MCS 1000 Series
Metallic Contamination Sensor

Operation and Installation Guide

English (translation of original instructions)

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Content

Operation and Installation Guide.................................................................1
Imprint ...........................................................................................................2
Documentation Representative.................................................................2
Content..........................................................................................................3
Preface .........................................................................................................6
   Technical Support ........................................................................................7
   Modifications to the Product ......................................................................7
   Warranty .....................................................................................................7
   Using the Documentation .........................................................................8
Safety information and instructions...........................................................9
   Obligations and Liability ...........................................................................9
   Explanation of Symbols and Warnings, etc. .............................................10
   Proper/Designated Use ............................................................................10
   Improper Use ...........................................................................................10
   Informal Safety Precautions ..................................................................11
   Training and Instruction of Personnel .....................................................12
Storing the MCS .........................................................................................13
Decoding the model code label .................................................................13
Checking the MCS 13xx scope of delivery .............................................14
Checking the MCS 14xx scope of delivery .............................................15
Checking the MCS 15xx scope of delivery .............................................16
MCS Features ..............................................................................................17
   Functional principle ..................................................................................17
   Usable operating media ...........................................................................18
Dimensions ..................................................................................................19
   MCS13xx ..................................................................................................19
   MCS13xx with Ethernet module ..............................................................20
   MCS13xx with flange adapter set (optional accessories) .......................21
   MCS14xx ..................................................................................................22
   MCS14xx with Ethernet ...........................................................................23
   MCS14xx with flange adapter set (optional accessories) .......................24
   MCS15xx ..................................................................................................25
   MCS15xx with Ethernet ...........................................................................26
   MCS15xx with flange adapter set (optional accessories) .......................27
Mechanical connection types ....................................................................28
   Connecting MCS14xx via flange adapter set ........................................29
Fastening the MCS on the underside ......................................................30
   Fastening the MCS 13xx .........................................................................31
   Fastening the MCS 14xx .........................................................................31
   Fastening the MCS 15xx .........................................................................32
   Fastening MCS15xx via angle fastening set ............................................33
   Connecting MCS15xx via pipe adapter set .............................................33

MCS Features

Functional principle......................................................................................17
Usable operating media..............................................................................18

Dimensions.................................................................................................19

MCS13xx ..................................................................................................19
MCS13xx with Ethernet module ..............................................................20
MCS13xx with flange adapter set (optional accessories) .......................21
MCS14xx ..................................................................................................22
MCS14xx with Ethernet ...........................................................................23
MCS14xx with flange adapter set (optional accessories) .......................24
MCS15xx ..................................................................................................25
MCS15xx with Ethernet ...........................................................................26
MCS15xx with flange adapter set (optional accessories) .......................27

Mechanical connection types ....................................................................28

Connecting MCS14xx via flange adapter set ........................................29

Fastening the MCS on the underside ......................................................30

Fastening the MCS 13xx .........................................................................31
Fastening the MCS 14xx .........................................................................31
Fastening the MCS 15xx .........................................................................32
Fastening MCS15xx via angle fastening set ............................................33
Connecting MCS15xx via pipe adapter set .............................................33
Connecting MCS15xx via flange adapter plate (accessories) ........................................ 34
Connecting MCS15xx via SAE 4" per ISO 6162-1 (4xM16) ........................................ 35

**MCS hydraulic installation** ................................................................................... 35
Flow rate, differential pressure $\Delta p$ and viscosity $\nu$ characteristics ................. 36

**Electrical connection of the MCS** ......................................................................... 38
Plug pin assignment .................................................................................................. 38
Connection cable - Assignment / Color coding ....................................................... 39
Connecting cable wires ............................................................................................ 40

**Using switching outputs** .................................................................................... 41
Switching output - FE.NFE (factory setting) ............................................................. 41
Switching output - ALL.RDY .................................................................................. 41

**Switching logic "active low"** ................................................................................ 42
Switching on sensors ............................................................................................... 42
  Example: Operation - 1 particle detected .............................................................. 42
  Example: Operation - no particle detected ............................................................ 43
  Example: Operation - several particles detected .................................................. 43

**Switching logic "active high"** .............................................................................. 44
Switching on the sensor ......................................................................................... 44
  Example: Operation - 1 particle detected .............................................................. 44
  Example: Operation - no particle detected ............................................................ 45
  Example: Operation - several particles detected .................................................. 45

**Switching output "Device Ready"** .................................................................... 46

**Parameterizing MCS / reading off measured values** ......................................... 47
Connecting MCS 1000 with SMU 1200 ................................................................. 47
Connecting MCS with CSI-D-5 (Condition Sensor Interface) ................................ 48
Connecting MCS to HMG 3000 .............................................................................. 49

**Evaluating measurement results** ........................................................................ 50

**Menu structure** .................................................................................................... 51

**PowerUp Menu** .................................................................................................. 52
  MODE - select operating mode ............................................................................. 52
  S.TIME - Set storing interval ............................................................................... 52
  SEL.COM - Set protocol ....................................................................................... 52
  ADDRESS – Set bus address ................................................................................ 52
  DFAULT - Reset to factory setting ...................................................................... 52
  CANCEL - cancel without saving ........................................................................ 53
  SAVE - save changes ........................................................................................... 53

**Measuring menu** ................................................................................................. 53
  DSPLAY - Show measured variable ..................................................................... 53
  SWT.OUT - Set switching output ......................................................................... 54
  SWT.LOG - Set logic at the switching output ....................................................... 55
  SWT.PLS - Set pulse length at the switching output ............................................ 55
  CANCEL - cancel without saving ........................................................................ 55
  SAVE - Save changes .......................................................................................... 55

**Error analysis / remedy** ..................................................................................... 56
Error status - "active high" and "active low" .......................................................... 58
   Error status 1 "active low" ................................................................................. 58
   Error status 1 "active high" .............................................................................. 59
   Error status 2 "active low" ................................................................................. 59
   Error status 2 "active high" .............................................................................. 60
   Error status - "Device Ready" .......................................................................... 60

Servicing the MCS .................................................................................................. 61
Decommissioning MCS .......................................................................................... 61
Disposing of MCS .................................................................................................. 61
Spare parts and accessories ..................................................................................... 62
MCS channel default settings .................................................................................. 64
Technical data .......................................................................................................... 65
   Detection limits .................................................................................................... 66
Recalibration / Service ............................................................................................ 66
Customer Service ..................................................................................................... 66
Model Code ............................................................................................................... 67
Examples of connection ............................................................................................ 68
   Connection: operation voltage = measurement voltage ....................................... 68
      Using switching output 1 .................................................................................. 68
      Using switching output 2 .................................................................................. 68
      Using switching output 1 and 2 ......................................................................... 69
   Connection: operation voltage ≠ measurement voltage ....................................... 69
      Using switching output 1 .................................................................................. 69
      Using switching output 2 .................................................................................. 70
      Using switching output 1 and 2 ......................................................................... 70

EC declaration of conformity .................................................................................... 71

Glossary ..................................................................................................................... 72
   Ferromagnetic (Fe) ............................................................................................... 72
   Non-ferromagnetic (nFe) ...................................................................................... 72
   Certification ........................................................................................................... 72
      Basics of GL certification .................................................................................. 73
   Germanischer Lloyd Industrial Services GmbH, renewable energies.................. 73
Preface

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

It will acquaint you with the product and assist you in using it as intended in an optimal manner.

