

Operating Manual

Capacitive Level Sensor MLC490/491/492



Company / GHM brands

TA TELEMETRIE &
AUTOMATION

IMTRON

Martens

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GDFISINGFC

www.ghm-messtechnik.de

Retain for future reference.

V3.01

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1 Proper use (application areas)



Detailed information on the application area can be found in chapter “Product description”.

The operating safety of the device is ensured only with proper use and observation of the information given in the operating instructions.

For safety and guarantee reasons, work above and beyond that described in the operating instructions may only be carried out by personnel authorised by the manufacturer. Unauthorised conversions or modifications are expressly prohibited.

In the event of improper use, this device can pose dangers, depending on the application.



The device is **not** suitable for use in areas subject to the risk of explosion or system components relevant to safety in accordance with SIL.

General safety instructions, use

These operating instructions must be kept where they are immediately available to specialist personnel at all times.

All procedures described in these operating instructions must be carried out only by trained personnel authorised by the operator, while wearing the corresponding protective clothing.

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1.1 Safety signs and symbols

Warning instructions are designated in this document as described below in Table 1:

	<p>Warning! This symbol warns against immediately threatening danger, death, severe physical injury or serious material damage if instructions are not followed.</p>
	<p>Attention! This symbol warns against possible dangers or dangerous situations which can cause damage to the device itself or to the environment if instructions are not followed.</p>
	<p>Note! This symbol indicates procedures which have a direct influence on operation or can cause unforeseen reactions if instructions are not followed.</p>

Table 1

1.2 Safety instructions

Read the product description before bringing the device into operation. Ensure that the product is fully suitable for the applications in question.



The operator is responsible for the failure-free operation of the device. The operator is obliged throughout the complete usage time to establish and ensure that the required working and safety measures comply with the relevant applicable regulations.

1.3 Product liability and guarantee

Liability disclaimer:

The content of the operating instructions has been checked for compliance with the device described. Deviations cannot however be excluded, so that we offer no guarantee of full compliance. The information in these instructions is checked regularly, and necessary corrections incorporated into the following editions. We reserve the right to make technical amendments. All claims are also subject to the valid “General delivery conditions for products and services of the electronics industry”.

Martens Elektronik cannot check or repair devices without the specified, fully completed form (see chapter 8, Returns).

1.4 Standards and directives

Conforms to Directive 2004/108/EC

CE conformity EN 61326-2-3:2007-05

Vibration test EN60068-2-6, GL test 2

In household environments, the device must be installed in closed metal tanks/pipes.

1.5 Approvals

Process connection GHMadapt EHEDG certified.

Certificate no. 28/2011.

2 Product description

Capacitive level sensors are used principally for the registration of limit levels, full/empty signals in pipes and tanks in fluid, pasty and powdery media, and for the dry running protection of pumps. The design of the sensor also includes applications in the hygienic area and the chemical industry. Parts of the sensor in contact with the media consist only of materials which conform to FDA.

With the aid of the microprocessor-controlled measurement, the user can adapt the parameter setting to the process environment using a separate programming adapter and PC.

2.1 Delivery contents

- Level sensor
- These operating instructions
- Further documents if applicable

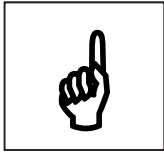
2.2 Operating principle

Capacitive level sensors register fluid, granular and pulverised media (not for use in areas subject to the risk of explosion). This charge transfer measurement procedure makes use of the storage capability of charges in the medium. The sensor tip and the tank wall (or built-in adapter/sleeve) thereby forms an electrical condenser.

If the sensor is in the air, a specific low initial capacity is measured. When the sensor is immersed in the medium, the capacity change is based on a change in the effective permittivity in the area of the measuring tip. This value is determined by the geometry of the sensor and the DK-value of the medium. The measurement procedure enables the monitoring of the product and the detection of any separating layer, e.g. water/oil. Influences due to foam formation and adhesions are minor to non-existent.

2.3 Temperature curve; CIP/SIP-cleaning

Note



In order to ensure the correct operation of the level sensor, it must be noted that the max. permissible process temperature (see Fig. 1) is in relationship to the ambient temperature and must not be exceeded.

