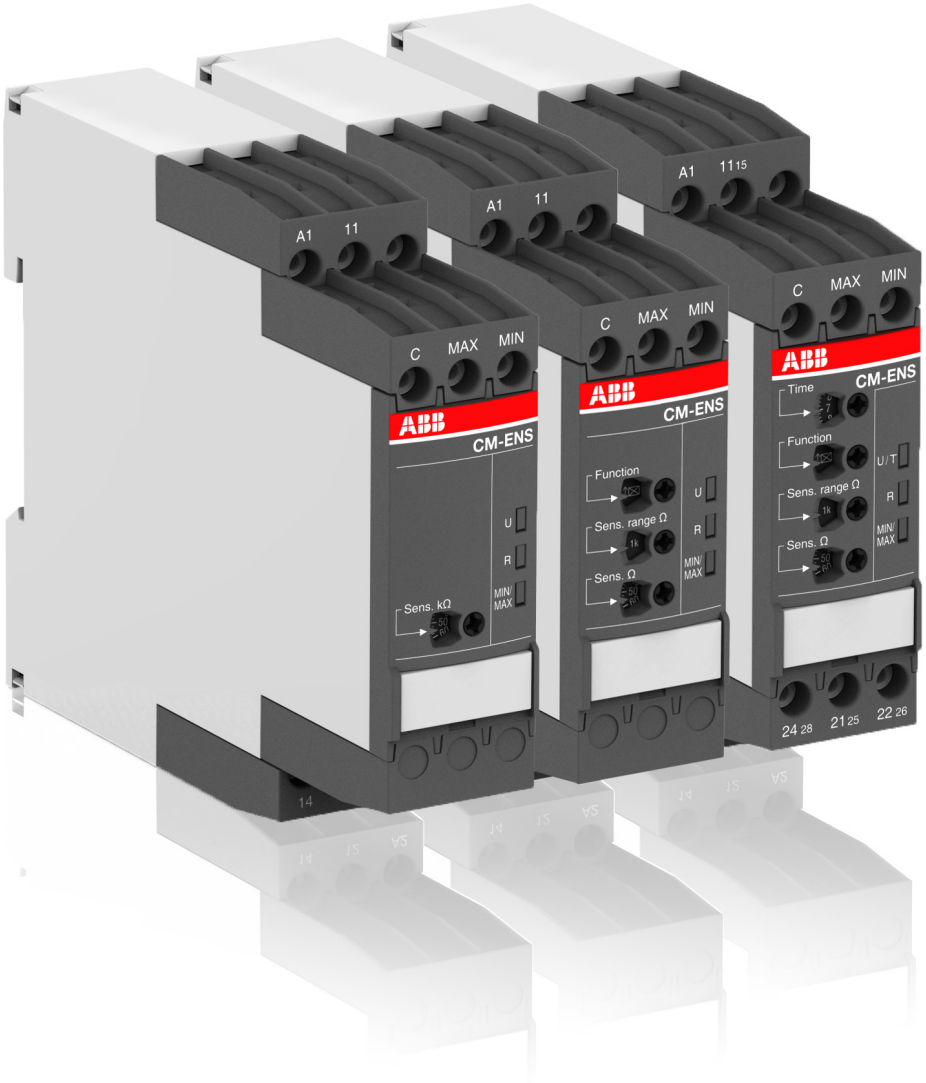
Liquid level monitors and controls
Product group picture

2



Liquid level monitors and controls
Table of contents

Liquid level monitors and controls

Liquid level monitors and controls
Benefits and advantages

CM-ENS.1x
- Control of one or two liquid levels (min/max)
- Fill or drain function
- Adjustable response sensitivity 5-100 kΩ

CM-ENS.2x
- Control of one or two liquid levels (min/max)
- Fill (UP) or Drain (DOWN), adjustable via front-face potentiometer
- Adjustable response sensitivity 0.1-1000 kΩ

CM-ENS.31
- Control of one or two liquid levels (min/max)
- Fill (UP) or Drain (DOWN), adjustable via front-face potentiometer
- Adjustable response sensitivity 0.1-1000 kΩ
- Selectable ON- or OFF-delay
- 2 c/o (SPDT) contacts

All CM-ENS devices
- Devices with wide rated control supply voltage 24-240 V AC/DC
- Cascadable
- High EMC immunity
- 3 LEDs for the indication of operational states
- Screw connection technology or Easy Connect Technology
- Housing material for highest fire protection classification UL 94 V-0
- Tool-free mounting and demounting on DIN rail
- 22.5 mm (0.89 in) width

ABB's liquid level monitoring relays are the ideal solution to regulate and control liquid levels and ratios of mixtures of conductive fluids. The assortment includes single- or multifunctional devices which can be used for overflow protection, dry-running protection of pumps, filling and draining applications as well as max. and min. level alarming.