Keep this documentation in the vicinity of the product for immediate reference.

Note that the information on the unit's engineering contained in the documentation was that available at the time of publication. There may be deviations in technical details, figures, and dimensions as a result.

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

HYDAC FILTER SYSTEMS GMBH
Technische Dokumentation
Postfach 12 51
66273 Sulzbach / Saar
Germany

We look forward to receiving your input.

“Putting experience into practice”
Technical Support
Contact our technical sales department if you have any questions on our product. When contacting us, please always include the model/type designation, serial no. and part-no. of the product:
Fax: ++49 (0) 6897 / 509 - 846
E-mail: filtersystems@hydac.com

Modifications to the Product
We would like to point out that changes to the product (e.g. purchasing additional options, etc.) may mean that the information in the operating instructions is no longer applicable or adequate.

After modification or repair work that affects the safety of the product has been carried out on components, the product may not be returned to operation until it has been checked and released by a HYDAC technician.

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

Warranty
For the warranty provided by us, please refer to the General Terms of Sale and Delivery of HYDAC Filter Systems GmbH.
You’ll find this under www.hydac.com -> Legal information
Using the Documentation

Note that the method described for locating specific information does not release you from your responsibility of carefully reading these instructions prior to starting the unit up for the first time and at regular intervals in the future.

What do I want to know?

I determine which topic I am looking for.

Where can I find the information I’m looking for?

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

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

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

Obligations and Liability

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

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

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

The safety precautions listed here are restricted to use of the MCS.

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

The MCS is only to be used as follows:

- solely for its designated use
- only when in a safe, perfect condition

Immediately remedy any malfunctions that might impair safety.

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

- Improper use of the MCS
- improper assembly, installation, commissioning, operation and maintenance of the MCS
- modifications to the MCS made by the user or purchaser
- Improper monitoring of unit components that are subject to wear and tear
- improperly performed repair work
Explanation of Symbols and Warnings, etc.

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

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

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

NOTICE denotes situations which can lead to property damage if safety precautions are not observed.

Proper/Designated Use

The MetallicContamination Sensor (MCS) is used for the continuous monitoring of particulate contamination in hydraulic and lubrication systems.

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

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

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

- Permanent monitoring of solid particle contamination in hydraulic and lubrication systems
- Observing all the notes contained in these operating instructions

Improper Use

Improper use may result in hazard to life and limb.

Improper use includes:

- Improper connection of the MCS voltage and sensor cables
- Operation with non-approved fluids.
Informal Safety Precautions

Apart from the operating instructions, any and all general and local regulations pertaining to accident prevention and environmental protection are to be made available and observance is to be maintained to them.

Make sure to keep the safety and hazard symbols and warnings on the MCS in a legible condition and to renew them as necessary.

The connection fittings are to be checked regularly for leakage via a visual check. Replace any loose connections or damaged cables immediately.

**WARNING**

Hydraulic systems are under pressure

Danger of bodily injury

► The hydraulic system must be depressurized before performing any work on the hydraulic system.
Training and Instruction of Personnel

The MCS may only be operated by properly trained and instructed personnel. The areas of responsibility of your staff must be established in a clear-cut manner.

Staff undergoing training may not use the MCS unless supervised by an experienced staff member.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Individuals</th>
<th>Persons undergoing training</th>
<th>Individuals with technical training/engineering background</th>
<th>Electrician</th>
<th>Supervisor with the appropriate authority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packing</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Transportation</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Commissioning</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Operation</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Troubleshooting/locating the source of malfunction</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Remedying of mechanical faults</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remedying of electrical faults</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Maintenance</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Repair work</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Decommissioning/storage</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
Storing the MCS

Store the MCS in a clean, dry place, in the original packing, if possible. Do not remove the packing until you are ready to install the unit.

Storage temperature: -40 ... 80°C / -40 ... 176°F
Relative humidity: max. 95%, non-condensing

Decoding the model code label

For identification details of the MetallicContamination Sensor, see the type label. This is located on the top of the unit and contains the exact product description and the serial number.

<table>
<thead>
<tr>
<th>Row</th>
<th>Definition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Model</td>
<td>Model per model code</td>
</tr>
<tr>
<td>2</td>
<td>P/N</td>
<td>Part no.</td>
</tr>
<tr>
<td>3</td>
<td>S/N</td>
<td>Always list complete serial no.</td>
</tr>
<tr>
<td>4</td>
<td>Date</td>
<td>Year/week of production</td>
</tr>
<tr>
<td>5</td>
<td>Index</td>
<td>Hardware index</td>
</tr>
<tr>
<td>6</td>
<td>Max. INLET press.</td>
<td>Max. operating pressure in bar/psi</td>
</tr>
</tbody>
</table>
Checking the MCS 13xx scope of delivery

The MetallicContamination Sensor MCS14xx comes packed and factory-assembled. Before starting up the MCS, check that the content of the package is complete.

The following items are supplied:

<table>
<thead>
<tr>
<th>Qty.</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MetallicContamination Sensor, MCS13xx</td>
</tr>
<tr>
<td>1</td>
<td>O-ring (18.7 x 3.53 NBR 70 Shore)</td>
</tr>
<tr>
<td>1</td>
<td>O-ring (25 x 3.53 NBR 70 Shore)</td>
</tr>
<tr>
<td>1</td>
<td>Operation and Installation Guide (this document)</td>
</tr>
</tbody>
</table>
Checking the MCS 14xx scope of delivery

The MetallicContamination Sensor MCS14xx comes packed and factory-assembled. Before starting up the MCS, check that the content of the package is complete.

The following items are supplied:

<table>
<thead>
<tr>
<th>Item</th>
<th>Qty.</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>MetallicContamination Sensor, MCS14xx</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>O-ring (25 x 3.53 NBR 70 Shore)</td>
</tr>
<tr>
<td>-</td>
<td>1</td>
<td>Operation and Installation Guide (this document)</td>
</tr>
</tbody>
</table>
Checking the MCS 15xx scope of delivery

The MetallicContamination Sensor MCS15xx comes packed and factory-assembled. Before starting up the MCS, check that the content of the package is complete.

