

# Liquid Alarm Sensor

## KS2, $\text{Ex}$ KS2.Ex for non-conductive and conductive media

Instruction Manual  
Version 1.01.00





**Dear customer,**

we have made up this operating manual in such a way that all necessary information about the product can be found and understood quickly and easily.

Should you still have any question, please do not hesitate to contact **M&C** directly or go through your appointed dealer. Respective contact addresses are to be found in the annexe to this operating manual. Please also contact our homepage [www.mc-techgroup.com](http://www.mc-techgroup.com) for further information about our products. There, you can read or download the data sheets and operating manuals of all **M&C** products as well as further information in German and English.

This Operating Manual does not claim completeness and may be subject to technical modifications.

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Version: 1.01.00

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## 1 GENERAL INFORMATION

The product described in this operating manual has been examined before delivery and left our works in perfect condition related to safety regulations. In order to keep this condition and to guarantee a safe operation, it is important to heed the notes and prescriptions made in this operating manual. Furthermore, attention must be paid to appropriate transportation, correct storage, as well as professional installation and maintenance work.

All necessary information a skilled staff will need for appropriate use of this product are given in this operating manual.

## 2 DECLARATION OF CONFORMITY



The product described in this operating manual complies with the following EU directives:

### ATEX-Directive

The product KS2.Ex which is described in this manual is produced in accordance with the EU directive for devices and protection systems for appropriate use in hazardous areas 2014/34/EU appendix II.

### EMV-Instruction

The requirements of the EU directive 2014/30/EU "Electromagnetic compatibility" are met.

### Low Voltage Directive

The requirement of the EU directive 2014/35/EU "Low Voltage Directive" are met.

The compliance with this EU directive has been examined according to DIN EN 61010.

### Declaration of conformity

The EU Declaration of conformity can be downloaded from the **M&C** homepage or directly requested from **M&C**.

### 3 SAFETY INSTRUCTIONS

**Please take care of the following basic safety procedures when mounting, starting up or operating this equipment:**

Read this operating manual before starting up and use of the equipment. The information and warnings given in this operating manual must be heeded.

Any work on electrical equipment is only to be carried out by trained specialists as per the regulations currently in force.

Attention must be paid to the requirements of VDE 0100 (IEC 364) when setting high-power electrical units with nominal voltages of up to 1000 V, together with the associated standards and stipulations.

Check the details on the type plate to ensure that the equipment is connected to the correct mains voltage.

Protection against touching dangerously high electrical voltages:

Before opening the equipment, it must be switched off and hold no voltages. This also applies to any external control circuits that are connected.

The device is only to be used within the permitted range of temperatures and pressures.

Check that the location is weather-protected. It should not be subject to either direct rain or moisture.

Only the especially marked liquid sensor KS2.EX is allowed to be operated in hazardous areas.

Installation, maintenance, monitoring and any repairs may only be done by authorized personnel with respect to the relevant stipulations.

### 4 WARRANTY

If the equipment fails, please contact **M&C** directly or else go via your appointed **M&C** dealer.

We offer a one year warranty as of the day of delivery as per our normal terms and conditions of sale and assuming technically correct operation of the device. Consumables are hereby excluded. The terms of the warranty cover repair at the factory at no cost or the replacement at no cost of the equipment free ex user location. Reshipments must be sent in a sufficient and proper protective packaging.

## 5 USED TERMS AND SIGNAL INDICATIONS



**DANGER!**

This means that death, severe physical injuries and/or important material damages **will occur** in case the respective safety measures are not fulfilled.



**WARNING!**

This means that death, severe physical injuries and/or important material damages **may occur** in case the respective safety measures are not fulfilled.



**CARE!**

This means that minor physical injuries **may occur** in case the respective safety measures are not fulfilled.

**CARE!**

Without the warning triangle means that a material damage may occur in case the respective safety measures are not met.

**ATTENTION!**

This means that an unintentional situation or an unintentional status may occur in case the respective note is not respected.