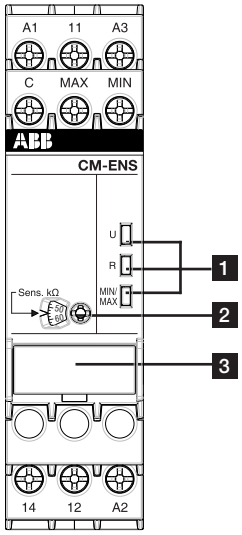
Global availability
You will find ABB control products in any application and corner of the world. They are in skyscrapers or windfarms, in offshore platforms or industrial areas which power the world. Approved by local and international standards. We believe in the strength of our brand and products - which is supported by our global service network to ensure your peace of mind.
- Latest approvals supports your installation complies to your local standards
- The product can be used in all installations in the world
- Giving you the confidence of world-wide sourcing – no matter where you build, install or operate your equipment

Reliable in harsh conditions
Our engineers thrive on the challenge to develop products that need to operate in the most difficult electrical, mechanical and environmental conditions. Our solutions protect your application from overloads, network irregularities, mechanical wear, and environmental stresses ensuring your peace of mind. When you buy an ABB product, you buy extensive environmental testing guarantee.
- High immunitiy against electromagnetic disturbances due to advanced measuring technology
- Operation in environment with high vibrations

Improve installation efficiency
In everything we do, we think of the customer and the application first. Our engineers constantly look for ways to simplify the installation process by developing innovative product designs which facilitate the product assembly and avoid mounting errors. ABB product can improve our customers' productivity and machinery quality.
- Simplified wiring even in case of different cable diameters
- Easy to adjust via front-face potentiometer
- Tool-free mounting and demounting
- Tool free installation due to push-in technology

Liquid level monitors and controls
Operating controls

CM-ENS.1x



1 **Indication of operational states with LEDs**

U: green LED - Status indication of control supply voltage
- control supply voltage applied

R: yellow LED - Status indication of the output relays
- energized

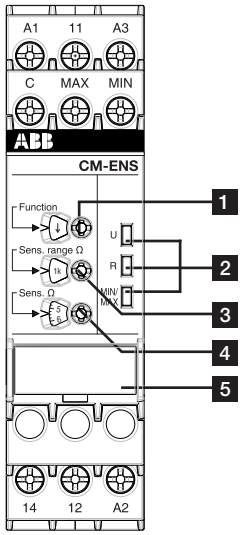
MIN/MAX: yellow LED - Status indication of the electrodes
- MIN and MAX wet
- MIN wet

2 **Adjustment of the response sensitivity**

R: yellow LED - relay status
U: green LED - control supply voltage

3 **Marker label**

CM-ENS.2x



1 **Adjustment of the function**
- Fill
- Drain

2 **Indication of operational states**

U: green LED - Status indication of control supply voltage
- control supply voltage applied

R: yellow LED - Status indication of the output relays
- energized

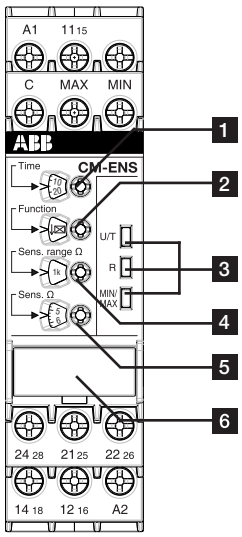
MIN/MAX: yellow LED - Status indication of the electrodes
- MIN and MAX wet
- MIN wet

3 **Adjustment of the response sensitivity range**

4 **Adjustment of the response sensitivity**

5 **Marker label**

CM-ENS.31



1 **Adjustment of the time delay**

2 **Adjustment of the function**
- ON-delayed Fill
- ON-delayed Drain
- OFF-delayed Fill
- OFF-delayed Drain

3 **Indication of operational states**

U: green LED - Status indication of control supply voltage
- control supply voltage applied
- time delay is running

R: yellow LED - Status indication of the output relays
- energized

MIN/MAX: yellow LED - Status indication of the electrodes
- MIN and MAX wet
- MIN wet

4 **Adjustment of the response sensitivity range**

5 **Adjustment of the response sensitivity**

6 **Marker label**

Liquid level monitors and controls
Selection table - Liquid level monitors and controls

