Quick start FMSC01S0

PARTICLE MONITOR

Read the safety and operating instructions before use!

Never remove the coverings. The device uses a laser with the potential to harm users.

FMSC01S0 Particle Monitor contains a laser sensor that is classified for intended use as a class 1 laser according to DIN EN 60825-1:2001-11. In reasonably foreseeable circumstances, the accessible laser radiation is not dangerous.
With direct exposure to class 1 lasers in the upper power range, injury, such as blinding, impairment of color vision and disruption, cannot be ruled out.

Indications on the product
On the back of the device there is the nameplate and the note with the laser class.

1.Quick Start

The steps that must be executed for commissioning the FMSC01S0 Particle Monitor are described below. The following components are necessary for this:

1. PC/laptop with RS232 connection, or alternatively a USB connection, that serves as the measurement computer.
2. FMSC01S0 Particle Monitor (order number: 04.006.00187)
3. Sensor cable to RS232 (cod. FMSA04S0, order number: 04.006.00191)
4. Power supply unit incl. power connector (cod. FMSA01S0, order number: 04.006.00190)
5. In addition, for connection via USB: USB to RS232 converter with associated driver software (cod. FMSA05S0, order number: 04.006.00194)

Sensor connection for data acquisition via USB

1. Connect the sensor cable to the sensor with the M12 connector.
2. Connect the 9-pin D-sub connector of the cable to the appropriate serial interface of the USB to RS232 converter.
3. Connect the power supply unit and the sensor cable.
4. Now properly connect your power supply unit to the line voltage via the power connector. Your sensor is now ready for operation.

Sensor connection for data acquisition via RS232

5. Connect the sensor cable to the sensor with the M12 connector.
6. Connect the 9-pin D-sub connector of the cable to the appropriate serial interface of your PC/laptop.
7. Connect the power supply unit and the sensor cable.
8. Now properly connect your power supply unit to the line voltage via the rubber connector. Your sensor is now ready for operation.

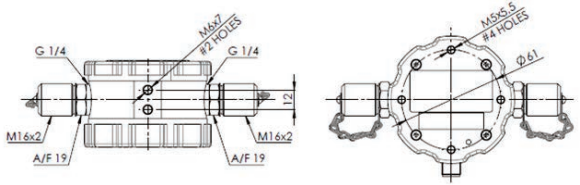
2.Technical data

Sensor Data	Size	Unit
Max Operating Pressure dynamic static	 420 600	 bar bar
Permissible flow rate	50...400	ml/min
Operating conditions		
Temperature	-20 … +85	°C
Relative humidity	0 … 100	% r H. (non-condensing)
Display readable up to	60	°C
Compatible liquids	mineral oils (H, HH, HL, HM, HV, HLP, HLPD, HVLP))	
	synthetic esters (HETG, HEPG, HEES, HEPR)	
	polyalkyleneglycols (PAG)	
	zinc and ash-free oils (ZAF)	
	polyalphaolefins (PAO)	
Wetted Materials	Stainless steel, sapphire, chrome, NBR, minimess coupling: Zinc/nickel	
Protection class [1]	IP67	
Power supply	9 … 33	V
Current consumption	Max. 0,2	A
Max. power consumption	2	W
Output		
Power output [2]	4...20	mA
Accuracy power output [3]	±2	%
Interfaces	RS232/CAN	-
Alarm contact	Open collector	-
Digital input for start and stop		
Power supply	9...33	V
Data memory	3000	data records
Connecting dimensions		
Fluid connections	G1/4 minimess M16x2	inch
Electrical connections	M12x1, 8-pole	-
Tightening torque M12-connection	0,1	Nm
Measuring range according to ISO 4406		
Cleanliness level (measuring range)	0...24	Ordinal number (OZ)
Cleanliness level (calibrated range)	10...22	Ordinal number (OZ)
Measuring accuracy (calibrated range)	±1	Ordinal number (OZ)
Weight	~720	g

Table 2.1: Technical data

1) With screwed-on connector
2) Output IOut is freely configurable (see operating manual)
3) In relation to the analogue current signal (4 ... 20 mA)

Fig. 2.1: Dimensional drawing



3. Installation

- Hydraulically the FMSC01S0 Particle Monitor must be connected to the pressure line respectively in bypass flow (50…400 ml/min).
- Adjust the flow rate by orifices and flow control valve (accessories).
- Within the menu (sensor parameter/flow) the current flow can be checked.
- Abrupt changes of the cross section, orifices, valves, and pumps at the inlet of the FMSC01S0 Particle Monitor have to be avoided in order to reduce de-aeration and accumulation of contaminants.
- The length of the pressure line has to be selected carefully. Long lines and low flow rates might lead to particle sedimentation. Moreover, the pressure loss is highly dependent on the viscosity. At low temperatures this might result in low flow rates and an insufficient flow through the FMSC01S0 Particle Monitor. In contrast, long pressure lines might be reasonable in case of free air within the oil. Thus, needed time for the solution of the air is provided.
- Steep and fast pressure gradients should be avoided in order to gain an exact measurement result.
- Sampling should be performed at a characteristic location.
- The factory setting of the sampling time is 1 minute by default. In case of very clean oil this time can be changed.