The following items are supplied:

<table>
<thead>
<tr>
<th>Item</th>
<th>Qty.</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>MetallicContamination Sensor, MCS15xx</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>O-ring (47.22 x 3.53 NBR 70 Shore)</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>O-ring (110.72 x 3.53 NBR 70 Shore)</td>
</tr>
<tr>
<td>-</td>
<td>1</td>
<td>Operation and Installation Guide (this document)</td>
</tr>
</tbody>
</table>
MCS Features

The MetallicContamination Sensor MCS is a stationary sensor for continuous monitoring of contamination of fluids – especially lubrication fluids – with metallic particles.

With appropriate system knowledge of the monitored system, damage resulting in detectable metallic particles can be discovered early.

The MCS uses digital signal processing to distinguish between ferromagnetic (Fe) and non-ferromagnetic (nFe) particles.

Particle results are signaled via two switching outputs. In the factory setting (default values), the ferromagnetic (Fe) particles are output via the first switching output and the non-ferromagnetic (nFe) particles via the second switching output. It is possible to make a switch in the menu so that the first switching output is used for the total particles (Fe and nFe) and second switch output is used as a "device ready signal". (For this, see also the chapter Using switching output.)

In addition, the MCS has serial communication interfaces with which connection to superordinate monitoring systems is possible.

The MCS is intended for incorporation in low-pressure circuits and test benches.

The flow rate through the sensor must be within the limits that hold for the respective type (see “Technical data”).

The MCS is approved for a maximum operating pressure of 20 bar.

Functional principle

Within the MCS, a high-frequency magnetic field is generated using a coil system. Two sensor coils detect changes in the field strength of this magnetic field.

Upon entry into this magnetic field of a:

- ferromagnetic (Fe) particle, the field strength increases depending on the size of the particle.
- non-ferromagnetic (nFe) particle, the field strength decreases depending on the size of the particle.

If a prespecified limit is exceeded, a particle event is signaled.

The output signal at the switching output is always the same and provides no information about the size of the particle.

Using the serial interfaces (RS 485 or HSI) makes it possible to evaluate appropriate particle size classes.
Usable operating media

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unpermitted operating media</strong></td>
</tr>
<tr>
<td>The sensor will be damaged</td>
</tr>
<tr>
<td>► Use the sensor only in conjunction with mineral and synthetic oils (for example: poly-alpha-olefins PAO and polyglycol, as used in the wind energy industry).</td>
</tr>
<tr>
<td>► The media used must be permanently compatible with the MCS sealing material - low-temperature FKM.</td>
</tr>
</tbody>
</table>
Dimensions

MCS13xx

Flange image SAE 3/4"

All dimensions in mm.
MCS13xx with Ethernet module

Flange image SAE 3/4"

All dimensions in mm.
MCS13xx with flange adapter set (optional accessories)

All dimensions in mm.
MCS14xx

Flange image SAE 3/4" All dimensions in mm.
MCS14xx with Ethernet

Flange image SAE 3/4"

All dimensions in mm.
MCS14xx with flange adapter set (optional accessories)

All dimensions in mm.
MCS15xx

Flange image SAE 4"
All dimensions in mm.
MCS15xx with Ethernet

Flange image SAE 3/4"

All dimensions in mm.
MCS15xx with flange adapter set (optional accessories)

All dimensions in mm.
Mechanical connection types

Observe the direction of flow through the MCS. The direction of flow is indicated by an arrow on the housing.

When selecting the installation site, take ambient factors like the temperature, dust, water, etc., into account.

The MCS is designed for IP67 according to DIN 40050 / EN 60529 / IEC 529 / VDE 0470.

Select between the following mechanical connection types:
Connecting MCS14xx via flange adapter set

A flange adapter set is available from HYDAC as an accessory under p/no. 3588249.

This flange adapter set makes it possible for you to connect the MCS directly to two pipes or hoses via the thread G1/2".

M = 25 Nm
Fastening the MCS on the underside

MCS models manufactured in 2012 and following have 4 fixing holes on the underside. Use these to secure the MCS. Below you will find the corresponding drilling templates for the individual MCS models.
Fastening the MCS 13xx

Fastening the MCS 14xx
Fastening the MCS 15xx

[Diagram showing the dimensions and screw mounting points for the MCS 15xx component.]
Fastening MCS15xx via angle fastening set

An angle fastening set is available as an accessory. HYDAC article no. 3477243.

Connecting MCS15xx via pipe adapter set

A pipe adapter set is available as an accessory. HYDAC article no. 3435426.

This pipe adapter set makes it possible to connect the MCS directly to two pipes or hoses via the thread 42L per ISO8431-1.
Connecting MCS15xx via flange adapter plate (accessories)

A flange adapter set is available as an accessory. HYDAC article no. 3442518.

With the flange adapter set SAE4"-SAE1½" (1) you have the opportunity to mount the MCS between the filter unit and the pump. The flange adapter plate offers three ¼" connections for the integration of more sensors.

Example: installation in the filter cooling circuit between pump and partial flow filter.
Connecting MCS15xx via SAE 4" per ISO 6162-1 (4xM16)

Install the MCS with four screws (M16) to a component/unit. The drilling template corresponds to the SAE 4" per ISO 6162-1.

Example: installing the MCS on an NF filter

MCS hydraulic installation

During installation, observe the direction of flow through the MCS. The direction of flow is indicated by an arrow on the housing.

NOTICE

Working overpressure

The MCS will be destroyed.

► Note the maximum operating pressure of 20 bar / 290 psi.
Flow rate, differential pressure $\Delta p$ and viscosity $\nu$ characteristics

Observe the measured volumetric flow rate. For the MCS14xx this is between 2 and 40 l/min and for the MCS15xx between 10 and 200 l/min. For flow rates outside these limits, a detection of particles is no longer guaranteed.
The diagram shows the resulting differential pressure $\Delta p$ mbar as a function of the flow rate $Q$ l/min at different viscosities.
Electrical connection of the MCS

Plug pin assignment

<table>
<thead>
<tr>
<th>Pin</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Supply voltage 9 ... 36 V DC</td>
</tr>
<tr>
<td>2</td>
<td>Switch out 2 (normally open)</td>
</tr>
<tr>
<td>3</td>
<td>GND for supply voltage</td>
</tr>
<tr>
<td>4</td>
<td>GND switching output</td>
</tr>
<tr>
<td>5</td>
<td>HSI (HYDAC Sensor Interface)</td>
</tr>
<tr>
<td>6</td>
<td>RS485 +</td>
</tr>
<tr>
<td>7</td>
<td>RS485 -</td>
</tr>
<tr>
<td>8</td>
<td>Switch out 1 (normally open)</td>
</tr>
</tbody>
</table>

The two switching outputs are in each case a passive, n-switching power MOSFET. The switching outputs are open without current. There is contact between the plug housing and the housing.
Connection cable - Assignment / Color coding

Our accessories list includes connection cables of various lengths with one connection plug (8-pole, M12x1, according to DIN VDE 0627) and an open end.