**NOTE!**

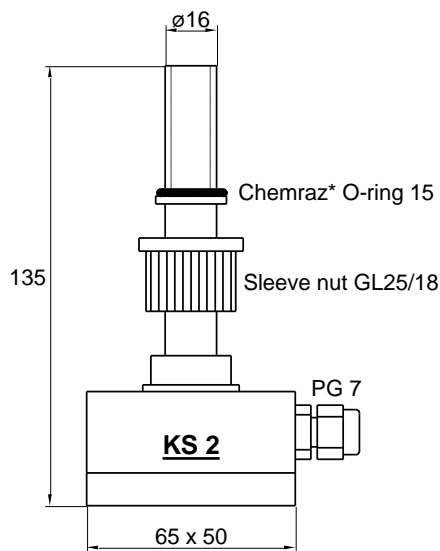
These are important information about the product or parts of the operating manual which require user's attention.

**SKILLED STAFF**

These are persons with necessary qualification who are familiar with installation, use and maintenance of the product.

## 6 APPLICATION


Liquid alarm sensors are used in gas sample conditioning systems for monitoring gas cooling and condensate removal devices in order to provide protection for downstream analysis instruments. This monitoring device **KS2 / KS2.Ex** reliably signals the penetration of **non conductive** (e.g. alcohol) **and conductive** (e.g. water) **liquid** in the event of cooling or condensate removal equipment being defective, thus avoiding expensive down time as well as high repair costs for analysis instruments. In the event of an alarm, we recommend to switch off the power supply for the sample gas or a solenoid valve in the sample conditioning system.



\* Chemraz is a Greene Tweed Trademark

Figure 1 KS2 / KS2.Ex Liquid-Sensor

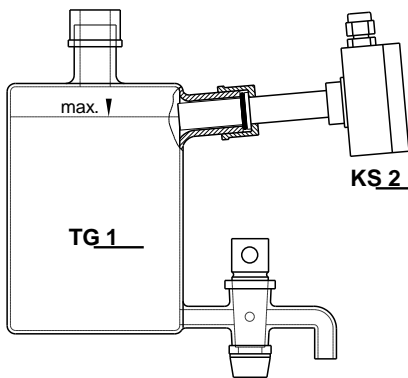
## 7 TECHNICAL DATA

Sensor	KS2	KS2 Peek	KS2.Ex
Part No.	<b>03E4100</b>	<b>03E4110</b>	<b>03E4200</b>
Pressure	max. 2 bar abs.	max. 11 bar abs.	max. 2 bar abs.
Max. operating temperature	0°C to +60°C		0°C to +50°C
Liquid alarm limit	1,5ml		
Material of sample contacting parts	PTFE, Chemraz, SS316Ti	Peek, Chemraz, SS316Ti	PTFE, Chemraz, SS316Ti
Sample connection Standard (Fitting for mounting in stainless steel filter: connector GE SS ½"NPT-18mm Part No.. 09V2317)	ø16 mm for GL25	ø18 mm for mounting in stainless steel filter FSS...-D1/2"NPT	ø16 mm for GL25
Option sample connection ø18 mm, Part No.: <b>03E9400</b> (Fitting for mounting in stainless steel filter: connector GE SS ½"NPT-18mm Part No.. 09V2317)	for mounting in stainless steel filter FSS...-D1/2"NPT		for mounting in stainless steel filter FSS...-D1/2"NPT
Method of mounting / mounting position	clamping attachment / for liquid alarm vertical with opening upwards		
Max. voltage / current / power consumption			13,5V / 31 mA / 125 mW
Inner capacity max.			150 nF
Inner inductivity max.			0 mH
Power supply	8-12VDC feeding via FA1.4 or FA1.1		8V DC / max.2,4mA operating: < 1,4 mA alarm
Connection cable, length 1,5 m <i>standard</i>	3 x 0,25mm <sup>2</sup>		2 x 0,25mm <sup>2</sup>
Cable capacity inductivity	200pF/m 1µH/m		
Protection	IP 54 DIN 40050		 II 1 G EEx ia IIC T6 KEMA 03ATEX1006
Weight	190 g		



