirements:

MS Windows® XP® or higher

MS Windows® HyperTerminal

MS Excel® 10.0 or higher

Serial interface COM port RS232 or USB (see connection cable)

Order number: R928019604

**16.1.7 Connection cable PC serial**

Order number: R928019605

**16.1.8 Connection cable printer V.24 / RS 232**

Order number: R928019606

**16.1.9 Connection cable PC USB**

Order number: R928019607

## 17 Troubleshooting

### 17.1 How to proceed for troubleshooting

- ▶ Always act systematically and targeted, even when pressed for time. Random and imprudent disassembly and readjustment of settings might result in the inability to restore the original error cause.
- ▶ First get a general idea of how your product works in conjunction with the entire system.
- ▶ Try to find out whether the product has worked properly in conjunction with the entire system before the error occurred first.
- ▶ Try to determine any changes of the entire system in which the product is integrated:
  - Were there any changes to the product's operating conditions or operating range?
  - Were there any changes or repair works on the entire system (machine/system, electrics, control) or on the product? If so: What were they?
  - Was the product or machine used as intended?
  - How did the malfunction appear?
- ▶ Try to get a clear idea of the error cause. Directly ask the (machine) operator.

If you could not remedy the occurred fault, please contact one of the addresses you find at <http://www.boschrexroth.com>.

If the device does not accept entries any more, switch it off and on again after some seconds. After the initialization, the particle counter will continue as usual.

## 18 Technical data

**Table 4: Device data**

| Device data                         |  |
|-------------------------------------|--|
| Measurement technology              | Optical particle counter with integrated sensor flow conditioning  |
| Measuring principle                 | Light extinction method, for particles larger than 4 $\mu\text{m}$ (c) equivalent diameter   |
| Max. particle concentration         | 40,000 particles/ml  |
| Measurement results                 | According to ISO 4406 and AS 4059 for the particles > 4 $\mu\text{m}$ (c), 6 $\mu\text{m}$ (c), 14 $\mu\text{m}$ (c), and 21 $\mu\text{m}$ (c) |
| Display                             | LC display with background lighting<br>2x16 characters   |
| Operating elements                  | On / off switch and 2 menu buttons   |
| Printer and data interface          | RS 232 C (EIA 232)   |
| Data memory                         | Non-volatile, sufficient for a measurement period of ca. 30 hours.   |
| Real-time clock                     | Recording of date and time at the beginning of the measurement   |
| Auxiliary energy                    | Installed battery for a measurement period of ca. 15 hours   |
| Charging device (Germany)           | 230 V, 50 Hz, 12 V, 600 mA at charging socket  |
| Charging device (outside Germany)   | 90-230 V, 50 Hz, 12 V, 600 mA at charging socket   |
| Calibration                         | Comparative measurement with test oil  |
| Accuracy                            | $\pm 0.5$ classes  |
| Protection class EN 60529 / IEC 529 | IP 54  |
| Product weight                      | ca. 5 kg   |
| Dimensions (width x height x depth) | 233 x 121 x 300 [mm]   |

**Table 5: Hydraulic data**

| Hydraulic data                    |  |
|-----------------------------------|--|
| Temperature range for application | 5-40 °C / no condensing atmosphere             |
| Storage temperature range         | 5-40 °C  |
| Admissible medium                 | Hydraulic and lubricating oils on mineral base |
| Operating pressure                | 12 - 315 bar (see also chapter 15.1.4)         |
| Media temperature                 | 5-70 °C  |
| Parts contacting the medium       | Glass, brass, aluminum, steel, NBR             |
| Nominal flow                      | ca. 300 ml/min                                 |

**Table 6: Considered standards and directives**

| Considered standards and directives |   |
|-------------------------------------|---|
| Directive 89/336 EEC:               | "Electromagnetic compatibility" (EMC directive)   |
| DIN EN 61010-1                      | "Safety requirements for electrical equipment for measurement, control and laboratory use" Part 1: General requirements |

## 19 Appendix

### 19.1 Address directory

Please refer to

<http://www.boschrexroth.com> for addresses of foreign subsidiaries.

### 19.2 Declaration of conformity

|   |                           |  |                           |                        |  |
|---|---------------------------|--|---------------------------|------------------------|--|
| <small>Electric Drives<br/>and Controls</small> | <small>Hydraulics</small> | <small>Linear Motion and<br/>Assembly Technologies</small> | <small>Pneumatics</small> | <small>Service</small> | <br> |
|---|---------------------------|--|---------------------------|------------------------|--|

**CE - declaration of conformity**

Agent: Bosch Rexroth Filtration Systems GmbH

Address: Hardtwaldstraße 43  
68775 Ketsch, Germany

Product: Mobile Particle Counter MPC 4614  
(Four Channel Particle Counter)

The described product meets the EU- Guidelines 89/336/EWG (modified by 91/263/EWG und 92/31/EWG). The following harmonised standards have been used to validate conformity:

EN 5502; EN 61000-4-2; EN 61000-4-3; EN 61000-4-4; EN 61000-4-5.

We certify the conformity of the product described above.

Location, Date: Ketsch, 17.07.2007

Binding Signature:  

|  |  |
|--|--|
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