The color coding of the HYDAC accessory cable ZBE42-xx is listed in the table below:

<table>
<thead>
<tr>
<th>Pin</th>
<th>Color</th>
<th>Connection to</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>White</td>
<td>Supply voltage 9 ... 36 V DC</td>
</tr>
<tr>
<td>2</td>
<td>Brown</td>
<td>Switching output 2</td>
</tr>
<tr>
<td>3</td>
<td>Green</td>
<td>GND supply voltage</td>
</tr>
<tr>
<td>4</td>
<td>Yellow</td>
<td>GND switching output</td>
</tr>
<tr>
<td>5</td>
<td>Gray</td>
<td>HSI (HYDAC Sensor Interface)</td>
</tr>
<tr>
<td>6</td>
<td>Pink</td>
<td>RS485 +</td>
</tr>
<tr>
<td>7</td>
<td>Blue</td>
<td>RS485 -</td>
</tr>
<tr>
<td>8</td>
<td>Red</td>
<td>Switching output 1</td>
</tr>
<tr>
<td>Case</td>
<td>-</td>
<td>Shield</td>
</tr>
</tbody>
</table>
Connecting cable wires

To prevent a ground loop, connect the shield of the connector cable only if the MCS1000 is not grounded or not sufficiently connected to the PE conductor.

Example: circuit diagram with two power supplies:

Lead voltages $U_{m1}$ and $U_{m2}$ as well as the load resistances and bridges via a separate external terminal strip.

Note that the voltage $U$ may be 40 V DC at most and the current $I$ 1.5 A at most.

Use for the pull-up resistance $\geq 1\,k\Omega$

You can find more possible examples in the chapter "Examples of connection".

Using several supply voltages makes it necessary to define the following terms for error analysis:

<table>
<thead>
<tr>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation voltage</td>
<td>Voltage for operating the MCS (electronics, coil system).</td>
</tr>
<tr>
<td>Measurement voltage</td>
<td>Voltage $U_{m1/2}$ at switching output 1/2 for superordinate controllers.</td>
</tr>
<tr>
<td>Signal value</td>
<td>Measurement voltage on = high</td>
</tr>
<tr>
<td></td>
<td>Measurement voltage off = low</td>
</tr>
</tbody>
</table>
Using switching outputs

The two switching outputs delivery pulses that can be counted or utilized in a superordinate controller.

The logic of the signal outputs is parameterizable. You can select between "active low" (factory setting) and "active high".

Details on setting the switching outputs can be found starting on page 54.

Choose among the following settings for the switching output:

Switching output - FE.NFE (factory setting)
A signal for all ferromagnetic (Fe) particles is output at switching output 1, and a signal for all non-ferromagnetic (nFe) particles at switching output 2.

<table>
<thead>
<tr>
<th>Particles</th>
<th>Switching Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>ferromagnetic (Fe)</td>
<td>= 1</td>
</tr>
<tr>
<td>non-ferromagnetic (nFe)</td>
<td>= 2</td>
</tr>
</tbody>
</table>

Switching output - ALL.RDY
A signal for all ferromagnetic (Fe) particles and all non-ferromagnetic (nFe) particles is output at switching output 1.

The switching output 2 outputs the "Device Ready" signal indicating readiness for use.

<table>
<thead>
<tr>
<th>Particles</th>
<th>Switching Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>ferromagnetic (Fe)</td>
<td>= 1</td>
</tr>
<tr>
<td>and</td>
<td></td>
</tr>
<tr>
<td>non-ferromagnetic (nFe)</td>
<td>= 2</td>
</tr>
<tr>
<td>Device Ready</td>
<td></td>
</tr>
</tbody>
</table>
Switching logic "active low"

Both switching outputs emit a currentless signal when a particle is detected.

You can set the duration of the signal between 5 and 200 ms.
This value is factory set to 7 ms.

The signal gives no indication of the shape and size of the particles.

Switching on sensors

Note that after the sensor has been switched on or after voltage has returned, a start-up phase of ~ 70 seconds is necessary before the first measurement can be made.

Example: Operation - 1 particle detected

![Diagram showing the operation of the sensor with a time delay of Δt and an active low signal]
Example: Operation - no particle detected

Example: Operation - several particles detected
Switching logic "active high"

Both switching outputs emit a signal when a particle is detected. You can set the duration of the signal $\Delta t$ between 5 and 200 ms. This value is factory set to 7 ms. The signal gives no indication of the shape and size of the particles.

Switching on the sensor

Note that after the sensor has been switched on or after voltage has returned, a start-up phase of $\approx$ 70 seconds is necessary before the first measurement can be made.

Example: Operation - 1 particle detected

![Diagram showing the switching logic and sensor operation](chart.png)
Example: Operation - no particle detected

Example: Operation - several particles detected
Switching output "Device Ready"

When "Device Ready" is set, the buzzer signal of the ferromagnetic and non-ferromagnetic particles is emitted on the switching output S1.

The signal indicating that the MCS is ready for use is emitted on the switching output S2. The signal is always emitted in the same way regardless of the switching logic "active low" or "active high".

Note that after the sensor has been switched on and after voltage has returned after an interruption, a start-up phase of ~ 70 seconds is necessary before the signal can be evaluated.

After that, the switching output "Device Ready" goes to permanent "low" potential.

![Graph showing the output signal](image-url)
Parameterizing MCS / reading off measured values

Connecting MCS 1000 with SMU 1200

The MCS 1000 can be connected to the HYDAC SensorMonitoring Unit SMU 1200. The SMU1200 makes it possible to:

- set parameters
- save the MCS measurement data with a time stamp
- read off stored data via USB memory stick
- forward the online measurement data to a PC
- forward the switching outputs to a superordinate controller

You can find more details in the SMU 1200 operating instructions.
Connecting MCS with CSI-D-5 (Condition Sensor Interface)

With the CSI-D-5 kit you have the opportunity to parameterize the MCS using a PC and to read off online and stored measurement data.