	1SVR 550 855 R9500	1SVR 550 850 R9500	1SVR 550 851 R9500	1SVR 550 855 R9400	1SVR 550 850 R9400	1SVR 550 851 R9400	1SVR 730 850 R0100	1SVR 740 850 R0100	1SVR 730 850 R2100	1SVR 740 850 R2100	1SVR 730 850 R0200	1SVR 740 850 R0200	1SVR 730 850 R2200	1SVR 740 850 R2200	1SVR 730 850 R0300	1SVR 740 850 R0300
	CM-ENE MIN	CM-ENE MIN	CM-ENE MIN	CM-ENE MAX	CM-ENE MAX	CM-ENE MAX	CM-ENS.11S	CM-ENS.11P	CM-ENS.13S	CM-ENS.13P	CM-ENS.21S	CM-ENS.21P	CM-ENS.23S	CM-ENS.23P	CM-ENS.31S	CM-ENS.31P
Rated control supply voltage U_s																
24-240 V AC/DC							■	■			■	■			■	■
24 V AC	■			■												
110-130 V AC		■			■				■	■			■	■		
220-240 V AC			■			■			■	■			■	■		
Sensor circuit																
Number of electrodes (including ground reference)	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3
Reponse sensitivity range																
0-100 kOhm	■	■	■	■	■	■										
5-100 kOhm							adj	adj	adj	adj						
0.1-1000 kOhm											adj	adj	adj	adj	adj	adj
Monitoring function																
Dry running protection	■	■	■				■	■	■	■	■	■	■	■	■	■
Overflow protection				■	■	■	■	■	■	■	■	■	■	■	■	■
Liquid level control				■	■	■	■	■	■	■	■	■	■	■	■	■
Operating principle																
Open-circuit principle	■	■	■				■	■	■	■						
Closed-circuit principle				■	■	■										
Open- or closed-circuit principle											sel	sel	sel	sel	sel	sel
Adjustable ON-/OFF-delay																
0.1-10 s															■	■
Output contacts																
n/o	1	1	1	1	1	1										
c/o (SPTD)							1	1	1	1	1	1	1	1	2	2
Connection type																
Push-in terminals								■		■		■		■		■
Double-chamber cage connection terminals							■		■		■		■		■	

adj: adjustable
sel: selectable

Liquid level monitors and controls
Ordering details

CM-ENE MIN

CM-ENS.3x

Bar electrode

Suspension electrode

Description

The liquid level monitoring relay CM-ENS monitors and controls the liquid level and ratios of mixtures of conductive fluids. It is used for filling and draining applications, to protect pumps against dry-running, tanks against overflow and for signalization of the status of the monitored liquid level.

Liquid level monitoring relays are

Suitable for		Not suitable for	
spring water	acids, bases	chemically pure water	ethylene glycol
drinking water	liquid fertilizers	fuel	concentrated alcohol
sea water	milk, beer, coffee	oils	paraffin
sewage	non-concentrated alcohol	explosive areas (liquid gas)	lacquers

Ordering details

Characteristics	Type	Order code	Price 1 pc	Weight (1 pc) kg (lb)
See “Selection table - Liquid level monitors and controls” on page 2/103.	CM-ENE MIN	1SVR550855R9500		0.15 (0.33)
		1SVR550850R9500		0.15 (0.33)
		1SVR550851R9500		0.15 (0.33)
	CM-ENE MAX	1SVR550855R9400		0.15 (0.33)
		1SVR550850R9400		0.15 (0.33)
		1SVR550851R9400		0.15 (0.33)

Ordering details

Characteristics	Type	Order code	Price 1 pc	Weight (1 pc) kg (lb)
See “Selection table - Liquid level monitors and controls” on page 2/103.	CM-ENS.11S	1SVR730850R0100		0.124 (0.273)
	CM-ENS.11P	1SVR730850R2100		0.117 (0.258)
	CM-ENS.13S	1SVR740850R0100		0.153 (0.337)
	CM-ENS.13P	1SVR740850R2100		0.145 (0.320)
	CM-ENS.21S	1SVR730850R0200		0.125 (0.276)
	CM-ENS.21P	1SVR740850R0200		0.117 (0.258)
	CM-ENS.23S	1SVR730850R2200		0.154 (0.340)
	CM-ENS.23P	1SVR740850R2200		0.147 (0.324)
	CM-ENS.31S	1SVR730850R0300		0.143 (0.315)
	CM-ENS.31P	1SVR740850R0300		0.134 (0.295)

S: screw connection
P: push-in connection

Ordering details - Bar electrodes

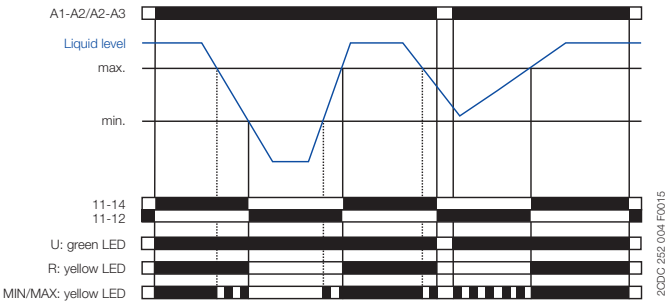
Description	Material no.	Type	Order code	Price 1 pc	Weight (1 pc) kg (lb)
Compact support for 3 bar electrodes	-	CM-KH-3	1SVR450056R6000		0.06 (0.132)
Distance plate for 3 bar electrodes		CM-AH-3	1SVR450056R7000		0.06 (0.132)
Counter nut for 1“ thread		CM-GM-1	1SVR450056R8000		0.06 (0.132)
Length: 300 mm	1.4301	CM-SE-300	1SVR450056R0000		0.08 (0.176)
Length: 600 mm	1.4301	CM-SE-600	1SVR450056R0100		0.08 (0.176)
Length: 1000 mm	1.4301	CM-SE-1000	1SVR450056R0200		0.08 (0.176)

