

Motor load monitor

Examples of use

The motor load monitor monitors load states of single and three-phase asynchronous motors. The evaluation of the phase angle between current and voltage, allows a very precise monitoring of the load states.

Compared to the other conventional measuring principles (e.g. pressure transducers, current measurement), $\cos \varphi$ monitoring is a more precise and economical alternative. The motor is used as sensor for its own load status.

Main applications

■ Pump monitoring

- Dry-running protection (underload)
- Closed valves (overload)
- Pipe break (overload)

■ Heating, air-conditioning, ventilation

- Monitoring of the degree of pollution of filters
- V-belt breakage (underload)
- Closed shutters/valves (overload)
- Air ventilating volume

■ Agitating machines

- High consistency within the tank (overload)
- Pollution of the tank (overload)

■ Transport/Conveyance

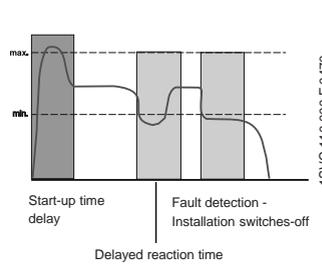
- Overload of means of transportation
- Clamping of belts (overload)
- Material accumulation in spiral conveyors (overload)
- Lifting platforms

■ Machine installation

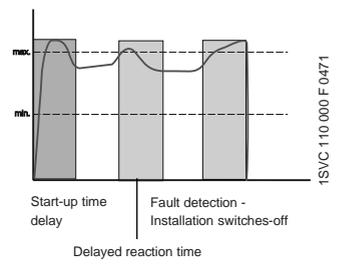
- Wear of tools, e.g. worn disks of circular saws, etc. (overload)
- Tool breakages (underload)
- V-belt drives (breakage-underload)

Pump control

Dry-running protection

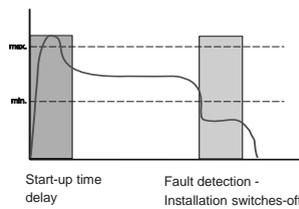


Filter pollution

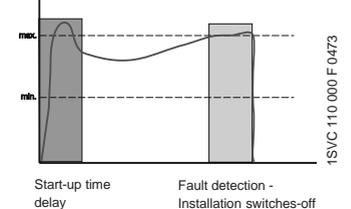


Ventilator monitoring

V-belt monitoring

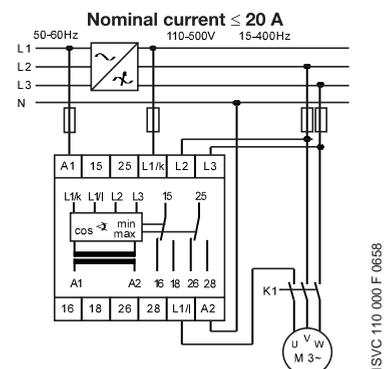
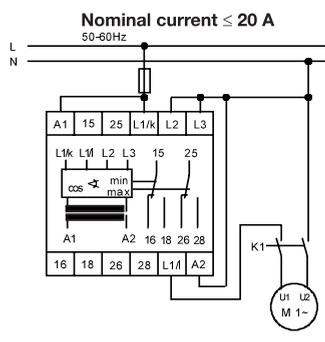
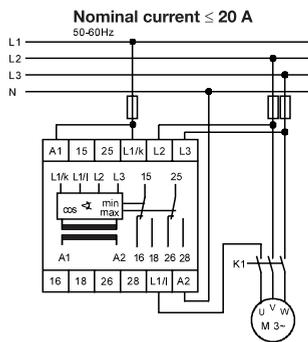


Filter pollution



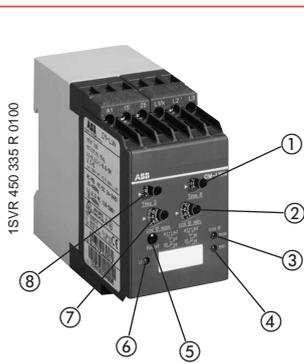
Measuring and monitoring relays

Examples of wiring



Motor load monitor CM-LWN

Ordering details



CM-LWN

- ① Reaction delay "Time R"
- ② Threshold limit for "cos ϕ min"
- ③ Red LED - cos ϕ max. exceeded
- ④ Red LED - cos ϕ min. below
- ⑤ Reset button
- ⑥ Green LED - Supply voltage
- ⑦ Threshold limit for "cos ϕ max"
- ⑧ Starting-up delay adjustable "Time S"