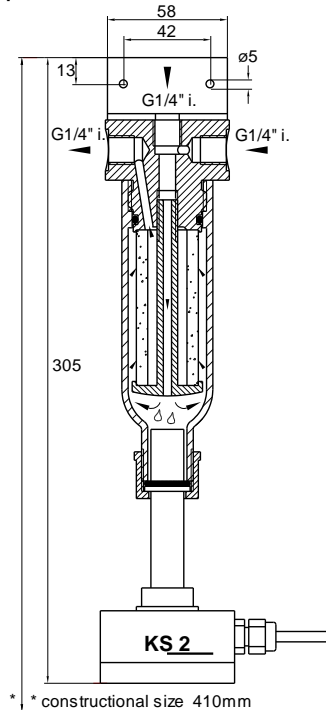
## 8 DESCRIPTION

The **M&C** liquid sensor **KS2 / KS2.Ex** works on the principle of capacitive measurement and is suitable for non-conductive and conductive media. A pre-amplifier is integrated in the sensor housing and is connected with the necessary external electronic controller via 2- resp. 3-wire. For the sensor type **KS2** the required electronic controller is available in various versions, **FA1.1** or **FA1.4** and is described in a separate data sheet. The **M&C** liquid sensor **KS2.Ex** for applications in hazardous areas and media should only be applied in connection with electronic controller **WE77.Ex1**, **KFA6-SR2-Ex1.W** or an electronic with the same performance data (see chapter 9.4). For electronics with the same performance data there is no guarantee for problemless operation. The **M&C KS2 / KS2.Ex** liquid sensor is constructed in such a way that any droplets of liquid in the sample gas are attracted directly to the active sensor surface. Even small liquid droplets will trigger a sure and rapid alarm. The sensors can be mounted with the 16mm  $\varnothing$  stainless steel body in the GL-25 connector of the Universal filter **F...-D** or the condensate pot **TG1** or in the flow chamber **LS/KS**.



**Figure 2** KS2.. liquid sensor for level monitoring in the condensate pot type TG1

In the event of condensate breakthrough, the filter acts as a buffer vessel preventing immediate liquid penetration.



**Figure 3** Liquid alarm-sensor KS.2 / KS2.Ex in a Universal filter F...-D

## 9 FUNCTION

### 9.1 CONNECTION AND ADJUSTMENT OF THE SENSOR TYPE KS2 AT THE ELECTRONIC FA1.1

- Link the sensor to the electronic FA1.1 (see also manual 5-6.10ME)

KS2 terminal X4/3 to FA1.1 terminal 15 (yellow)

KS2 terminal X4/2 to FA1.1 terminal 17 (white)

KS2 terminal X4/1 to FA1.1 terminal 18 (brown)

Adjustment with „dry“ sensor:

- Turn the potentiometer to the left until the green LED is OFF and the red LED is ON.  
Turn the potentiometer very slowly to the right. After the green LED is ON, turn the potentiometer for another 0,5 rotations to the right.

Checking the sensibility:

Test the sensor with the condensate of your application, if possible. A condensate quantity of 1,5 ml effects the alarm release. The sensor can be adjusted to a higher sensibility if the potentiometer is turned to the left.



**NOTE!**

**A sensor with high sensitivity can cause false alarms.**

### 9.2 CONNECTION AND ADJUSTMENT OF THE SENSOR TYPE KS2 AT THE ELECTRONIC FA1.4

- Link the sensor to the electronic FA1.4 (see also manual 5-6.10ME)

KS2 terminal X1/3 to FA1.4 terminal 15 (yellow)

KS2 terminal X1/2 to FA1.4 terminal 17 (white)

KS2 terminal X1/1 to FA1.4 terminal 18 (brown)

Adjustment with „dry“ sensor:

- Turn the potentiometer to the left until the green LED is OFF and the red LED is ON.  
Turn the potentiometer very slowly to the right. After the green LED is ON, turn the potentiometer for another 0,5 rotations to the right.

Checking the sensibility:

Test the sensor with the condensate of your application, if possible. A condensate quantity of 1,5 ml effects the alarm release. The sensor can be adjusted to a higher sensibility if the potentiometer is turned to the left.



**NOTE!**

**A sensor with high sensitivity can cause false alarms.**

### 9.3 CONNECTION OF THE SENSOR TYPE KS2.EX TO THE ELECTRONICS WE77/EX1



**NOTE!**

The bridge between the connecting points 3 and 4 of the electronics WE77/Ex1 guarantees a „safty-first“ alarm release (alarm in case of voltage loss and parting of the cable).

The function is as follows:

**dry sensor** : LED „ON“ contact MC-NO terminal 7 and 9 closed Sensor current > 1,7 mA

**wet sensor** : LED „OFF“ contact MC-NC terminal 7 and 8 closed Sensor current < 1,4 mA

#### Brigde between connecting points 4 and 5 or missing bridge



**NOTE!**

If the bridge is missing or switched between the connecting points 4 and 5 of the electronics WE77/Ex1 the alarm is not working in a „safty-first“ mode (no alarm in case of voltage loss).