Ordering details - Suspension electrodes

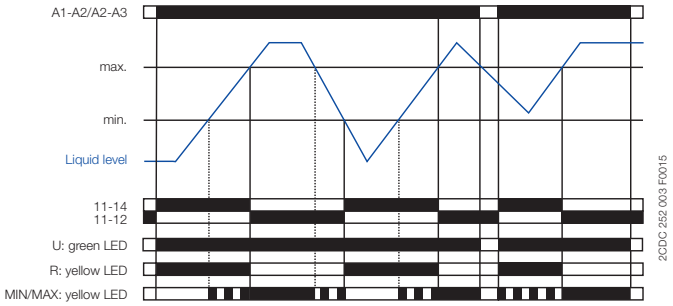
Description	Material no.	Type	Order code	Price	Weight (1 pc) kg (lb)
CM-HE suspension electrode	1.4104	CM-HE	1SVR402902R0000		0.074 (0.163)
CM-HC suspension electrode	1.4104	CM-HC	1SVR402902R1000		0.09 (0.198)
CM-HCT supsension electrode suitable for drinking water	1.4301	CM-HCT	1SVR402902R2000		0.09 (0.198)

Liquid level monitors and controls
Function diagrams

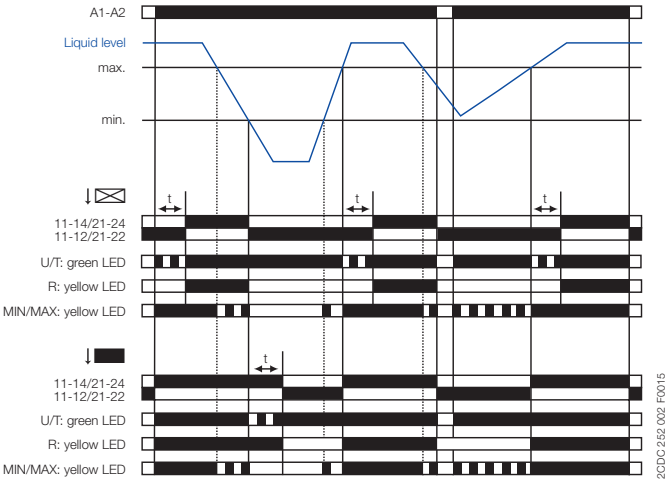
CM-ENS



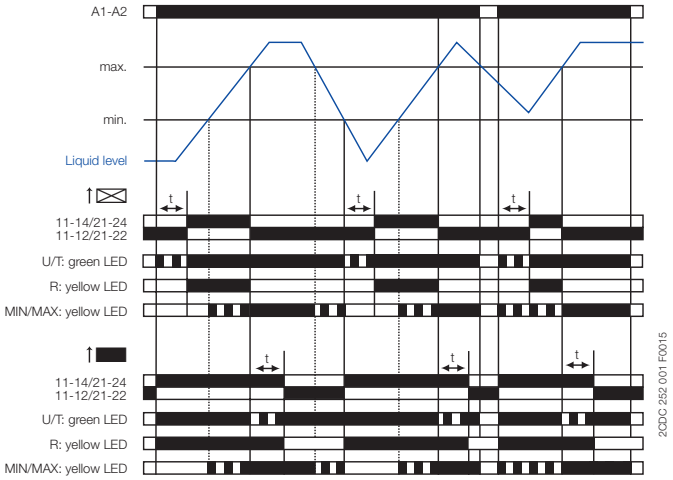
Drain: CM-ENS.1x, CM-ENS.2x



Fill: CM-ENS.2x

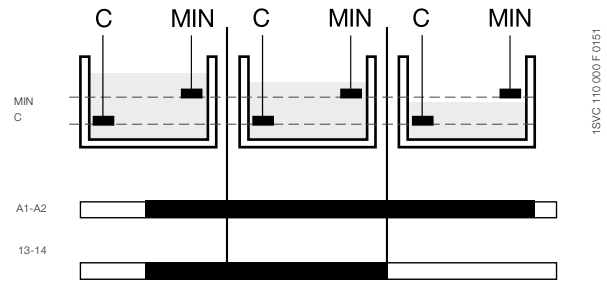


Drain: CM-ENS.31

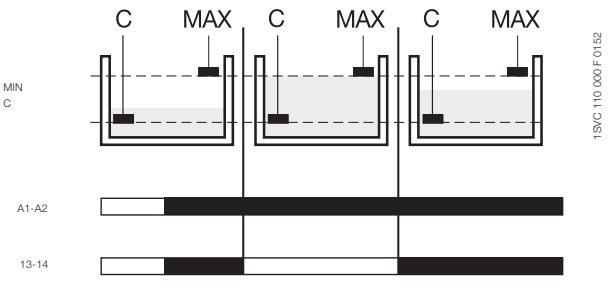


Fill: CM-ENS.31

CM-ENE MIN



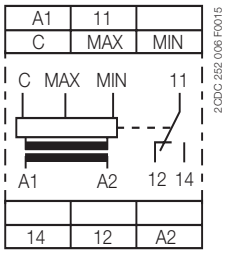
CM-ENE MAX



The liquid level relays CM-ENE MIN and CM-ENE MAX are used to monitor levels of conductive liquids, for example in pump control systems for dry-running or overflow monitoring.
The measuring principle is based on the occurring resistance change when moisting single-pole electrodes. The single-pole electrodes (see also section Accessories) are connected to the terminals C and MIN or MAX.
If the supply voltage is applied to A1-A2 and the electrodes are wet, the output relay of the CM-ENE MIN is energized and the output relay of the CM-ENE MAX is de-energized.
The output relay of the CM-ENE MIN de-energizes if the electrodes are no longer wet. The output relay of the CM-ENE MAX energizes if the electrodes are no longer wet.

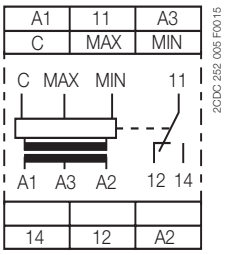