- Monitors status of inductive loads
- Sector monitoring cos ϕ min and cos ϕ max in one unit
- 2c/o contacts/ closed-circuit principle
- Starting-up delay adjustable from 0.3-30s
- Direct measuring up to 20A
- Reaction delay adjustable from 0.2-2s
- 1 or 3-phase monitoring
- 3 LEDs to display all operational states
- Approvals



The CM-LWN module monitors load status of inductive loads.

The primary application is to monitor asynchronous motors (squirrel cage), having single or 3-phase power supplies, under varying load conditions. The measuring principle is based on the evaluation of the phase difference (ϕ) between voltage and current in a single phase (power factor).

The phase difference is nearly inversely proportional to the load. Therefore, cosine ϕ , measured relatively from 0 to 1, measures the relationship of effective power to apparent power. A value of 0 indicates a low inductive load and a value of 1 indicates a large inductive load.

Threshold limits for cos ϕ max and cos ϕ min may be set using the LWN monitoring relay.

If either set limit has been reached, an LED lights and the relay will de-energize.

When cos ϕ again falls within acceptable limits, the relay will revert to its operational state and the LED will resume a steady flashing mode.

This message can be deleted by the reset button or by switching off the supply.

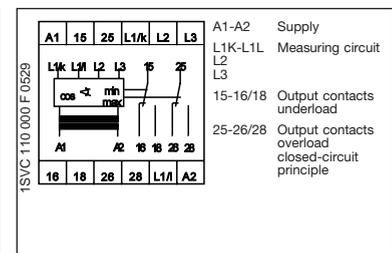
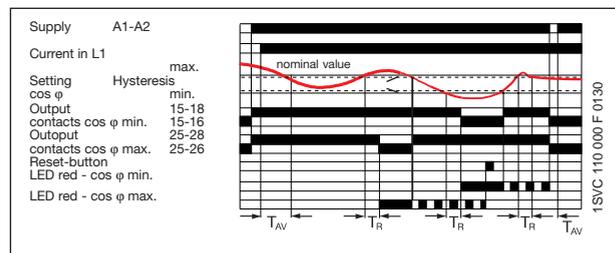
A time delay (Time S) of 0.3 to 30 secs. can be set for the starting-up of the motor.

It is also possible to set a reaction delay time (Time R) of 0.2 to 2 secs. for the operating state, to suppress unavoidable load peak-to-peak values.

To guarantee the correct operation of the reaction delay time (Time R), the set value for cos ϕ max. must be greater than the cos ϕ min. plus the hysteresis.

The displays for overload and low load must not be active simultaneously. Because supply and measuring circuits are electrically isolated internally, the LWN can be used with different supply voltages.

1 Function



Type	Supply voltage	Order code	Pack. unit piece		
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Current ranges: 0,05-5A;

CM-LWN	24-240VAC/DC	1SVR 450 335 R 0000	1		RS 442-9253
	110-130VAC	1SVR 450 330 R 0000	1		
	220-240VAC	1SVR 450 331 R 0000	1		
CM-LWN	380- 440VAC	1SVR 450 332 R 0000	1		
	480-500VAC	1SVR 450 334 R 0000	1		

Current ranges: 2-20A;

CM-LWN	24-240VAC/DC	1SVR 450 335 R 0100	1		RS 442-9269
	110-130VAC	1SVR 450 330 R 0100	1		
	220-240VAC	1SVR 450 331 R 0100	1		
CM-LWN	380-440VAC	1SVR 450 332 R 0100	1		
	480-500VAC	1SVR 450 334 R 0100	1		