Connect the CSI-D-5 kit, HYDAC article no. 3249563, in accordance with the following connection diagram.
Connecting MCS to HMG 3000

You can use the HMG 3000 to set the parameters of the MCS. Connect the HMG 3000 to the MCS in accordance with the following connection diagram.

MCS 1000

You can find more details in the HMG 3000 operating instructions.
Evaluating measurement results

The counter readings of the MCS are not comparable with particle concentrations as these are known from optical particle counters per ISO 4406.

If the counter reading stays the same, this does not mean that a constant particle concentration is present, but rather the no further particles have been detected.

Occurring particles need not have been generated immediately before being detected by the sensor. Depending on the system, they may be sedimented particles that were stirred up by shaking or vibration and then got into the fluid stream.

For detailed evaluation of the measurement results, it is necessary to know the following operating parameters of the system:

- Is a constant, variable, or only temporarily existent fluid stream through the sensor present?
  Example: During the analysis of the particles occurring each day, the actual operating duration of the system is to be considered. This can vary significantly from day to day, for example, in gear transmissions in wind energy plants.

- Is it possible for particles to flow back?
  Example: In case of depressurization from an incompletely bled system.

- Is a fluid filter present that filters out the particles, or are they conveyed through the circuit?
  Example: Without filtration, an individual particle can be detected several times by the MCS.
## Menu structure

### Power Up Menu

<table>
<thead>
<tr>
<th>Mode</th>
<th>M2</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.Time</td>
<td>Set value</td>
</tr>
<tr>
<td>SEL.COM</td>
<td>HSI</td>
</tr>
<tr>
<td>ADDR</td>
<td>HSI Set value</td>
</tr>
<tr>
<td>Default</td>
<td></td>
</tr>
<tr>
<td>Cancel</td>
<td></td>
</tr>
<tr>
<td>Save</td>
<td></td>
</tr>
</tbody>
</table>

### Measuring Menu

<table>
<thead>
<tr>
<th>Display</th>
<th>FE A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FE B</td>
</tr>
<tr>
<td></td>
<td>FE C</td>
</tr>
<tr>
<td></td>
<td>NFE D</td>
</tr>
<tr>
<td></td>
<td>NFE E</td>
</tr>
<tr>
<td></td>
<td>NFE F</td>
</tr>
<tr>
<td></td>
<td>CYC A</td>
</tr>
<tr>
<td></td>
<td>CYC B</td>
</tr>
<tr>
<td></td>
<td>CYC C</td>
</tr>
<tr>
<td></td>
<td>CYC D</td>
</tr>
<tr>
<td></td>
<td>CYC E</td>
</tr>
<tr>
<td></td>
<td>CYC F</td>
</tr>
<tr>
<td></td>
<td>STATUS</td>
</tr>
<tr>
<td></td>
<td>FI</td>
</tr>
<tr>
<td></td>
<td>TEMP C</td>
</tr>
<tr>
<td></td>
<td>TEMP F</td>
</tr>
<tr>
<td>SWT.OUT</td>
<td>M2</td>
</tr>
<tr>
<td></td>
<td>FE.NFE</td>
</tr>
<tr>
<td></td>
<td>ALL.RDY</td>
</tr>
<tr>
<td>SWT.LOG</td>
<td>M2</td>
</tr>
<tr>
<td></td>
<td>ACT.HI</td>
</tr>
<tr>
<td></td>
<td>ACT.LOW</td>
</tr>
<tr>
<td>SWT.PLS</td>
<td>Set value</td>
</tr>
<tr>
<td>Cancel</td>
<td></td>
</tr>
<tr>
<td>Save</td>
<td></td>
</tr>
</tbody>
</table>
PowerUp Menu

**MODE - select operating mode**

- **Function:** Adjustment not possible
- **Parameters:** none
- **Factory setting:** M2 (Measure and switch)

**S.TIME - Set storing interval**

- **Function:** After the time interval set, the total number of particles is written to the memory of the MCS. The number of particles within the time intervals can be seen from the parameter DSPLAY - CYC.
- **Parameters:** 1 - 120 minutes
- **Factory setting:** 60

**SEL.COM - Set protocol**

- **Purpose:** Set transfer protocol to the superordinate system
- **Function:** Adjustment not possible.
- **Parameters:** none
- **Factory setting:** HSI

**ADDRESS – Set bus address**

- **Parameters:** A - Z for the HSI bus
- **Factory setting:** D

**DFAULT - Reset to factory setting**

- **Function:** Reset to the factory settings
  
  You can find the factory setting at the corresponding parameter.
CANCEL - cancel without saving
Parameters: none

SAVE - save changes
Parameters: none

Measuring menu

DISPLAY - Show measured variable
Function: Select the measured variable that is displayed after switching the unit on and after voltage has returned.

The measured variables FE A to NFE F show a summation of the particles in the corresponding category. The counter starts when voltage is switched on and is reset by the absence of voltage. The counter readings are stored in the internal memory after the passage of S.TIME in each case.

The parameter CYC (cycle) gives the number of particles per variable that were counted within the current measurement time (parameter S.TIME).

The measuring time begins when the voltage is switched on or the power-up menu is exited. The value of the current interval is always displayed.

Parameters:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FE A</td>
<td>ferromagnetic particles (Fe)</td>
</tr>
<tr>
<td>FE B</td>
<td>ferromagnetic particles (Fe)</td>
</tr>
<tr>
<td>FE C</td>
<td>ferromagnetic particles (Fe)</td>
</tr>
<tr>
<td>NFE D</td>
<td>non-ferromagnetic particles (nFe)</td>
</tr>
<tr>
<td>NFE E</td>
<td>non-ferromagnetic particles (nFe)</td>
</tr>
<tr>
<td>NFE F</td>
<td>non-ferromagnetic particles (nFe)</td>
</tr>
<tr>
<td>CYC A</td>
<td>ferromagnetic particles (Fe)</td>
</tr>
<tr>
<td>CYC B</td>
<td>ferromagnetic particles (Fe)</td>
</tr>
<tr>
<td>CYC C</td>
<td>ferromagnetic particles (Fe)</td>
</tr>
<tr>
<td>CYC D</td>
<td>non-ferromagnetic particles (nFe)</td>
</tr>
</tbody>
</table>
CYC E: non-ferromagnetic particles (nFe)        Class E
CYC F: non-ferromagnetic particles (nFe)        Class F

STATUS: Status byte
(00 at status = O.K.)

FI: Field strength of the field coil in the MCS

TEMP C: Medium temperature in °C (indirect measurement via sensor in the spool)
TEMP F: Medium temperature in °F (indirect measurement via sensor in the spool)

Factory setting: FE A
The value of 1000 µm is shown on the display as 1k.