The sensor current is on a very low level. Therefore we recommend to switch a resistance of 10kΩ parallel to the sensor to increase the level.

The function than is as follows:

**dry sensor** : LED „OFF“ contact MC-NC terminal 7 and 8 closed Sensor current > 1,7 mA

**wet sensor** : LED „ON“ contact MC-NO terminal 7 and 9 closed Sensor current < 1,4 mA

### 9.4 CONNECTION OF THE SENSOR TYPE KS2.EX TO THE ELECTRONICS KFA6-SR2-EX1.W

Move all switches (S1-S3) on the front into position I (left).

The function is as follows:

#### **dry sensor**

LED position	LED name	Color / status	Description
Left	,OUT'	Yellow on	Contact MC-NC terminal 7 and 8 closed, Sensor current > 1,7 mA

#### **wet sensor**

LED position	LED name	Color / status	Description
Left	,OUT'	Yellow off	contact MC-NO terminal 7 and 9 closed, Sensor current < 1,4 mA

The other LED's:

LED position	LED name	Color / status	Description
In the middle	,CHK'	Red off	Sensor circuit OK
In the middle	,CHK'	Red flashing	Sensor circuit Open
Right	,PWR'	Green on	Power on
Right	,PWR'	Green off	Power off

### 9.5 ADJUSTMENT OF THE SENSOR TYPE KS2.EX

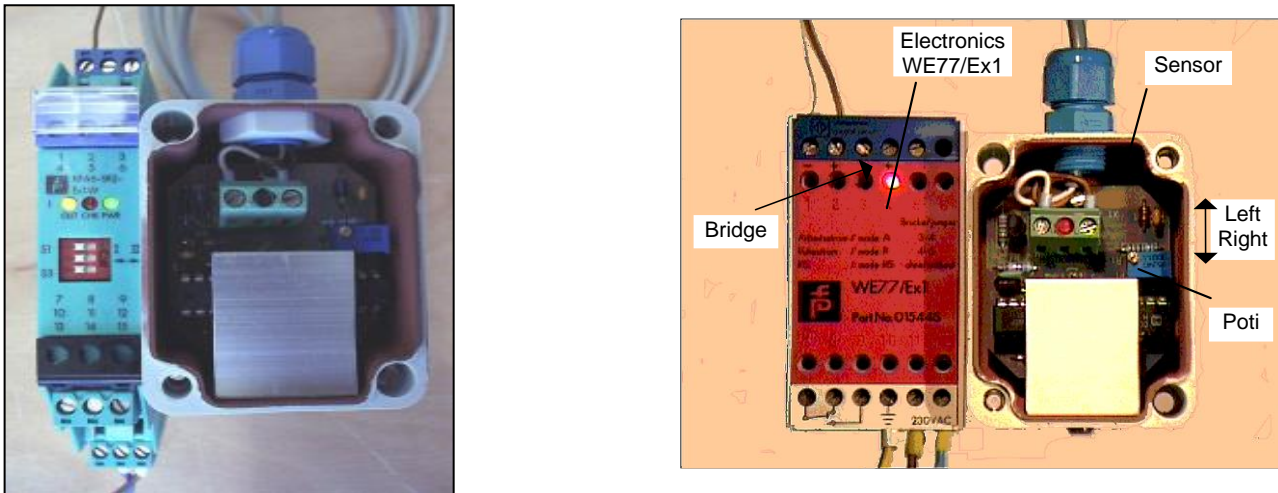


Figure 4 Electronic KFA6-SR2-Ex1.W (left) and terminal box KS2.Ex respectively WE77/Ex1

- Turn the potentiometer (figure 4) to the left until the LED is OFF.
- Turn the potentiometer slowly to the right. After the LED is ON, turn the potentiometer for another 1,5 rotations to the right.