Liquid level monitors and controls
Connection diagrams

CM-ENS.11, CM-ENS.21



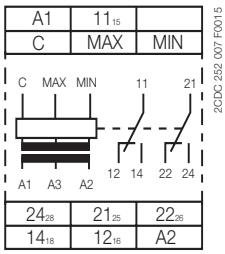
A1–A2	Control supply voltage
11–12/14	1 c/o (SPDT) contact
C	Reference electrode
MAX	Maximum level electrode
MIN	Minimum level electrode

CM-ENS.13, CM-ENS.23



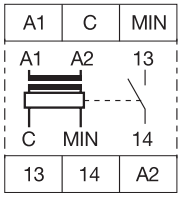
A1–A2	Control supply voltage 220-240 V AC
A3-A2	Control supply voltage 110-130 V AC
11–12/14	1 c/o (SPDT) contact
C	Reference electrode
MAX	Maximum level electrode
MIN	Minimum level electrode

CM-ENS.31



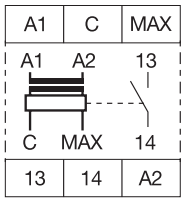
A1–A2	Control supply voltage
11_{15}–12_{16}/14_{18}	1 c/o (SPDT) contact
21_{25}-22_{26}/24_{28}	2nd c/o (SPDT) contact
C	Reference electrode
MAX	Maximum level electrode
MIN	Minimum level electrode

CM-ENE MIN



A1-A2	Rated control supply voltage
C	Reference electrode
MIN	Minimum level
13-14	Output contact -open-circuit principle

CM-ENE MAX

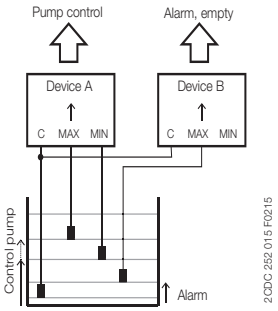


A1-A2	Rated control supply voltage
C	Reference electrode
MIN	Maximum level
13-14	Output contact -open-circuit principle

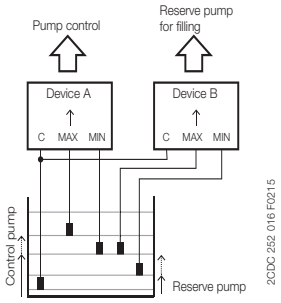
Liquid level monitors and controls
Cascading of several devices, application examples

Two devices in one tank

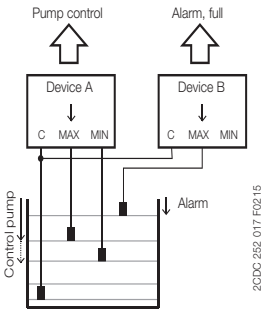
Several CM-ENS can be used in one tank. This extends the functionality with a pre-warning by two additional electrodes. In this way, two additional alarm outputs for exceeding or dropping below the normal level can be implemented in addition to the filling levels MAX and MIN.