**SWT.OUT - Set switching output**

Function: You can find a detailed description on page 41.

Parameters: FE.NFE  S1 = Ferromagnetic (Fe)
             S2 = Non-ferromagnetic (nFe)
             ALL.RDY S1 = ferromagnetic (Fe) and non-ferromagnetic (nFe)
             S2 = Device Ready

Factory setting: FE.NFE
**SWT.LOG - Set logic at the switching output**
Parameters: ACT.HI active high  
ACT.LOW active low  
Factory setting: ACT.LOW

**SWT.PLS - Set pulse length at the switching output**
Function: Setting the pulse length of the switching outputs  
Parameters: 5 - 200 milliseconds  
Factory setting: 7

**CANCEL - cancel without saving**
Parameters: none

**SAVE - Save changes**
Parameters: none
Error analysis / remedy

Using several supply voltages makes it necessary to define the following terms for error analysis:

<table>
<thead>
<tr>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation voltage</td>
<td>Voltage for operating the MCS (electronics, coil system).</td>
</tr>
<tr>
<td>Measurement voltage</td>
<td>Voltage $U_{M1/2}$ at switching output 1/2 for superordinate controllers.</td>
</tr>
<tr>
<td>Signal value</td>
<td>Measurement voltage on = high</td>
</tr>
<tr>
<td></td>
<td>Measurement voltage off = low</td>
</tr>
</tbody>
</table>

Remove the connection cable on the MCS for error analysis and check the socket on the connection cable according to the following steps:

<table>
<thead>
<tr>
<th>Step</th>
<th>Pin</th>
<th>Pin &lt;-&gt; Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>3</td>
<td>Check the operation voltage.</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>4</td>
<td>Check the measurement voltage $U_{M1}$ at the switching output 1</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>4</td>
<td>Check the measurement voltage $U_{M2}$ at the switching output 2</td>
</tr>
</tbody>
</table>

![Diagram of connection cable and pinout](image)
<table>
<thead>
<tr>
<th>Switching logic</th>
<th>Signal value at switching output</th>
<th>Step 1</th>
<th>Step 2 / 3</th>
<th>Status</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>active low</td>
<td>High</td>
<td>ON</td>
<td>ON</td>
<td>The MCS has not detected any particle</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>ON</td>
<td>ON</td>
<td>Error on the MCS</td>
<td>Contact HYDAC</td>
</tr>
<tr>
<td>active high</td>
<td>Low</td>
<td>ON</td>
<td>ON</td>
<td>The MCS has not detected any particle</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>ON</td>
<td>ON</td>
<td>Error on the MCS</td>
<td>Contact HYDAC</td>
</tr>
<tr>
<td></td>
<td>ON</td>
<td>OFF</td>
<td></td>
<td>Error in measurement voltage</td>
<td>Reestablish the measurement voltage.</td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td>ON</td>
<td></td>
<td>The MCS is switched off; error in operation voltage</td>
<td>Reestablish the operation voltage.</td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td>OFF</td>
<td></td>
<td>The MCS is switched off; error in operation voltage / measurement voltage</td>
<td>Reestablish the operation and measurement voltage.</td>
</tr>
</tbody>
</table>
Error status - "active high" and "active low"

In "active high" and "active low" operation, two errors can occur. In case of error, proceed as follows:

1. Check the operation voltage to the MCS.
2. Check the measurement voltage \( U_{M1/2} \) to the MCS.
3. Perform a reset. Remove the connection cable of the MCS for 10 seconds. Reconnect the connection cable to the MCS.
4. If there is no change in the error status, contact HYDAC.

Observe the starting phase of ~ 70 seconds.

Error status 1 "active low"

The signal at the switching output is permanently free of voltage. The MCS has detected an error.

<table>
<thead>
<tr>
<th>Operation voltage</th>
<th>ON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement voltage ( U_{M1/2} )</td>
<td>ON or OFF</td>
</tr>
</tbody>
</table>
**Error status 1 "active high"**

The signal at the switching output is permanently voltage-carrying. The MCS has detected an error.

This error occurs also when operation voltage is switched off and measurement voltage is switched on.

\[
\begin{align*}
U & = U_{\text{M1/2}} \\
0 \text{ V} & \quad 0 \\
\text{Operation voltage} & \quad \text{ON or OFF} \\
\text{Measurement voltage } U_{\text{M1/2}} & \quad \text{ON}
\end{align*}
\]

**Error status 2 "active low"**

The signal at the switching output is permanently voltage-carrying. The MCS has not detected an error.

This error occurs also when operation voltage is switched off and measurement voltage is switched on.

Only a superordinate controller can differentiate between this error signal and normal operation without detection of a particle. Evaluate the signal duration and the behavior of the two switching outputs S1 and S2 separately.

\[
\begin{align*}
U & = U_{\text{M1/2}} \\
0 \text{ V} & \quad 0 \\
\text{Operation voltage} & \quad \text{OFF} \\
\text{Measurement voltage } U_{\text{M1/2}} & \quad \text{ON}
\end{align*}
\]
Error status 2 "active high"

The signal at the switching output is permanently free of voltage. The MCS has not detected an error.

This error occurs also when external measurement voltage is switched off.

Only a superordinate controller can differentiate between this error signal and normal operation without detection of a particle. Evaluate the signal duration and the behavior of the two switching outputs S1 and S2 separately.

Error status - "Device Ready"

In the "Device Ready" error status there is a signal change from "low" to "high"
Servicing the MCS

The MCS is maintenance-free:

Decommissioning MCS

To decommission the unit, proceed as follows:

1. Remove the electric plug.
2. Depressurize the unit.
3. Remove the connected hoses/piping from the MCS.
4. Remove the MCS from the cable / from the component.

Disposing of MCS

Dispose of the packaging material as appropriate for your area.

