

Technical manual BA 0509



Filling level

Capcont M

Fill level limit switch

for capacitive filling level supervision
in liquids and solids

Useable

- for filling level resp. limit value detection in container
- for dry run protection of pumps
- in liquids, viscous substances, granular substances or powders
- for electrically conductive and non-conductive materials

Suitable for wide process temperature range from -30°C to $+125^{\circ}\text{C}$

Useable at process pressures from -1 to 10 bar

Fully isolated electrode rod with isolation 1mm in PTFE

Integrated evaluation electronic with PNP switching output - invertible

ACS-CONTROL-SYSTEM
know how mit system



Lauterbachstr. 57 – 84307 Eggenfelden – Germany
Tel: +49 8721/9668-0 – Fax: +49 8721/9668-30
info@acs-controlsystem.de – www.acs-controlsystem.de

Index

Application description	3
Function description	3
Safety notes	3
Installation notes	3
Maintenance notes	4
Repair notes	4
Electrical connection	4
Operation and display elements	4
Technical data	5
Dimension drawings	6
Order code overview	6

Application description

The devices of the series **Capcont M** with integrated evaluation electronic are compact filling level limit switches for supervision of filling levels in liquids and solids within container or pipes at process temperatures from -30°C to $+125^{\circ}\text{C}$ and process pressures from -1 up to 10 bar.

The device is suitable for limit value detection of also as dry run protection in liquids and viscous substances and also in powdery and fine granular substances, like e.g. grain, flour, powdered milk, mixing food, cement, chalk or gypsum.

It can be used in electrically conductive as well as in non-conductive materials.

Function description

The filling level limit switch **Capcont M** is mounted in the wall of the pressure container or of the pipe.

The device is a capacitive operating sensor for limit value detection.

Electrode rod, filling material and container wall creates an electrical capacitor.

The contact of the electrode rod with the filling material produces a variation in capacity, that is evaluated by the electronic and converted in a correspondent switching action.

At transgression or underrun of the limit value a switching signal is produced at the PNP switching output.

This allows the driving of relays, contactors, magnetic valves, light indicators, horns as well as SPS inputs.

A pluggable yellow LED indicates an active PNP switching output.

A switch for changeover minimum and maximum safety is integrated.

The adjustment of the responsivity is done by a potentiometer.

Safety note

Each person that is engaged with inauguration and operation of this device, must have read and understood this technical manual and especially the safety notes.



Installation, electrical connection, inauguration and operation of the device must be made by a qualified employee according to the informations in this technical manual and the relevant standards and rules.

The device may only be used within the permitted operation limits that are listed in this technical manual. Every use besides these limits as agreed can lead to serious dangers.

The materials of the device must be chosen resp. checked for suitability to the respective application requirements (contacting substances, process temperature). An unsuitable material can lead to damage, abnormal behavior or destruction of the device and to the resulting dangers.

The device may not used as sole device for prevention of dangerous conditions in machines and plants.

The device meets article 3 (3) of the EC directive 97/23/EC (pressure equipment device directive) and is designed and produced in good engineer practice.

The device meets the legal requirements of all relevant EC directives. **CE**

Installation notes

Drive the system pressure free prior installation resp. deinstallation of the device.

The tightening of the process connection may only be done at the hexagon by a suitable spanner.

The maximum permitted torque strength is 50 Nm.

The screw in of the process connection by using the connection housing is not permitted.

The correct function of the device within the specific technical data can only be guaranteed, if the permitted temperature in the area of the connection housing from -30°C to $+100^{\circ}\text{C}$ (with LED) / $+125^{\circ}\text{C}$ (without LED) will not be exceeded.

At a horizontal mounting the device should be installed at an angel with the electrode rod tip below (approx. 20° ... 30°), to allow an easier flow-off of filling material residues.

The versions with length L longer than type A are not intended for horizontal installation.

Forces to the side of the sensor rod, produced e.g. by mixer or near fill-in openings should be avoided.

Maintenance notes

The device is free of maintenance.

Repair notes

A repair may only be carried out by the manufacturer.

If the device must be sent back for repair, the following informations must be enclosed:

- An exact description of the application.
- The chemical and physical characteristics of the product.
- A short description of the occurred error.

Befor returning the device for repair, the following measures must be proceeded:

- All stick product residues must be removed. This is especially important, if the product is unhealthy, e.g. causitic, toxic, carcinogenic, radioactive etc.
- A returning must be refrained, if it is not possible by 100% to remove the unhealthy product completely, because e.g. it is penetrate into cracks or is diffused throug plastic.

Electrical connection

The electrical connection of the device must be carried out according to the respective country specific standards. Incorrect installation or adjustment could cause applicationally conditioned risks.

Use only suitable cables with $\varnothing 7...9$ mm and max. 25Ω per wire, that fulfills the requirements e.g. regarding temperature, resistance or laying at the place of installation.