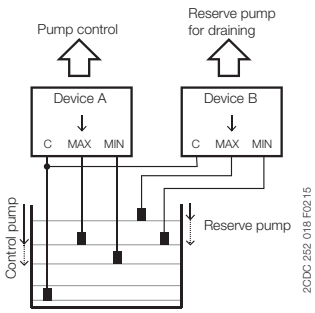
Fillling with alarm empty



Filling with reserve pump

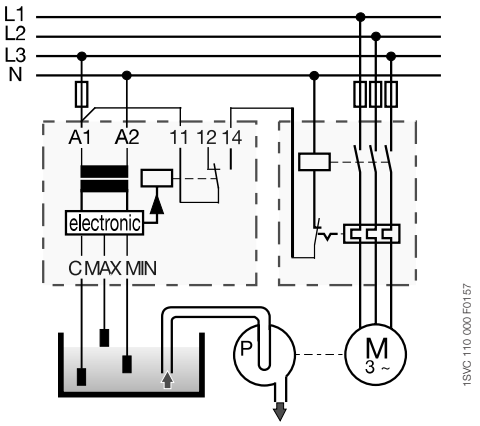


Draining with alarm full

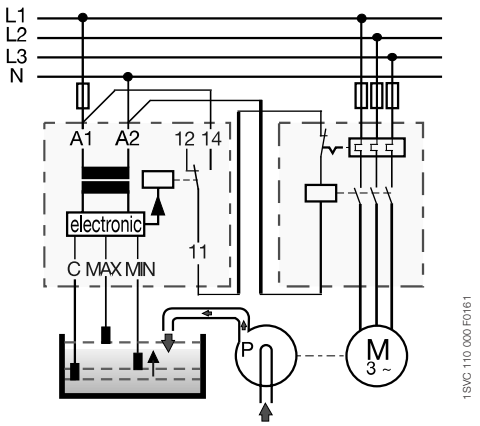


Draining with reserve pump

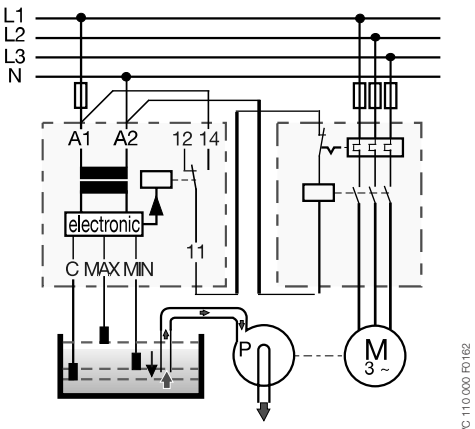
Application examples



CM-ENS.1x
Liquid level control - drain



CM-ENS.2x, CM-ENS.31
Liquid level control - fill - selected function "↑" (UP)



CM-ENS.2x, CM-ENS.31
Liquid level control - drain - selected function "↓" (Down)

Liquid level monitors and controls
Technical data - CM-ENE

Type			CM-ENE MIN	CM-ENE MAX
Supply circuit				
Rated control supply voltage U_S - power consumption		A1-A2	24 V AC approx. 1.5 VA	
		A1-A2	110-130 V AC approx. 1.2 VA	
		A1-A2	220-240 V AC approx. 1.4 VA	
Rated control supply voltage U_S tolerance			-15...+15 %	
Rated frequency			50-60 Hz	
Duty time			100 %	
Measuring circuit			MIN-C, MAX-C	
Monitoring function			dry-running protection	overflow protection
Response sensitivity			0-100 kΩ, not adjustable	
Maximum electrode voltage / current			30 V AC / 1.5 mA	
Electrode supply line	max. cable length / capacity		30 m / 3 nF	
Timing circuit				
Tripping delay			fixed approx. 200 ms	
Indication of operational states				
Output relay energized			R: yellow LED	
Output circuits			13-14	
Kind of output			1 n/o contact	
Operational principle			open-circuit principle [1]	closed-circuit principle [1]
Rated operational voltage U_e			250 V	
Mininimum switching voltage / minimum switching current			- / -	
Maximum switching voltage			250 V	
Rated operational current I_e		AC-12 (resistive) 230 V	4 A	
		AC-15 (inductive) 230 V	3 A	
		DC-12 (resistive) 24 V	4 A	
		DC-13 (inductive) 24 V	2 A	
AC rating (UL 508)	utilization category (Control Circuit Rating Code)		B 300	
	max. rated operational voltage		300 V AC	
	max. continuous thermal current at B 300		5 A	
	max. making/breaking apparent power at B 300		3600/360 VA	
Mechanical lifetime			30 x 10^6 switching cycles	
Electrical lifetime (AC-12, 230 V, 4 A)			0.3 x 10^6 switching cycles	
Max. fuse rating to achieve short-circuit protection		n/c contact	-	
		n/o contact	10 A fast-acting	
General data				
Dimensions			see 'Dimensional drawings'	
Mounting			DIN rail (IEC/EN 60715)	
Mounting position			any	
Degree of protection	housing / terminals		IP50 / IP20	
Electrical connection				
Connecting capacity	fine-strand with wire-end ferrule		2 x 0.75-1.5 mm^2 (2 x 18-16 AWG)	
	fine-strand without wire-end ferrule		2 x 1-1.5 mm^2 (2 x 18-16 AWG)	
	rigid		2 x 0.75-1.5 mm^2 (2 x 18-16 AWG)	
Stripping length			10 mm (0.39 inch)	
Tightening torque			0.6-0.8 Nm	
Environmental data				
Ambient temperature ranges	operation/storage		-20..+60 °C / -40...+85 °C	
Damp heat	IEC/EN 60068-2-30		40 °C, 93 % RH, 4 days	
Vibration withstand	IEC/EN 60068-2-6		10-57 Hz: 0.075 mm; 57-150 Hz: 1 g	
Isolation data				
Rated insulation voltage U_i between supply, measuring / output circuit			250 V	
Rated impulse withstand voltage U_{imp} between all isolated circuits			4 kV / 1.2-50 µs	
Pollution degree			3	
Overvoltage category			III	
Standards / Directives				
Standards			IEC/EN 60947-5-1, EN 50178	
Low Voltage Directive			2014/35/EU	
EMC Directive			2014/30/EU	
RoHS Directive			2011/65/EU	
Electromagnetic compatibility				
Interference immunity to			IEC/EN 61000-6-2	
electrostatic discharge	IEC/EN 61000-4-2		level 3 (6 kV / 8 kV)	
radiated, radio-frequency, electromagnetic field	IEC/EN 61000-4-3		level 3 (10 V/m)	
electrical fast transient / burst	IEC/EN 61000-4-4		level 3 (2 kV / 5 kHz)	
surge	IEC/EN 61000-4-5		level 4 (2 kV L-L)	
conducted disturbances, induced by radio-frequency fields	IEC/EN 61000-4-6		level 3 (10 V)	
Interference emission			IEC/EN 61000-6-3	
high-frequency radiated	IEC/CISPR 22, EN 55022		class B	
high-frequency conducted	IEC/CISPR 22, EN 55022		class B	