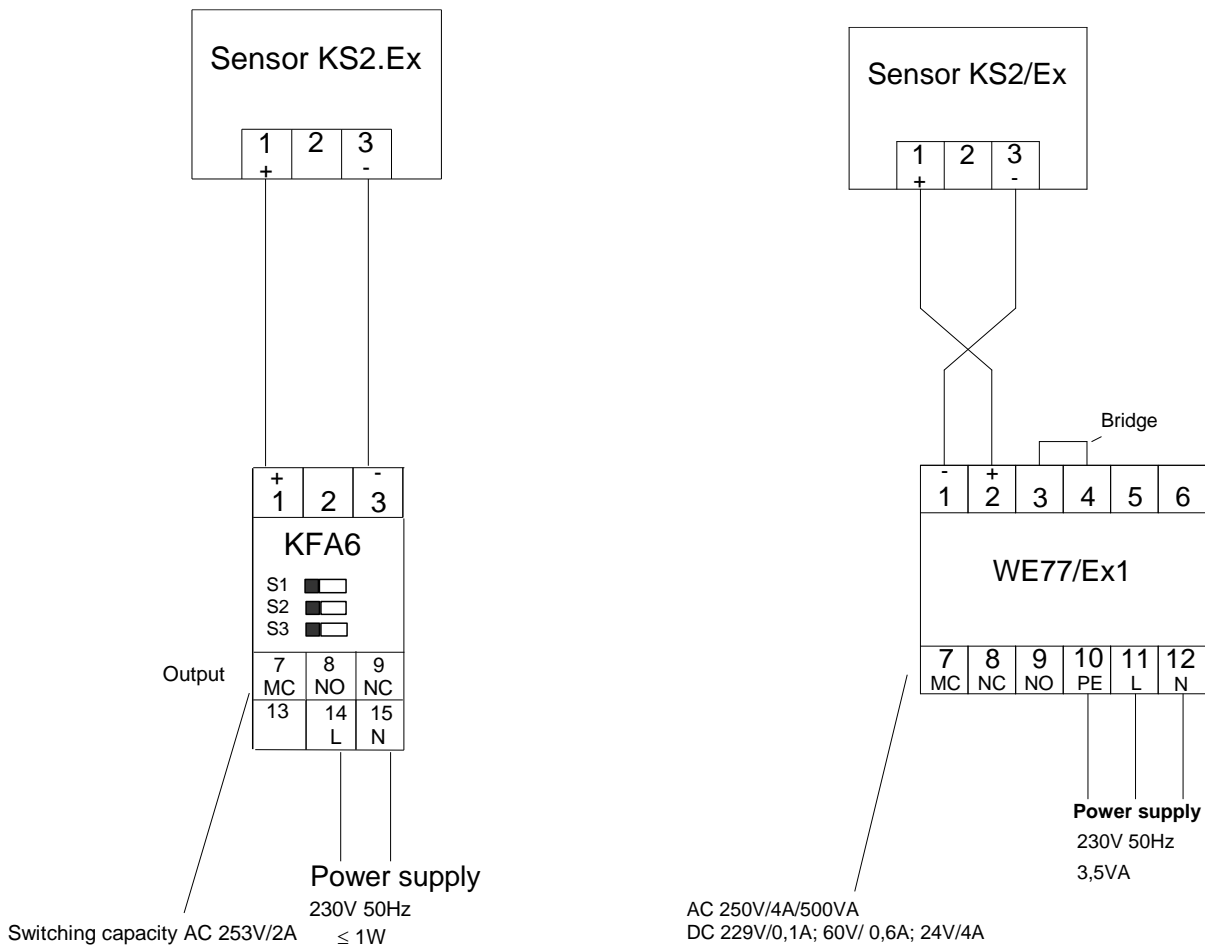


Figure 5 Wiring diagram KS2.Ex and KFA6-SR2-Ex1.W respectively WE77/Ex1

**Technical data for switch amplifiers (techn. data sensor see page 5)**

<b>Evaluation for example by section switch amplifier KFA6-SR2-Ex1.W</b>		
<b>Nominal revolutions according to DIN 19234 respectively Namur</b>		
Voltage $U_o$	10,6 V	
Current $I_o$	19 mA	
Power consumption $P_o$	51 mW	
<b>Data according to certificate of conformity for KS2.Ex</b>		
Voltage max. $U_o$	13,5V	
Current max. $I_k$	31mA	
Power consumption $P_{max}$	125mW	
Permissible connection data Class	EEx ia IIB	EEx ia IIC
Outer capacity max.	929nF	230nF
Outer inductivity max.	5mH	3mH
Permissible connection data Class	EEx ib IIB	EEx ib IIC
Outer capacity max.	2929nF	609nF
Outer inductivity max.	115mH	31mH