Remark: 1c/o = SPDT; 2c/o = DPDT

Motor load monitor CM-LWN

Technical data and standards / directives

Measuring and monitoring relays

		CM-LWN	
Input circuit			
Supply voltage	power consumption		
	24-240VAC/DC	A1-A2	approx. 8.4VA/W
	110-130VAC	A1-A2	approx. 3.6VA
	220-240VAC	A1-A2	approx. 3.6VA
	380-440VAC	A1-A2	approx. 3.6VA
	480-500VAC	A1-A2	approx. 3.6VA
Tolerance of the supply voltage			-15%...+10%
Supply voltage frequency AC version			50-60Hz
Supply voltage frequency AC/DC version			15-400Hz or DC
Duty cycle			100%
Measuring circuit		L1-L1k-L2-L3	
Monitoring function		Load monitoring by evaluating the phase difference between current and voltage	
Voltage range L1k-L2-L3		110-500VAC single- or three-phase	
Current range L1-L1k		version 0.5-5A	version 2-20A
Overload current input		25A for 3s	100A for 3s
Threshold value		cosPhi min and cosPhi max adjustable 0-1	
Hysteresis (referring to the Phi-angle in°)		4°	
Frequency of measuring voltage		15-400Hz	
Measuring cycle time max.		300ms	
Time circuit		Display of over and undervoltage fault	
Start up time (time_S)		0.3-30s adjustable	
Reaction time (time_R)		0.2-2s adjustable	
Timing error within the tolerance of supply voltage		≤ 0.5%	
Timing error within temperature range		≤ 0.06% / °C	
Display of operational status			
Supply voltage		U, green LED	
cos Phi min decreased		min, red LED	
cos Phi max exceeded		max, red LED	
Output circuits		15-16/18, 25-26/28	
No. of contacts		2 x 1c/o	
Operating principle ¹⁾		closed-circuit principle	
Contact material		AgCdO	
Rated voltage acc. to VDE0110, IEC664-1, IEC947-1		250V	
Switching voltage max.		400VAC, 300VDC	
Rated switching current AC12 (resistive)		230V	4A
Rated switching current AC15 (inductive)		230V	3A
Rated switching current DC12 (resistive)		24V	4A
Rated switching current DC13 (inductive)		24V	2A
Max. mechanical life		30 x 10 ⁶	
Max. electrical life(acc. to AC12, 230V, 4A)		0.1 x 10 ⁶	
Short circuit proof, max. fuse rating		n/c contact	4 A fast operation class gL
		n/o contact	6 A fast operation class gL
General data			
Width of enclosure		45mm	
wire size		2 x 2.5mm ² (2x14AWG) stranded with wire end ferrule	
Installation position		any	
Degree of protection housing/ terminals		IP50 / IP20	
Operating temperature		-25°C...+65°C	
Storage temperature		-40°C...+85°C	
Mounting		DIN rail (EN50022)	
Standards / directives			
Product standard		IEC60255-6, EN60255-6	
Electromagnetic compatibility		89/336 EWG, 91/263 EWG, 92/31 EWG, 93/68 EWG, 93/67 EWG	
EMV-tests acc. to EN50082-2			
ESD acc. to IEC61000-4-2, EN61000-4-2		Level 3 - 6kV/8 kV	
HF-radiation resistance acc. to IEC61000-4-3, EN61000-4-3		Level 3 - 10V/m	
Burst acc. to IEC61000-4-4, EN61000-4-4		Level 3 - 2kV/5kHz	
Surge acc. to IEC1000-4-5, EN61000-4-5		Level 4 - 2kV L-L	
HF line emission acc. to IEC61000-4-6, EN61000-4-6		Level 3 - 10V	
Low voltage directive		93/68/EWG	
Vibration resistance acc. to IEC 68-2-6 Fc		mechanical resistance 10G, f = 55Hz, a = 0.95 mm, t = 2h per level	
Operating safety		4G	
Climatic test acc. to IEC68-2-30 Db		24h cycle, 55°C, 93% rel., 96h	
Approvals		cULus, GL, GOST	
Isolation data			
Rated HD625.1 S1, VDE0110, IEC664-1, IEC60255-5			
Rated insulation voltage between supply- , measuring- and output circuit		250V, 400V, 500V per version	
Rated impulse withstand voltage between all isolated circuits		4kV/1.2 - 50µs	
Test voltage between all isolated circuits		2.5kV, 50Hz, 1min.	
Pollution category		3	
Overvoltage category		3	

Remark: 1c/o = SPDT