During the CIP-Sterilization process (max. 140°C for 30 min.) it is necessary to switch off the power supply, because the Level sensor can take damages.

max. process temperature [°C]

Process- vs. Ambient temperature

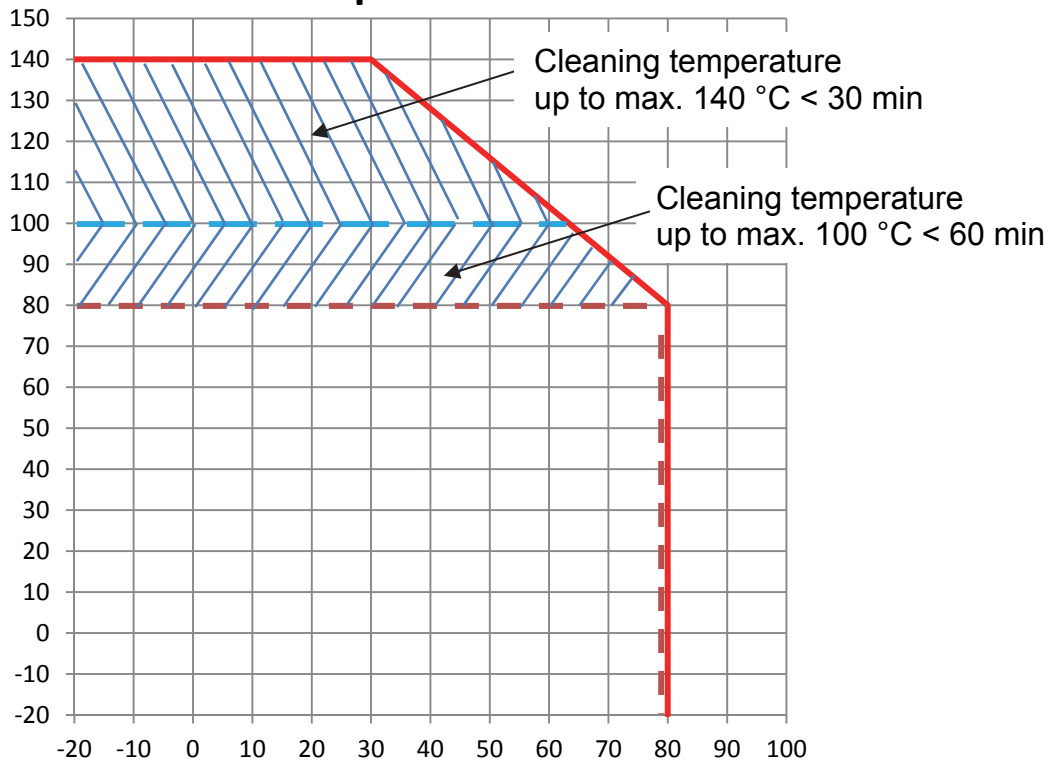


Figure 1 max. ambient temperature [°C]

- max. values
- Sensor must be cut off from the supply voltage
- - - CIP-cleaning temperature max 100°C < 60 min.
- - - Max. Process- and ambient temperature