Use only shielded signal and measurement wires and install them separated from power leading wires. Connect the cable shield only at one side to earth, ideally at the installation place of the device.

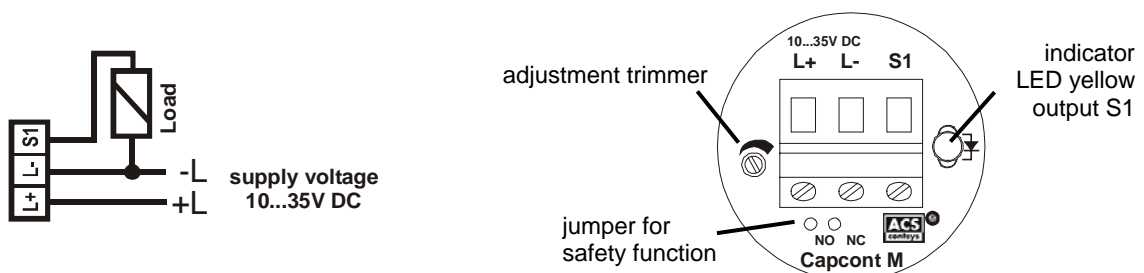
For inauguration it is suggested to switch off all connected control devices to avoid unintended control actions.

The voltage applied to the terminal contacts may not exceed 35 V to avoid damage of the electronic. All connections are polarity protected.

The load at the PNP switching output will be connected to the terminal +L by a semiconductor switch contactless and by this bounce-free. At an activated switching state a positive signal near supply voltage is produced at the terminal S1.

At deactivated switching state and at failure of supply voltage the semiconductor switch is shut off.

Inductive loads at the PNP switching output, e.g. relays or contactors may only be used with a free-wheeling diode or a RC protection circuit to avoid high voltage peaks.



Operation and display elements

Indicator	yellow light-emitting diode	→ PNP switching output active
Adjustment trimmer	adjustment of the responsivity	
	turn to the right	→ PNP switching output active at higher DK value
	procedure at adjustment:	
	▪ filling material must have fully covered the electrode rod	
	▪ turn adjustment trimmer left (counterclockwise), till output switches off	
	▪ turn adjustment trimmer right (clockwise), till output switches on	
	▪ continue turning adjustment trimmer right for a half rotation	
Jumper	safety function	minimum protection = jumper plugged (NO) maximum protection = contacts open (NC)

Technical data

Auxiliary supply

Supply voltage:	10 V to 35 V DC	reverse polarity protected
Ripple voltage:	$\leq 2 V_{PP}$	condition: within the permitted supply voltage range
Supply current:	$\leq 10\text{mA}$	switching outputs no load
Insulating voltage:	$75V_{DC}$	

Switching output

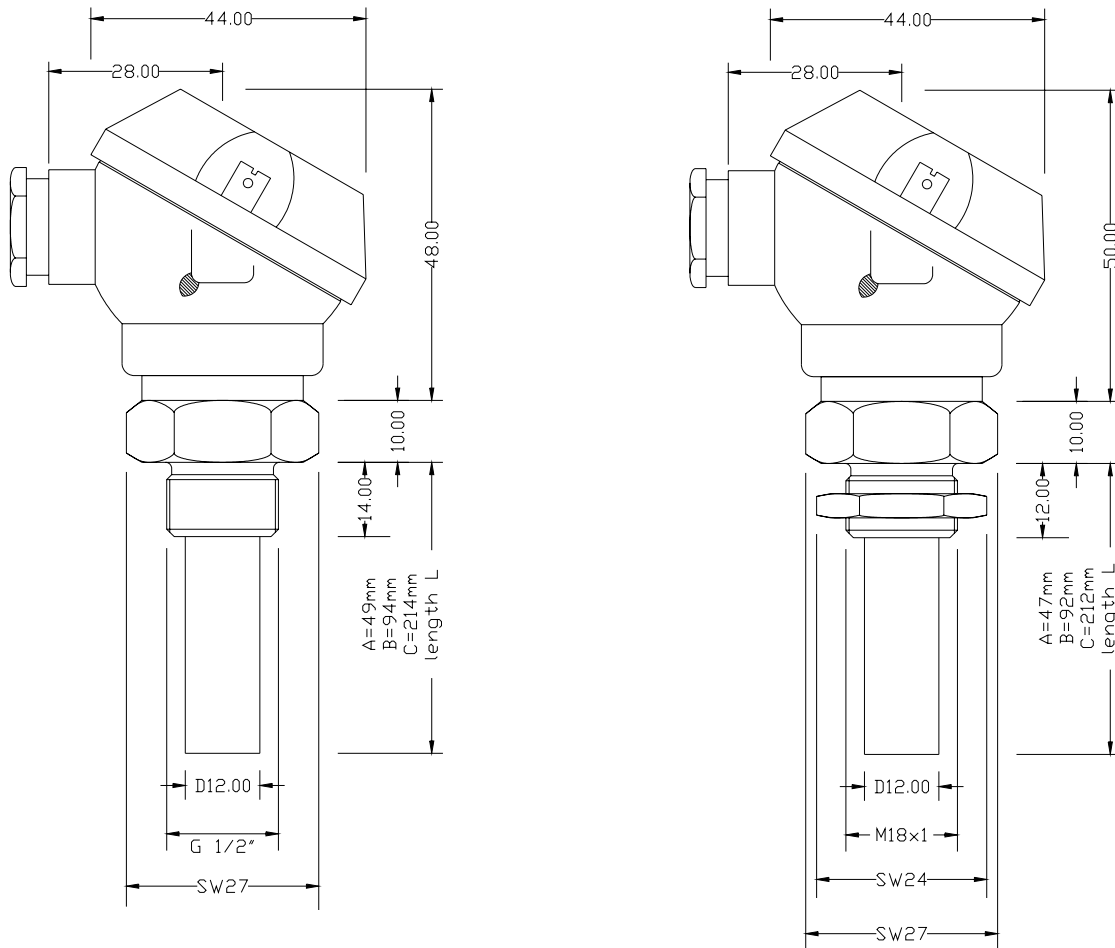
Function:	PNP switching to +Vs, principle (NO/NC) invertible by jumper	
Output voltage:	$V_{S1} \geq +V_s - 2 V$	
Output current:	$\leq 250 \text{ mA}$	current limited, short circuit protected
Rise up time:	$\leq 30 \mu\text{s}$	$R_L \leq 3\,000 \Omega$ resp. $I_L \geq 4,5 \text{ mA}$
Delay time:	$\leq 200 \text{ ms} / \geq 5 \text{ Hz}$	
Switching cycles:	$\geq 100.000.000$	
Switching hysteresis:	depending on filling material	
Adjustment responsivity:	trimmer multiple turns	