[1] Open-circuit principle: Output relay energizes if the measured value exceeds/drops below the adjusted threshold.
Closed-circuit principle: Output relay de-energizes if the measured value exceeds/drops below the adjusted threshold.

Liquid level monitors and controls
Technical data - CM-ENS

Type			CM-ENS.1x		CM-ENS.2x		CM-ENS.31	
Supply circuit								
Rated control supply voltage U_S	CM-ENS.11, CM-ENS.21, CM-ENS.31: A1-A2		24-240 V AC/DC					
	CM-ENS.13, CM-ENS.23: A1-A2		220-240 V AC					
	CM-ENS.13, CM-ENS.23: A3-A2		110-130 V AC					
Rated control supply voltage U_S tolerance			-15...+10 %					
Rated frequency			50-60 Hz					
Frequency range			47-63 Hz					
Typical current / power consumption		24 V AC	25 mA / 0.6 W		25 mA / 0.6 W		25 mA / 0.6 W	
		110-130 V AC	20 mA / 2.6 VA		20 mA / 2.6 VA		8 mA / 1.1 VA	
		220-240 V AC	8.5 mA / 2.1 VA		8.5 mA / 2.1 VA		10 mA / 2.4 VA	
		24-240 V AC/DC	11 mA / 2.6 VA		11 mA / 2.6 VA		11 mA / 2.6 VA	
Power failure buffering time		min.	20 ms					
Start-up time t_s		range 5-100 kΩ	max. 1.3 s		-		-	
		range 0.1-1 kΩ	-		max. 900 ms			
		range 1-10 kΩ	-		max. 900 ms			
		range 10-100 kΩ	-		max. 1.3 s			
		range 100-1000 kΩ	-		max. 6.3 s			
Measuring circuit			**MAX-MIN-C**					
Sensor type			electrode					
Monitoring function			fill or drain		fill or drain, selectable			
Measuring principle			conductivity measurement					
Number of electrodes			3					
Response sensitivity			adjustable: 5-100 kΩ		adjustable: 0.1-1000 kΩ			
Maximum electrode voltage			6 V AC					
Maximum electrode current			1 mA		2 mA			
			max cable capacity	**max cable lenght**	**max cable capacity**	**max cable lenght**	**max cable capacity**	**max cable lenght**
Electrode supply line		range 5-100 kΩ	10 nF	100 m	-	-	-	-
		range 0.1-1 kΩ	-	-	200 nF	1000 m	200 nF	1000 m
		range 1-10 kΩ	-	-	200 nF	1000 m	200 nF	1000 m
		range 10-100 kΩ	-	-	20 nF	100 m	20 nF	100 m
		range 100-1000 kΩ	-	-	4 nF	20 m	4 nF	20 m
Max. measuring cycle		range 5-100 kΩ	1000 ms		-		-	
		range 0.1-1 kΩ	-		700 ms			
		range 1-10 kΩ	-		700 ms			
		range 10-100 kΩ	-		1.1 s			
		range 100-1000 kΩ	-		5 s			
Timing circuit								
Time delay			-				0.1-30 s, adjustable, ON- or OFF-delay	
Indication of operational states								
Control supply voltage			U: green LED					
Output relay energized			R: Yellow LED					
Electrode / alarm status			MAX/MIN: Yellow LED					
Output circuits								
Kind of output		11_{15}-12_{16}/14_{18}	relay, 1 c/o (SPDT) contact				relay, 1st c/o (SPDT) contact	
		21_{15}-22_{16}/24_{18}	-				relay, 2nd c/o (SPDT) contact	
Operational principle			open-circuit principle		open- or closed-circuit principle (selectable)			
Contact material			AgNi alloy, Cd free					
Rated operational voltage U_e			250 V AC					
Minimum switching voltage / minimum switching current			12 V / 10 mA					
Maximum switchting voltage / Maximum switching current			see data sheets					
Rated operational current I_e		AC-12 (resistive) 230 V	4 A					
		AC-15 (inductive) 230 V	3 A					
		DC-12 (resistive) 24 V	4 A					
		DC-13 (inductive) 24 V	2 A					
AC rating (UL 508)	utilization category (Control Circuit Rating Code)		B 300 pilot duty; general purpose 250 V, 4 A, cos φ 0.75					
	max. rated operational voltage		300 V AC					
	max. continuous thermal current at B 300		5 A					
	max. making/breaking apparent power at B 300		3600/360 VA					
Mechanical lifetime			10 x 10^6 switching cycles					
Electrical lifetime (AC-12, 230 V, 4 A)			0.1 x 10^6 switching cycles					
Max. fuse rating to achieve short-circuit protection		n/c / n/o contact	6 A / 10 A fast-acting				10 A / 10 A fast-acting	
Conventional thermal current I_{th}			4 A					