2.4 Design of the measurement system

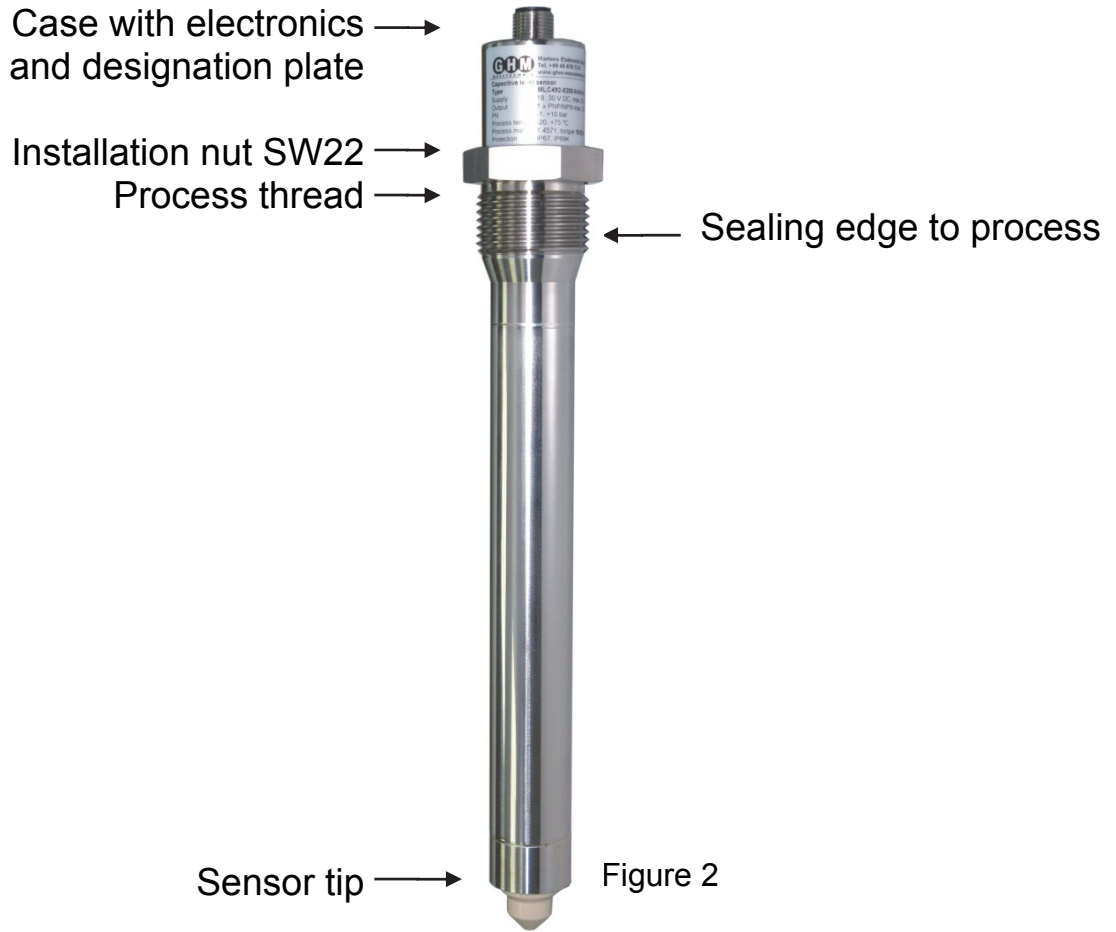


Figure 2

Block wiring diagram (Fig. 3)

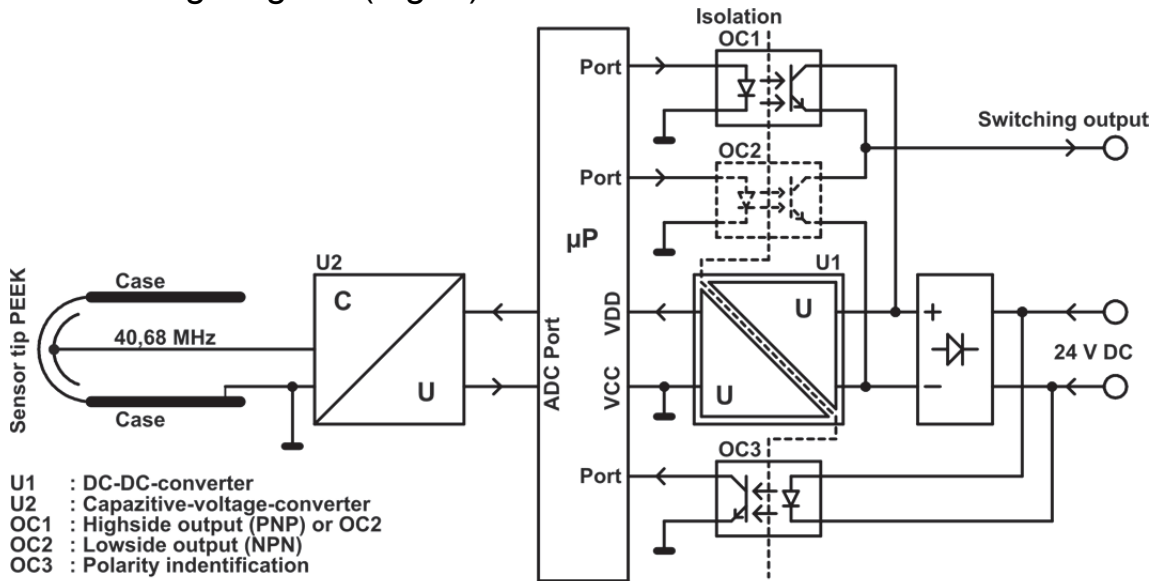


Figure 3

2.5 Type plate

The type designation plate (Fig. 4) contains the main identification data.

- Type and article designation
- Technical data
- Serial number

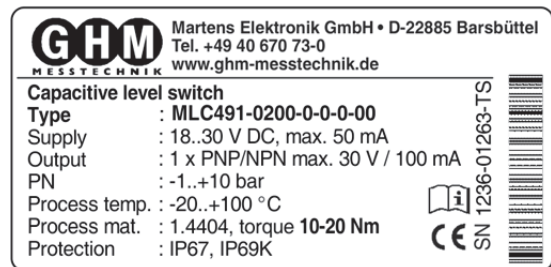
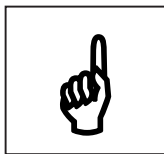


Figure 4

3 Mounting and electrical installation

3.1 Mechanical mounting

The correct seating of the device, correct function and sealing of the connection can only be ensured by using the *GHMadapt* accessories. The device is not suitable for use in abrasive materials.



No additional sealing material (e.g. Teflon[®] tape) must be used on the sealing cone or on the thread. Use a suitable welding tool for the correct installation of *GHMadapt* welded sleeves.

The sensor must not be used as a welding aid.

Installation direction of the welded sleeves (Fig. 5).

The marking shows the position of the M12 connector.