<b>Evaluation by section switch amplifier WE77/Ex1</b>		
<b>Nominal revolutions according to DIN 19234 respectively Namur</b>		
No-load voltage $U_{AO}$	approx. 8V DC	
Locked motor current $J_{AK}$	approx. 8mA	
Forward break-over point $J_s$	1,2mA - 2,1mA	
Switching hysteresis $J_H$	approx. 0,2mA	
<b>Data according to certificate of conformity</b>		
Voltage max. $U_o$	13,5V	
Current max. $I_k$	31mA	
Power consumption $P_{max}$	125mW	
Permissible connection data Class	EEx ia IIB	EEx ia IIC
Outer capacity max.	929nF	230nF
Outer inductivity max.	5mH	3mH
Permissible connection data Class	EEx ib IIB	EEx ib IIC
Outer capacity max.	2929nF	609nF
Outer inductivity max.	115mH	31mH

**10 CLEANING OF THE SENSOR**

**NOTE!**

The plastic housing of the sensor has to be cleaned with a moist cloth.

## 11 SPARE PARTS LIST

Wear, tear and replacement part requirements depend on specific operating conditions. The recommended quantities are based on experience and are not binding.

### Liquid sensor type KS2 / KS2.Ex (C) consumable parts and (R) recommended spare parts

Part number	Description	C/R	recommended quantity KS2/KS2.Ex being in operation [years]		
			1	2	3
91 E 4000	O-Ring $\varnothing$ 15x2,5mm for KS-Sensor Material: Chemraz	R	1	1	1
91 E 4005	O-Ring $\varnothing$ 9x2mm for KS-Sensor Material: Chemraz	R	1	1	1
91 E 4010	O-Ring $\varnothing$ 9x2mm for KS-Sensor Material: Viton	R	1	1	1
91 E 4015	O-Ring $\varnothing$ 13x1mm for KS-Sensor Material: Viton	R	1	1	1
90 F 0022	Union nut GL25/18	R	1	1	1