Liquid level monitors and controls
Technical data - CM-ENS

Type			CM-ENS.1x	CM-ENS.2x	CM-ENS.31
General data					
MTBF			on request		
Duty time			100 %		
Dimensions			see 'Dimensional drawings'		
Mounting			DIN rail (IEC/EN 60715), snap-on mounting without any tool		
Mounting position			any		
Minimum distance to other units			CM-ENS.x1: not necessary CM-ENS.x3: 10 mm if contact current > 2 A		
Degree of protection		housing / terminals	IP50 / IP20		
Material of housing			UL 94 V-0		
Electrical connection					
			Screw connection technology		**Easy Connect Technology (push-in)**
Connecting capacity		fine-strand with(out) wire end ferrule	1 x 0.5-2.5 mm² (1 x 18-14 AWG) 2 x 0.5-1.5 mm² (2 x 18-16 AWG)		2 x 0.5-1.5 mm² (2 x 18-16 AWG)
		rigid	1 x 0.5-4 mm² (1 x 20-12 AWG) 2 x 0.5-2.5 mm² (2 x 20-14 AWG)		2 x 0.5-1.5 mm² (2 x 20-16 AWG)
Stripping length			8 mm (0.32 in)		
Tightening torque			0.6-0.8 Nm (7.08 lb.in)		-
Environmental data					
Ambient temperature ranges		operation	-25...+60 °C		
		storage	-40...+85 °C		
Damp heat, cyclic		IEC/EN 60068-2-30	6 x 24 h cycle, 55 °C, 95 % RH		
Climatic class		IEC/EN 60721-3-3	3K5 (no condensation, no ice formation)		
Vibration, sinusoidal			class 2		
Shock			class 2		
Isolation data					
Rated impulse withstand voltage U_{imp}	supply circuit / measuring circuit		4 kV		
	supply circuit / output circuits		4 kV		
	measuring circuit / output circuits		4 kV		
	output circuit 1 / output circuit 2		4 kV		
Rated insulation voltage U_i	supply circuit / measuring circuit		300 V		
	supply circuit / output circuits		300 V		
	measuring circuit / output circuits		300 V		
	output circuit 1 / output circuit 2		300 V		
Basic insulation	supply circuit / measuring circuit		250 V AC / 300 V DC		
	supply circuit / output circuits		250 V AC / 300 V DC		
	measuring circuit / output circuits		250 V AC / 300 V DC		
	output circuit 1 / output circuit 2		250 V AC / 300 V DC		
Protective separation (IEC/EN 61140, EN 50178)	supply circuit / measuring circuit		250 V AC / 300 V DC		
	supply circuit / output circuits		250 V AC / 300 V DC		
	measuring circuit / output circuits		250 V AC / 300 V DC		
Pollution degree			3		
Overvoltage category			III		
Standards / Directives					
Standards			IEC/EN 60255-27, IEC/EN 60947-5-1		
Low Voltage Directive			2014/35/EU		
EMC Directive			2014/30/EU		
RoHS Directive			2011/65/EU		
Electromagnetic compatibility					
Interference immunity to			IEC/EN 61000-6-2, IEC/EN 60255-26		
electrostatic discharge		IEC/EN 61000-4-2	level 3 (6 kV / 8 kV)		
radiated, radio-frequency, electromagnetic field		IEC/EN 61000-4-3	level 3 (10 V/m)		
electrical fast transient / burst		IEC/EN 61000-4-4	level 3, 2 KV / 5 kHz		
surge		IEC/EN 61000-4-5	level 3, installation class 3, supply circuit and measuring circuit 1 kV L-L, 2 kV L-earth		
conducted disturbances, induced by radio-frequency fields		IEC/EN 61000-4-6	level 3, 10 V		
voltage dips, short interruptions and voltage variations		IEC/EN 61000-4-11	class 3		
Interference emission			IEC/EN 61000-6-3		
high-frequency radiated		IEC/CISPR 22, EN 55022	class B		
high-frequency conducted		IEC/CISPR 22, EN 55022	class B		