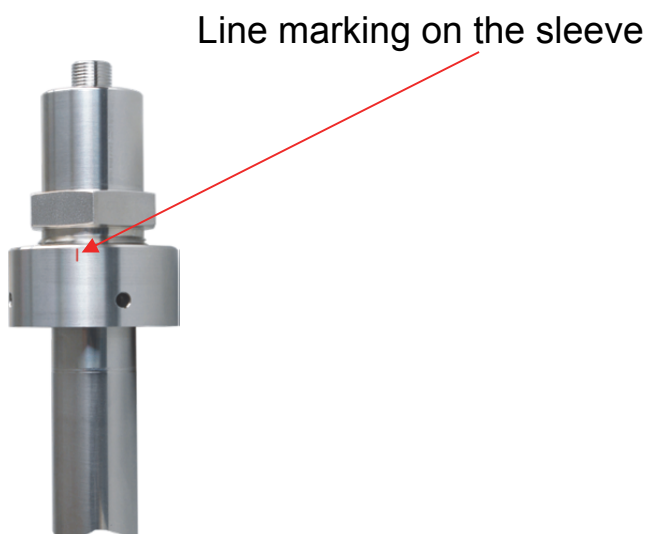


Figure 5

3.2 Welding instructions

Welding in Tanks:



Figure 6

1. Drill a hole with the outer diameter of the sleeve, max. tolerance +0.2 mm
2. Tack the sleeve in place at 8 points (Fig. 6)
Not the correct sequence of the tacking
3. Screw in the welding aid (see Product information GHMadapt AMH123)
4. Weld the sections between the tacks
8 sections for thread G 1



Welding in pipes:

In addition to the APH pipe system, ball sleeves or sleeves with a welding shoulder for pipes with collars are also available for this purpose.

8 sections for thread G 1.



Note: the maximum permissible tightening torque of the material in question when fitting! In order to ensure correct operation, the PEEK measuring tip must be completely covered by the medium. Remove the sensor before carrying out any welding work on the tank. This will avoid damage to the electronics by inductive coupling.

The case must not be used for screwing in! Tightening will result in damage to the electronics. Use the fixed nut provided for screwing in the sensor.

In order to avoid excess heating or warping of the sleeve during the welding process, allow a pause between the individual sections so that the sleeve can cool down.

3.2.1 Instructions on Ordinance (EC) 1935/2004

The following components of the product are designed in accordance with Ordinance (EC) 1935/2004 for permanent contact with foodstuffs:

- PEEK sensor tip
- Stainless steel 1.4404 sensor sheath

3.3 Electrical installation



The device must be installed only by a qualified electrician. The national and international regulations for the installation of electrical systems of the relevant operator country apply.

Power supply according to DIN EN60664-1, SELV, PELV.

The switch function of opening or closing (Fig. 7 + 8) depends on the polarity of the auxiliary voltage at connection pin 1 and 3 of the M12 connector.

An active switch output is available at connection pin 4. This can be supplied as a PNP(standard) or NPN output. The maximum load current is 100 mA and is proof against short-circuit.

3.4 Connection diagrams

PNP output

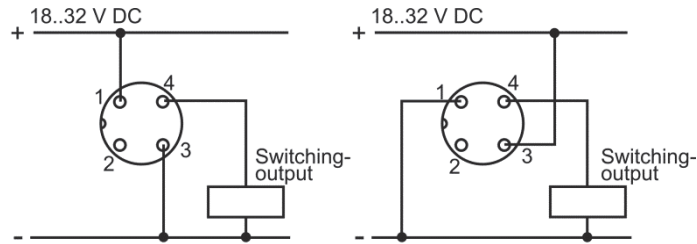


Figure 7

NO function

NC function

NPN output

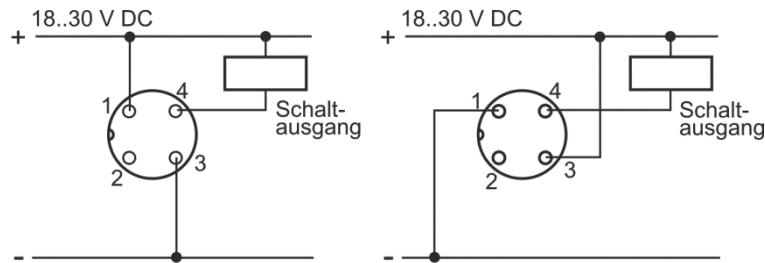


Figure 8

NO function

NC function

4 Operating elements and functions

An EYY120 programming adapter is required for the parameter setting of the device. After starting the software on the PC, the parameters and the operating structure are read out of the device (see separate operating instructions). The following parameters (Tab. 2) are available:

Operating structure for MLC490 / 491 / 492

1 st menu level	2 nd menu level	Editor type	Format	Dimension	Value range	Works setting
0 - Exit	Parameter					
1 - Application	1.0 - Back					
	1.1 - Installation	Free text input	ASCII		0 to 20 ASCII characters	Martens Elektronik
2 - Sensor input	2.0 - Back					
	2.1 - Mean value filter	Number input	###	without	1..256	50
3 - Output 1	3.0 - Back					
	3.1 - Switch point	Number input	###.# - ###.#	DK	See Table 3	See Table 3
	3.2 - Switch function	Selection table			Min-Contact, Max-Contact	Max-Contact
	3.3 - Delay time	Number input	##.## - ##.##	s	0.01..10.00 – 0.01..10.00	0.1 – 0.1
9 - Info	9.0 - Back					
	9.1 - Firmware	Text display	ASCII		16 ASCII characters	Fx.x.x
	9.2 - Hardware	Text display	ASCII		16 ASCII characters	Hx.x.x
10 - Measurement	10.0 - Back					
	10.1 – DK-Value					

Table 2

*Parameter 3.1: Switching point

Description	Value range		Factory setting
	Switch-on value	Switch-off value	
MLC490	20.1..175.0	20.0..174.9	20.1.. 20.0
MLC491	5.1..175.0	5.0..174.9	6.0.. 5.0
MLC492	1.1..175.0	1.0..174.9	2.1..2.0

Table 3

Menu 1 – Application; Parameter 1.1 – Installation:

Input of a free text. The text can be used for the measurement point designation (e.g. Tank no.). This has no influence on the functionality of the device.

Menu 2 – Process input; Parameter 2.1 – Mean value filter:

This parameter (Fig. 9) determines the number of measurement values for the sliding formation of the average value. The conversion procedure generates the measurement values at time intervals of 1.2 ms. These are then assessed by a sliding average value filter, before they lead to the switching signal in the following processing stages. The displacement of the response characteristics in the event of a jump from a DK-value of 1.0 (air) to 80.0 (water) and back again to 1.0 is shown in the following graphic.

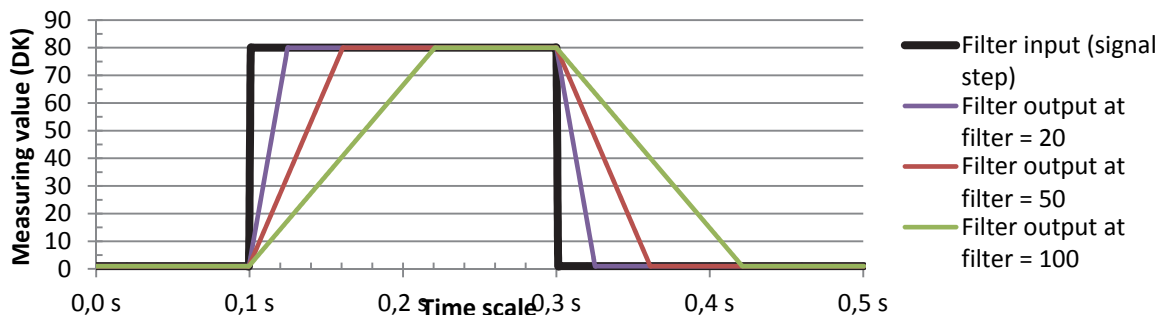


Figure 9

The following applies in general: The higher the number, the better the interference suppression with simultaneous increase of the response time.

Menu 3 – Output 1; Parameter 3.1- Switch point : These two parameters define the switching point of the output. The first value corresponds to the switch-on point, the second value to the switch-off point. The hysteresis results from the difference between the two values.

Example: An MLC490 with PNP output, connected as the closer function (see Connection diagrams). The output should switch on at a DK-value of > 30.0 and switch off again at a DK-value of < 25.0.

Parameter setting:

Parameter 3.1: Switching point = 30.0 – 25.0 Fig. 9
 Parameter 3.2: Switch function = No Fig. 11

The following graphic shows the switching characteristics with a slow rise and fall of the measurement value:

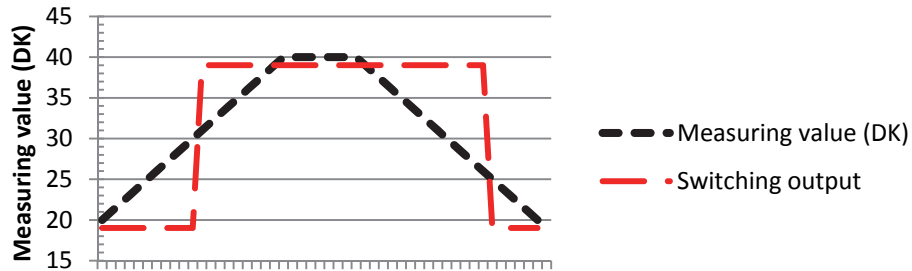


Figure 10

Menu 3 – Output 1; Parameter 3.2 – Switch function:

With this function the output signal can be inverted. If we take the example from the previous paragraph and set the parameter 3.2: Inversion = “Yes” (Fig. 11), this produces the following graphic:

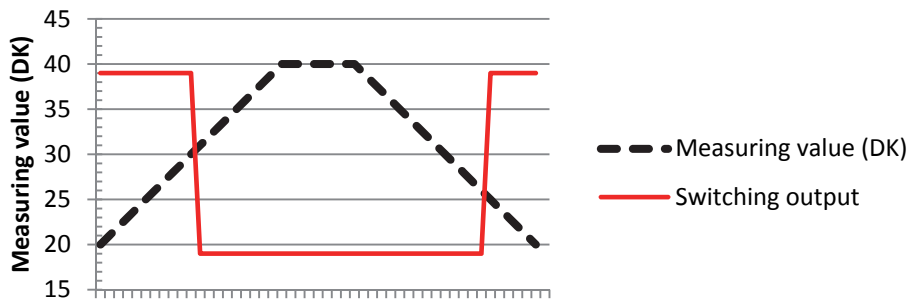


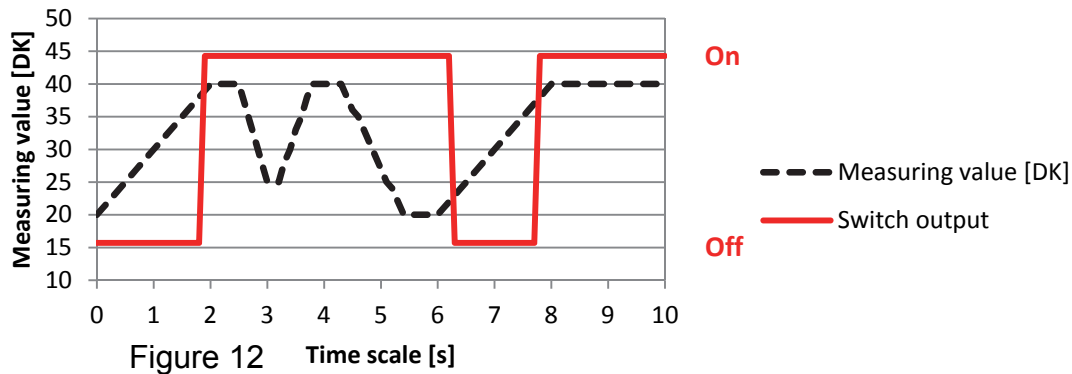
Figure 11

Menu 3 – Output 1; Parameter 3.3 – Delay time (Fig. 12):

In order to suppress interference or other application-specific imponderables (e.g. wave formation in the tank, air bubbles in the medium), the time response characteristics of the switch output can be damped. For this purpose there are two parameters; the first specifies how long the internal switching signal must remain present and constant until this results in a change of the output. The second defines for how long a switch condition must be maintained as a minimum before a change takes place. These relationships are shown in the following graphic by means of an example in which the measurement value fluctuates between DK = 20 and DK = 40.

Parameter setting:

- Parameter 3.1: Switch point = 30.1 – 29.9
 - Parameter 3.2: Switch function = “No”
 - Parameter 3.3: Delay time = 0.8 s – 1.5 s
- Fig. 12



Brief changes in the measurement value, as occur for example due to wave movements in the tank, are suppressed by the time response parameters.

Menu 9 – Info; Parameter 9.1 – Firmware:

The firmware version used in the device is displayed.

Menu 9 – Info; Parameter 9.2 – Hardware:

The hardware version used in the device is displayed.

5 Commissioning, maintenance and servicing

5.1 Commissioning

1. Check the integrity at the sleeve.
2. Ensure that the cable screw fitting is fitted tightly and that the M12 connector is correctly fitted.
3. After switching on the auxiliary power, check the correct switching function.

5.2 Maintenance

Case:

When cleaning, care must be taken to ensure that the device connections are completely connected and sealed. The case surface and the seals must not be attacked by the cleaning agent.

If the case is cleaned using a high-pressure cleaning appliance, care must be taken to ensure that the spray jet is not directed at the electrical connection. Deposits of cleaning agents on the thread must be avoided.


Sensor:

Depending on the application, deposits (dirt) may form on the sensor tip and affect the result. If the medium tends to heavy formation of deposits, regular cleaning is recommended.

Extreme care must be taken when cleaning to ensure that the sensor tip is not damaged. The material must be resistant to any cleaning agents used!

5.3 Servicing

Clean the sensor (and especially the sealing cone) and the auxiliary tool after dismantling and before refitting the device carefully with suitable tools and agents, in order to maintain the integrity and hygiene requirements. The device itself *cannot* be repaired.