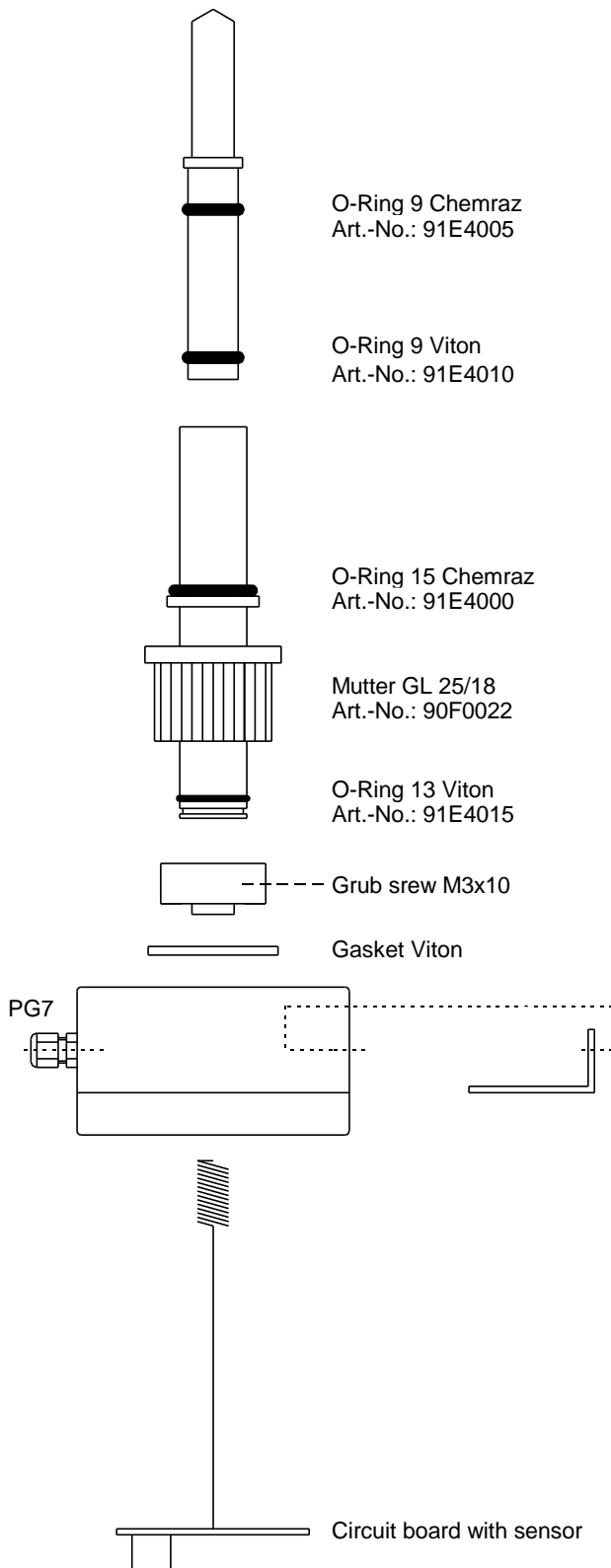
## 12 APPENDIX

- Mounting of the sensor type KS2
- EC-Type Examination Certificate: **KEMA 03ATEX1006**



For additional manuals and data sheets please look on our home page  
[www.mc-techgroup.com](http://www.mc-techgroup.com)

- Manual flow alarm **FA**  
Document: **5-6.10MD**
- Data sheet condensate vessel **TK, TG**  
Document: **3-6.3.1**
- Data sheet universal filter **FP, FT**  
Document: **5-1.1**



**Figure 6** Mounting of the sensor type KS2



translation


original language: german

(1) **EC-TYPE EXAMINATION CERTIFICATE**

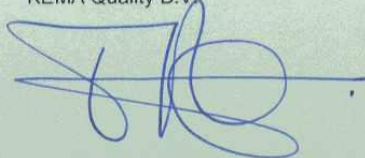
- (2) Equipment or protective system intended for use in potentially explosive atmospheres - Directive 94/9/EC
- (3) EC-Type Examination Certificate Number: **KEMA 03ATEX1006**
- (4) Equipment or protective system: **Liquid Sensor Type KS2.Ex**
- (5) Manufacturer: **M&C Products Analysetechnik GmbH**
- (6) Address: **Rehhecke 79, 40885 Ratingen-Lintorf, Germany**
- (7) This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.
- (8) KEMA Quality B.V., notified body number 0344 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the directive.

The examination and test results are recorded in confidential report no. 2010185.

- (9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:
- EN 50014 : 1997      EN 50020 : 2002      EN 50284 : 1999**
- (10) If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.
- (11) This EC-Type Examination Certificate relates only to the design, examination and tests of the specified equipment or protective system according to the Directive 94/9/EC. Further requirements of the directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.
- (12) The marking of the equipment or protective system shall include the following:


**II 1 G    EEx ia IIC T6**

Arnhem, 20 February 2003  
KEMA Quality B.V.



T. Pijker  
Certification Manager

\* This Certificate may only be reproduced in its entirety and without any change

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DUTCH COUNCIL FOR  
ACCREDITATION



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(13) **SCHEDULE**  
 (14) **to EC-Type Examination Certificate KEMA 03ATEX1006**

(15) **Description**

The Liquid Sensor Type KS2.Ex is suitable for use in non-conductive and conductive media and monitors gas cooling and condensate drainage installations. The sensor signal is converted into an electrical signal according the NAMUR standard.

Ambient temperature range 0 ... 50 °C.

**Electrical data**

Sensor input circuit ..... in type of explosion protection intrinsic safety EEx ia IIC, with the following maximum values:

$U_o$	=	13,5	V
$I_o$	=	31	mA
$P_o$	=	125	mW

Supply circuit ..... in type of explosion protection intrinsic safety EEx ia IIC, only for connection to a certified intrinsically safe circuit, with the following maximum values:  
 (terminals X1/1 and X1/3)

$U_i$	=	13,5	V
$I_i$	=	31	mA
$P_i$	=	125	mW
$C$	=	150	nF
$L_i$	=	0	mH

The sensor input circuit and the supply circuit are galvanically connected with each other.

(16) **Report**

KEMA No. 2010185.

(17) **Special conditions for safe use**

None.

(18) **Essential Health and Safety Requirements**

Covered by the standards listed at (9).

(19) **Test documentation**

1. Certificate of Conformity KEMA No. Ex-95.D.1265

dated

2. Drawing No.	2345-4.10.0 d	08.01.2003
	2345-5.03.0 d	14.02.2002
	2345-7.01.1 a	04.03.2002
	2345-7.01.2	08.03.2001
	2345-7.01.3 a	04.03.2002
	2345-7.01.3	08.03.2001
Component list	2345-5.03.0 a	20.02.2003