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

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

<table>
<thead>
<tr>
<th>Designation</th>
<th>Qty</th>
<th>Part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCS14xx flange adapter set SAE 3/4&quot; - G 1/2&quot;, consisting of:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1x Flange connection SAE</td>
<td>1</td>
<td>3588249</td>
</tr>
<tr>
<td>1x O-ring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4x Cylinder head screw</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MCS15xx pipe adapter set 42L, consisting of:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2x Pipe adapter 42L</td>
<td>1</td>
<td>3435426</td>
</tr>
<tr>
<td>2x O-rings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8x Cylinder head screw</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8x Washer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8x Spring washer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Quantity</td>
<td>Code</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
<td>----------</td>
<td>--------</td>
</tr>
<tr>
<td>MCS15xx flange adapter set SAE 4&quot; - SAE 1½&quot;, consisting of:</td>
<td>1</td>
<td>3442518</td>
</tr>
<tr>
<td>2x O-rings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4x Cylinder head screw</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4x Washer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4x Spring washer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4x Cylinder head screw</td>
<td></td>
<td></td>
</tr>
<tr>
<td>O-ring (25 x 3.53 NBR 70 Shore)</td>
<td>1</td>
<td>601905</td>
</tr>
<tr>
<td>O-ring (47.22 x 3.53 NBR 70 Shore)</td>
<td>1</td>
<td>604815</td>
</tr>
<tr>
<td>O-ring (110.72 x 3.53 NBR 70 Shore)</td>
<td>1</td>
<td>603576</td>
</tr>
<tr>
<td>Socket plug (female) with 2 m line, shielded, 8-pole, M12x1</td>
<td>1</td>
<td>3281220</td>
</tr>
<tr>
<td>Socket plug (female) with 5 m line, shielded, 8-pole, M12x1</td>
<td>1</td>
<td>3281239</td>
</tr>
<tr>
<td>MCS15xx angle plate set, consisting of:</td>
<td>1</td>
<td>3477243</td>
</tr>
<tr>
<td>1x Angle plate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4x Cylinder head screw</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8x Washer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4x Spring washer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4x Nut</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Extension cable 5 m,  
Socket plug (female) 8-pole, M12x1 /  
Socket plug (male) 8-pole, M12x1  

| ZBE 43-05 | 1 | 3281240 |

### Socket plug (female) with screw clamp,  
8-pole, M12x1  

| ZBE 44 | 1 | 3281243 |

### Connection cable – Ethernet,  
Length 5 m, Patch  
Socket plug 4-pole, M12x1 / RJ45 plug  

| ZBE 45-05 | 1 | 3346100 |

### Connection cable – Ethernet,  
Length 10 m, Patch  
Socket plug 4-pole, M12x1 / RJ45 plug  

| ZBE 45-10 | 1 | 3346101 |

### Connection cable – Ethernet,  
Length 5 m, Patch  
Socket plug 4-pole, M12x1 / RJ45 plug  

| ZBE 46-05 | 1 | 3346102 |

### Connection cable – Ethernet,  
Length 10 m, Patch  
Socket plug 4-pole, M12x1 / RJ45 plug  

| ZBE 46-10 | 1 | 3346103 |

### CD with “FluMoS light” PC Software  

| 1 | 3251484 |

### ConditionSensor Interface CSI-D-5 kit  

| 1 | 3249563 |

---

### MCS channel default settings

<table>
<thead>
<tr>
<th>Channel:</th>
<th>Particles</th>
<th>MCS13xx</th>
<th>MCS14xx</th>
<th>MCS15xx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class A</td>
<td>Fe</td>
<td>70 ... 100 µm</td>
<td>100 ... 150 µm</td>
<td>200 ... 350 µm</td>
</tr>
<tr>
<td>Class B</td>
<td>Fe</td>
<td>100 ... 150 µm</td>
<td>150 ... 200 µm</td>
<td>350 ... 500 µm</td>
</tr>
<tr>
<td>Class C</td>
<td>Fe</td>
<td>&gt; 150 µm</td>
<td>&gt; 200 µm</td>
<td>&gt; 500 µm</td>
</tr>
<tr>
<td>Class D</td>
<td>nFe</td>
<td>200 ... 300 µm</td>
<td>300 ... 450 µm</td>
<td>550 ... 750 µm</td>
</tr>
<tr>
<td>Class E</td>
<td>nFe</td>
<td>300 ... 400 µm</td>
<td>450 ... 600 µm</td>
<td>750 ... 1000 µm</td>
</tr>
<tr>
<td>Class F</td>
<td>nFe</td>
<td>&gt; 400 µm</td>
<td>&gt; 600 µm</td>
<td>&gt; 1000 µm</td>
</tr>
</tbody>
</table>
## Technical data

<table>
<thead>
<tr>
<th><strong>Hydraulic data</strong></th>
<th><strong>MCS13xx</strong></th>
<th><strong>MCS14xx</strong></th>
<th><strong>MCS15xx</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow rate</td>
<td>0.4 … 8 l/min</td>
<td>2 … 40 l/min</td>
<td>10 … 200 l/min</td>
</tr>
<tr>
<td>Maximum operating pressure</td>
<td>20 bar / 290 psi</td>
<td>20 bar / 290 psi</td>
<td>20 bar / 290 psi</td>
</tr>
<tr>
<td>Fluid temperature range</td>
<td>-40 … 85°C / -40 … 185°F</td>
<td>-40 … 85°C / -40 … 185°F</td>
<td>-40 … 85°C / -40 … 185°F</td>
</tr>
<tr>
<td>Diameter / sensor cross-section</td>
<td>1/4”</td>
<td>1/2”</td>
<td>1”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>General data</strong></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature</td>
<td>-40 … 70°C / -40 … 170°F</td>
<td>-40 … 70°C / -40 … 170°F</td>
<td>-40 … 70°C / -40 … 170°F</td>
</tr>
<tr>
<td>Mechanical connection</td>
<td>SAE 3/4”</td>
<td>SAE 3/4”</td>
<td>SAE 4” (4x M16)</td>
</tr>
<tr>
<td>Protection class to DIN 40050</td>
<td>IP 67</td>
<td>IP 67</td>
<td>IP 67</td>
</tr>
<tr>
<td>Weight</td>
<td>~ 3.0 kg</td>
<td>~ 2.5 kg</td>
<td>~ 3.5 kg</td>
</tr>
<tr>
<td>Dimensions (L x W x H)</td>
<td>83 x 120 x 120 mm</td>
<td>83 x 120 x 120 mm</td>
<td>83 x 162 x 140 mm</td>
</tr>
<tr>
<td>Vibration 10 - 58 Hz</td>
<td>0.75 mm (amplitude)</td>
<td>0.75 mm (amplitude)</td>
<td>0.75 mm (amplitude)</td>
</tr>
<tr>
<td>58 - 500 Hz</td>
<td>10 g (acceleration)</td>
<td>10 g (acceleration)</td>
<td>10 g (acceleration)</td>
</tr>
<tr>
<td>Shock</td>
<td>40 g</td>
<td>40 g</td>
<td>40 g</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Electrical data</strong></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation voltage</td>
<td>9 … 36 V DC, residual ripple &lt; 10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power consumption</td>
<td>5 W max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 configurable switching outputs (n-switching Power MOSFET, normally open)</td>
<td>1 x Ferromagnetic (Fe) particles</td>
<td>1 x Non-ferromagnetic (nFe) particles</td>
<td>or</td>
</tr>
<tr>
<td></td>
<td>1 x Particle (Fe + nFe)</td>
<td>1 x Device Ready signal</td>
<td></td>
</tr>
<tr>
<td>Switching output loadable with</td>
<td>maximum: 1.5 A; 40 V DC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RS485 interface</td>
<td>2 wire, half duplex</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Electrical data