 When changing the medium (DK-value table 3) it may also be necessary to change the device type.

DK-value		
MLC490	MLC491	MLC492
20..175	5..175	1..175

Table 4

6 Technical data

Power supply

Supply voltage : 18..30 V DC, max. 50 mA
 Electrical connection : M12x1 -plug
 CE-conformity : EN 60664-1: 2008-01, EN 61326-1: 2004-05
 EN 61326-2-3: 2007-05

Ambient conditions

Ambient temperature : -20..+80 °C CIP capable
 Storage temperature : -20..+105 °C
 Climate class : EN 60068-2-38: 2010-06
 Vibrations : EN 60068-2-6, GL test2

Sensor

Radiated frequency : 40.68 MHz, <1 mW
 Measuring range : DK-value 20..175 (MLC490)
 DK-value 5..175 (MLC491)
 DK-value 1..175 (MLC492)
 Initialization time : 3 s
 Process temperature : -20..+100 °C, see figure 1 page 6
 Process pressure : -1..10 bar
 Process material : PEEK, FDA conform, SS-type 1.4404
 Process connection : G 1, GHMadapt, EHEDG certificate no. 28.2011
 Tightening torque : 10..20 Nm
 Installation position : Arbitrary, see chapter 3 Mounting/Installation

Output

Switching output : Transistor PNP / NPN max. 30 V / 100 mA
 short-circuit-proof

Delay time (response time)	: Configurable from 0.02..20 s
Isolation	: Sensor, case / supply voltage, outputs
Case	
Material	: 1.4404
Protection class	: IP67 / IP69K