4. Electrical connection

Only a qualified electrician should install the device. Comply with national and international guidelines for setting up electrical equipment. Power supply in accordance with EN50178, SELV, PELV, VDE0100-410/A1. Incorrect connection of the device can lead to damages! De-energize the system for the installation and connect the device as follows:

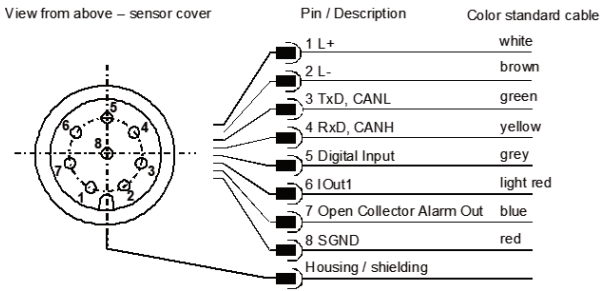


Fig. 4.1: Pin assignment of the connector

The permissible operating voltage is between 9 VDC and 33 VDC.
The sensor cable must be shielded. To achieve IP67 degree of protection, only use suitable connectors and cable.

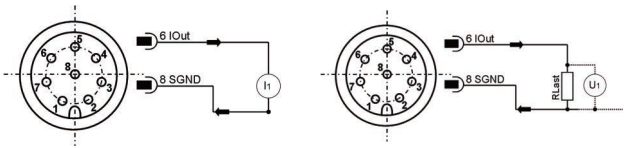


Fig 4.2: Measuring the analog 4..20 mA outputs with and without load resistor

Current should be measured with a suitable current measurement device, in accordance with Fig. 4.2. More details can be read within the manual. The calculation of the ordinal numbers ON by means of the analog current I can be performed according to the following equation:

OUTPUT	EQUATION	NUMBER
Ordinal number / cleanliness	$OZ = \frac{26}{16[mA]} \cdot I[mA] - \frac{26}{4}$	(4-1)

Fig 4.1: Calculating the scale number or purity class based on the current

Pursuant to ISO 4406, the current range covers scale numbers from 0 to 26. A current value of 4 mA would correspond to a scale number of 0, whereas 20 mA would correspond to a scale number of 26.

I_{OUT} in mA	4	12	20
Ordinal number	0	13	26

Fig 4.2: Table for calibrating the current inputs

5. Communication RS232

- Baud rate: 9600 (standard)/19200/57600/115200
- Parity: none
- Flow controll: none
- Data bits: 8
- Stop bits: 1

#	INSTRUCTION FORMAT	MEANING	RETURN FORMAT
1	RVal[CR]	Reading all measured values with subsequent check sum (CRC)	$Time:%.4f[h]; ISO4um:%d[-]; ISO6um:%d[-]; ISO14um:%d[-]; ISO21um:%d[-]; SAE4um:%c[-]; SAE6um:%c[-]; SAE14um:%c[-]; SAE21um:%c[-]; NAS:%c[-]; GOST:%c[-]; Conc4um:%.2f[p/ml]; Conc6um:%.2f[p/ml]; Conc14um:%.2f[p/ml]; Conc21um:%.2f[p/ml]; FIndex:%d[-]; MTime:%d[s]; ERC1:0x0000; ERC2:0x0000; ERC3:0x0000; ERC4:0x0300; CRC:z[CR][LF]
2	RID[CR]	Reading of identification with subsequent check sum (CRC)	$Filtrec; FMSC01S0; SN:xxxxxx; SW:xx.xx.xx; CRC:z[CR][LF]
3	RCon[CR]	Reading of configuration parameters with subsequent CRC	$Std:%d; StartMode:%d; Flow:%d; AO1:%d; Amode:%d; Mean:%d; Alarm4:%c; Alarm6:%c; Alarm14:%c; Alarm21:%c; AlarmNAS:%c; AlarmGOST:%c; AlarmT:%d[°C]; Mtime:%d[s]; Htime:%d[s]; CRC:z[CR][LF]

#	INSTRUCTION FORMAT	MEANING	RETURN FORMAT
4	RMemO[CR]	Reading of memory organisation (header), names and units	Time; ISO4um; ISO6um; ISO14um; ISO21um; SAE4um; SAE6um; SAE14um; SAE21um; NAS; GOST; Conc4um; Conc6um; Conc14um; Conc21um; FIndex; MTime; ERC1; ERC2; ERC3; ERC4[CR][LF]
5	RMem[CR]	Reading of complete memory, including header	[memory organization] %f;%f; … 0x0000[CR][LF] … %f;%f; … 0x0000[CR][LF] finished[CR][LF]
6	RMemH-n[CR]	Read memory of the recent n hours	$%f;%f; … 0x0000;CRC:z[CR][LF] … $%f;%f; … 0x0000;CRC:z[CR][LF] finished[CR][LF]

Table 5.1: Reading commands

For additional information on RS232 or CAN-communication and the digital channels please refer to the "FMSC01S0 operating manual" (www.filtrec.com)

Note: The indicated data only serve to describe the product. Information regarding the use of this product are only examples and suggestions. Representations do not always exactly correspond to the original. No legal claims arise from information provided by us in error. Technical information may change without notice. Catalog specifications are no guaranteed features. The information given does not release the user from his / her own assessments and inspections. Our products are subject to a process of natural wear and aging. The delivered product may thus differ from the illustration.

For any questions please contact:

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