| HSI interface          | 1 wire, half duplex |

Detection limits

<table>
<thead>
<tr>
<th></th>
<th>MCS13xx</th>
<th>MCS14xx</th>
<th>MCS15xx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particle size - Fe</td>
<td>&gt; 70 µm</td>
<td>&gt; 100 µm</td>
<td>&gt; 200 µm</td>
</tr>
<tr>
<td>Particle size - nFe</td>
<td>&gt; 200 µm</td>
<td>&gt; 300 µm</td>
<td>&gt; 550 µm</td>
</tr>
<tr>
<td>Particle rate</td>
<td>&gt; 25 / s</td>
<td>&gt; 25 / s</td>
<td>&gt; 25 / s</td>
</tr>
</tbody>
</table>

Particle size = volume-equivalent ball diameter

Recalibration / Service

Recalibration is not required.

Customer Service

For repair work, please use the following shipping address:

HYDAC SERVICE GMBH
Friedrichsthaler Straße 15a, Werk 13
66540 Neunkirchen-Heinitz
Germany
Telephone: ++49 (0)6897 509 883
Fax: ++49 (0)6897 509 324
E-mail: service@hydac.com
## Model Code

<table>
<thead>
<tr>
<th>Product</th>
<th>MCS = MetallicContamination Sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series</td>
<td>1 = 1000 Series</td>
</tr>
<tr>
<td>Contamination / sensor cross-section</td>
<td>3 = Particle &gt;70 µm / 1/4&quot;</td>
</tr>
<tr>
<td></td>
<td>4 = Particle &gt;100 µm / 1/2&quot;</td>
</tr>
<tr>
<td></td>
<td>5 = Particle &gt;200 µm / 1&quot;</td>
</tr>
<tr>
<td>Signal technology</td>
<td>1 - 2x Switching outputs + HSI/RS485 (HSI protocol)</td>
</tr>
<tr>
<td></td>
<td>7 - 2x Switching outputs / RS485 Ethernet (HSI TCP/IP protocol)</td>
</tr>
<tr>
<td>Fluids</td>
<td>0 = Mineral and synthetic oils</td>
</tr>
<tr>
<td></td>
<td>(particularly used in wind power industry)</td>
</tr>
<tr>
<td>Mechanical connection</td>
<td>1 = Flange connection, SAE 1/2&quot; according to ISO 6162-1 (only for MCS13xx)</td>
</tr>
<tr>
<td></td>
<td>2 = Flange connection, SAE 3/4&quot; according to ISO 6162-1 (only for MCS14xx)</td>
</tr>
<tr>
<td></td>
<td>5 = Flange connection, SAE 4&quot; according to ISO 6162-1 (only for MCS15xx)</td>
</tr>
<tr>
<td>Electrical connection</td>
<td>0 = Male connection M 12x1, 8 pole</td>
</tr>
<tr>
<td></td>
<td>1 = Male connection M 12x1, 8 pole and Ethernet M 12x1, 4 pole, D coded acc. IEC61076-2-101</td>
</tr>
<tr>
<td>Modification number</td>
<td>000 = Standard</td>
</tr>
</tbody>
</table>
Examples of connection

Attached you will find sample wiring for the use of the switching outputs S1 / S2 in operation with one or several different supply voltages.

Lead the load resistances and bridges via a separate external terminal strip.

Connection: operation voltage = measurement voltage

Using switching output 1

Using switching output 2
Using switching output 1 and 2

Connection: operation voltage ≠ measurement voltage

In the following examples, a measurement voltage of 10 V DC and an operation voltage of 24 V DC are used.

Using switching output 1
Using switching output 2

Using switching output 1 and 2
We hereby declare that the following designated product, on the basis of its design and construction, and in the version which we have brought to market, corresponds to the fundamental safety and health requirements contained in the standards listed below.

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

<table>
<thead>
<tr>
<th>Designation</th>
<th>Metallic Contamination Sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>MCS 1000 Series</td>
</tr>
<tr>
<td>Part no.</td>
<td>-</td>
</tr>
<tr>
<td>Serial-no.</td>
<td>-</td>
</tr>
<tr>
<td>EMC Guideline</td>
<td>2004/108/EG</td>
</tr>
<tr>
<td>EU directive on electromagnetic compatibility</td>
<td>EN 61000-6-3</td>
</tr>
<tr>
<td>Electromagnetic compatibility, immunity</td>
<td>EN 61000-6-2</td>
</tr>
</tbody>
</table>

2009-08-28
Thorsten Trier
Date Name (CE-authorized person)

Thornen Trier
Glossary

Ferromagnetic (Fe)
A "ferromagnetic" material is one that turns into a magnet through the influence of an external magnetic field. Examples are iron, cobalt, and nickel, which have this property at room temperature.

These materials differ in their residual magnetism (remanence) after being removed from the magnetic field. Materials with a high remanence are described as "magnetically hard" and materials with a low remanence are called "magnetically weak".

Non-ferromagnetic (nFe)
Many metals used in the industry do not have the above-mentioned ferromagnetic property. Examples include aluminum alloys, copper, brass as well as austenitic steels like stainless steel. Such metals are called "non-ferromagnetic"; they can be easily checked with a commercially available permanent magnet. If there is no adhesion, the metal is nFe.

Certification
The Metallic Contamination Sensor MCS 1000, a fluid sensor for detecting metallic solid particle contamination in lubricating liquids according to the inductive principle, was certified in February 2010 as an "add on" for condition monitoring systems in wind power plants.

The certification was provided by Germanischer Lloyd Industrial Services GmbH.
Basics of GL certification

  
  This guideline states that the sensors must be able to distinguish between ferromagnetic and non-ferromagnetic particles and that the installation location in the cooling filter circuit is upstream of the filter.

- **Testing criteria**
  
  Device design
  Manufacture
  Calibration
  Quality planning
  Product documentation (comprising data sheet and operating and maintenance instructions)
  Proof of function for the MCS 1000
  EMC test

- **Retrofitting in GL-certified plants**
  
  Condition monitoring systems in wind power plants which have already been certified by GL do not lose their certification if the MCS 1000 is built into the system after certification, as the component itself is certified.

**Germanischer Lloyd Industrial Services GmbH, renewable energies**

GL is one of the leading certification authorities in the wind energy sector, performing tests, certification procedures and approvals for wind power plants and their components.

GL Wind Order No. 4800/08/41043/254