6.1 Mechanical design/dimensions

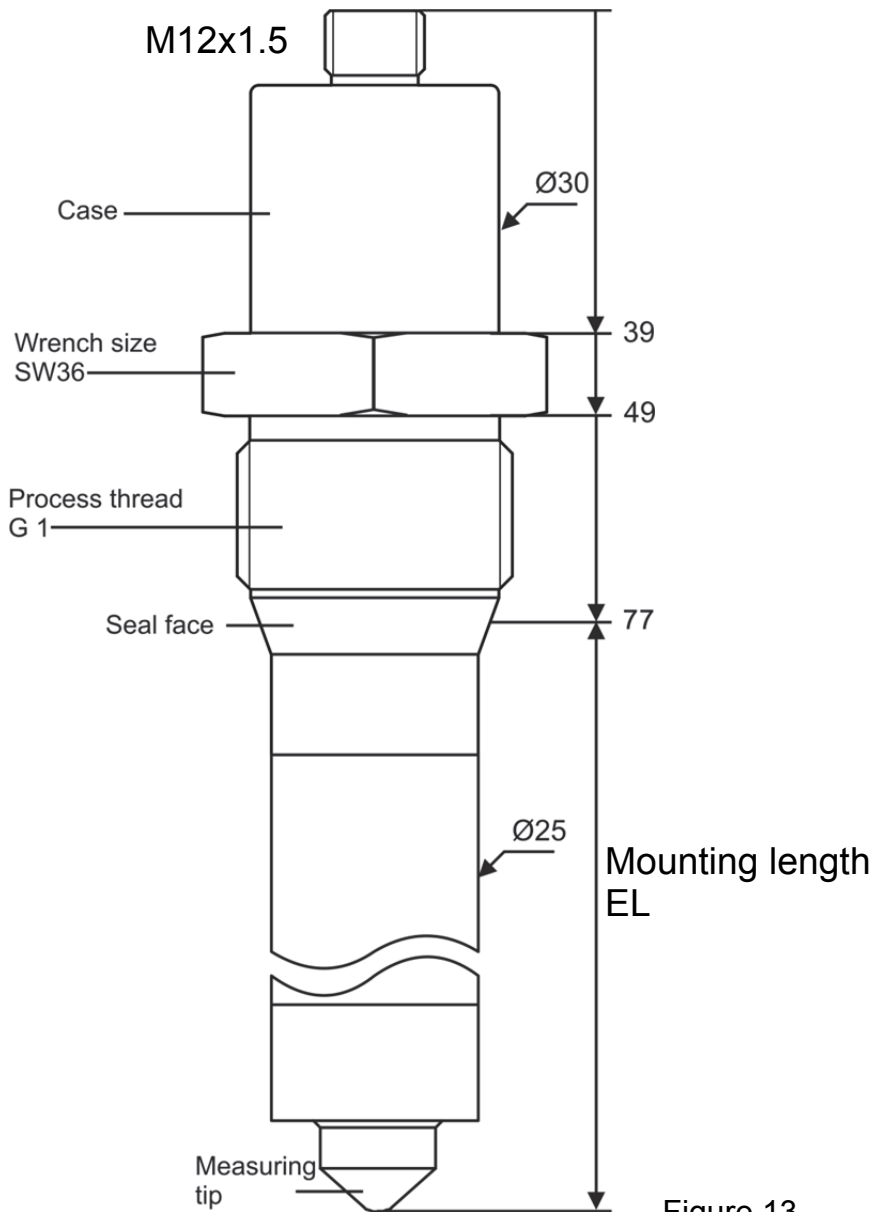


Figure 13

Measuring tip PEEK

6.2 Ordering code

MLC49 1. 2. 3. 4. 5. 6.
 - - - - -

1.	Measuring range	
	0	DK-value 20..175
	1	DK-value 5..175
	2	DK-value 1..175
2.	Mounting length EL [mm]	
	130	
	200	
	300	
	400	
	500	
	600	
	700	
	800	
	900	
	1000	
	XXX	custom length min. 130 mm, max. 1000 mm
3.	Switching output	
	0	PNP (standard)
	1	NPN
4.	Electrical connection	
	0	M12-plug
5.	Inspection window	
	0	without window
6.	Options	
	00	without option

Table 5

6.3 Accessoires



For sleeves, adapters and connection lines see separate product information "Accessories Hygienic Design".

6.4 Trouble-shooting

Fault	Cause	Remedy
Device fails to switch	No medium at the measuring tip	-
	Auxiliary voltage < 18 V	Check auxiliary voltage at PIN 1 and 3 of the cable socket; 18..30 V DC
	Short-circuit	Check wiring
	Cable break	Check continuity of cables
Device always switches	The measuring tip is in contact with the installation adapter/sleeve (soiled)	Clean the measuring tip
	No medium at the measuring tip	Electronics defective
Output switches with constant frequency $\approx 1\text{Hz}$	The internal self-diagnosis has identified a malfunction	Electronics defective

Table 6

7 Transport and storage of the device

The case must be packed carefully and stress-free for transport (no automatic binding of the packaging).

The device must be stored under the ambient conditions specified in the technical data.

8 Returns



Legal regulations for the protection of the environment and our personnel require that returned devices which have come into contact with fluid can be handled without risk to personnel and the environment.

If you send a device back to us for checking and repair, we must request that you pay strict attention to the following requirements:

The returns form can be downloaded from our homepage under: “Downloads/Forms”.

The repair can be done quickly and without further questions if the following points are fulfilled:

1. Every device must be delivered with a completed form.
2. The device must be cleaned and delivered in a safety package.
3. If the device was in contact with a critical media, a safety sheet of the media must be fixed on the cover of the package.

9 Disposal



The device components and packaging must be separated by materials for disposal. The legal regulations and guidelines applicable at the relevant time must be observed.

The device must not be disposed of as general waste. If a device is to be disposed of, send it back to us direct with the completed Returns form specified under Point 8, and we will then take care of proper disposal.

10 Imprint

Martens Elektronik GmbH, Kiebitzhörn 18, 22885 Barsbüttel

A subsidiary of GHM-Messtechnik GmbH

CEO: Günther Oehler

Place of fulfilment and jurisdiction: Barsbüttel

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11 EC conformity certification

EG-KONFORMITÄTSBESCHEINIGUNG EC-CERTIFICATE OF CONFORMITY	
	
Zertifikat-Nr.: Certificate No.:	MLC49x.EG1
Hersteller / Importeur: Manufacturer / Importer:	<i>Martens Elektronik GmbH</i> <i>Kiebitzhörn 18</i> <i>D-22885 Barsbüttel</i>
Produktfamilie: Product family:	<i>MLC49x</i>
Produktbeschreibung: Object description:	<i>Kapazitiver Grenzstandscharter</i> Capacity level switch
Wir erklären in alleiniger Verantwortung, dass das bezeichnete Produkt die Schutzanforderungen der Europäischen Richtlinien erfüllt. We hereby declare in sole responsibility that the designated product fulfills the safety requirements of the European directives.	
Erfüllung der Niederspannungsrichtlinie 2006/95/EG Fulfills the low voltage directive 2006/95/EG	
Prüfung nach der Norm: Tested in compliance with norm:	EN 60664-1: 2008-01
Erfüllung der EMV-Richtlinie 2004/108/EG Fulfills the EMC directive 2004/108/EG	
Prüfung nach den Normen: Tested in compliance with norms:	EN 61326-1: 2004-05 EN 61326-2-3: 2007-05
Datum der Erstanbringung des: CE-Zeichens auf das Produkt Date of first application of the CE mark to the product	12.2011
Ort, Datum: Place, date:	Barsbüttel, den 14.12.2011
Rechtsverbindliche Unterschrift: Legally binding signature:	<i>i.v.D. Ludwig</i> Geschäftsleitung, manager