Materials

Electrode rod isolation: (medium contact)	PTFE – polytetrafluorethylene (Teflon®)		
Process connection: (medium contact)	steel 1.4404 (AISI 316L) resp. 1.4571 (AISI 316Ti)		
Connection housing:	aluminum-pressure die-casting, powdery coated		
Cable gland:	housing brass nickel-plated, gasket CR / NBR		
Gaskets:	medium contact	→	FPM – fluorelastomere (Viton®) EPDM – etylene-propylene-dienmonomere CR – chloroprene-rubber (Neopren®) FFKM – perfluorelastomere (Kalrez®)
	others	→	FPM – fluorelastomere (Viton®)

Environmental conditions

Environmental temperature:	– 30°C...+100°C		
Process temperatures:	– 30°C...+125°C / with LED – 30°C...+100°C		
Process pressure:	– 1...10 bar		
Weight:	0,2 kg	for length L – type A	
Torque strength:	$\leq 50 \text{ Nm}$		
Protection classification:	process sided	IP68	DIN EN 60529
	connection sided	IP67	DIN EN 60529
Climatic classification:	4K4H	DIN EN 60721-3-4	
Vibration classification:	4 g	5 - 100 Hz	
EM – compatibility:	emission	DIN EN 61326-1	operation device class B
	immunity	DIN EN 61326-1	industrial range
Reference conditions:	DIN EN 60770-1 T = 25 °C, relative humidity 45...75 %, environmental air pressure 860...1060 kPa		



Capcont M capacitive filling level limit switch for liquids or solids, with PNP switching output

Type:

M Standard

Material electrode rod isolation / length L (medium contact):

A	PTFE polytetrafluorethylene (Teflon®)	L=49 mm (-2mm at process connection 0 – M18x1)
B	PTFE polytetrafluorethylene (Teflon®)	L=92 mm (-2mm at process connection 0 – M18x1)
C	PTFE polytetrafluorethylene (Teflon®)	L=212 mm (-2mm at process connection 0 – M18x1)
Y	other material isolation / other length	separate spec. necessary

Process connection:

0	M18 x 1	DIN ISO 724
1	G 1/2 " B	DIN EN ISO 228-1
Y	others on request	

Gaskets (medium contact):

1	FPM	fluorelastomere (Viton®)	
2	CR	chloroprene-rubber (Neopren®)	
3	EPDM	etylene-propylene-dienmonomere	for food applications
4	FFKM	perfluorelastomere (Kalrez®)	

Material process connection (medium contact):

V	Steel 1.4404 (AISI 316L) / 1.4571 (AISI 316 Ti)
---	---

Style / material connection housing:

3	Style F acc. to DIN 43729	aluminum
---	---------------------------	----------

Electronic - output:

A	1x PNP switching output
---	-------------------------

Process temperature:

0	-30°C to +125°C
---	-----------------

Electrical connection:

K	Terminal box
---	--------------

Length L in mm:

Capcont M _ _ _ V 3 A 0 K _