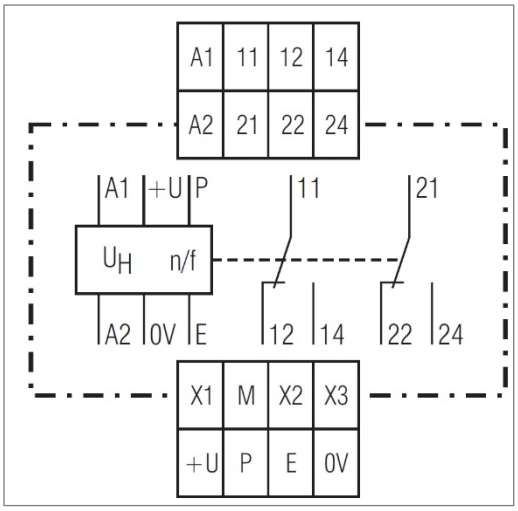
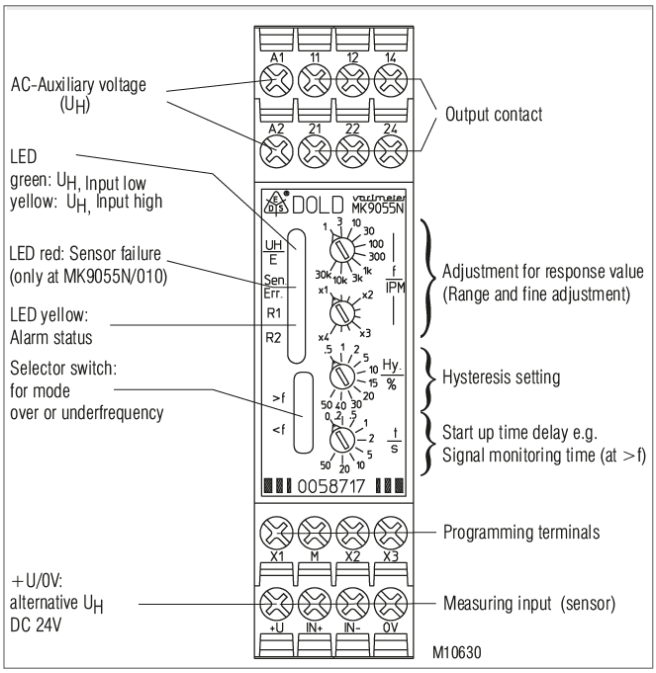
dimensions	22.5 x 90 x 97mm
operating range	**1 … 120.000 pulses / minute**

- ✓ **detection of high or low rpm /standstill (adjustable function)**
- ✓ **adjustable hysteresis 0.5 … 50%**
- ✓ **adjustable startup bypass time 0 … 50s**
- ✓ **status LED for auxiliary voltage, measuring input and output relay**
- ✓ **2 changeover contacts, closed circuit operation (relay is de-energized during alarm)**
- ✓ **universal input, for several sensors configurable**
- ✓ **responsive even at low rpm**

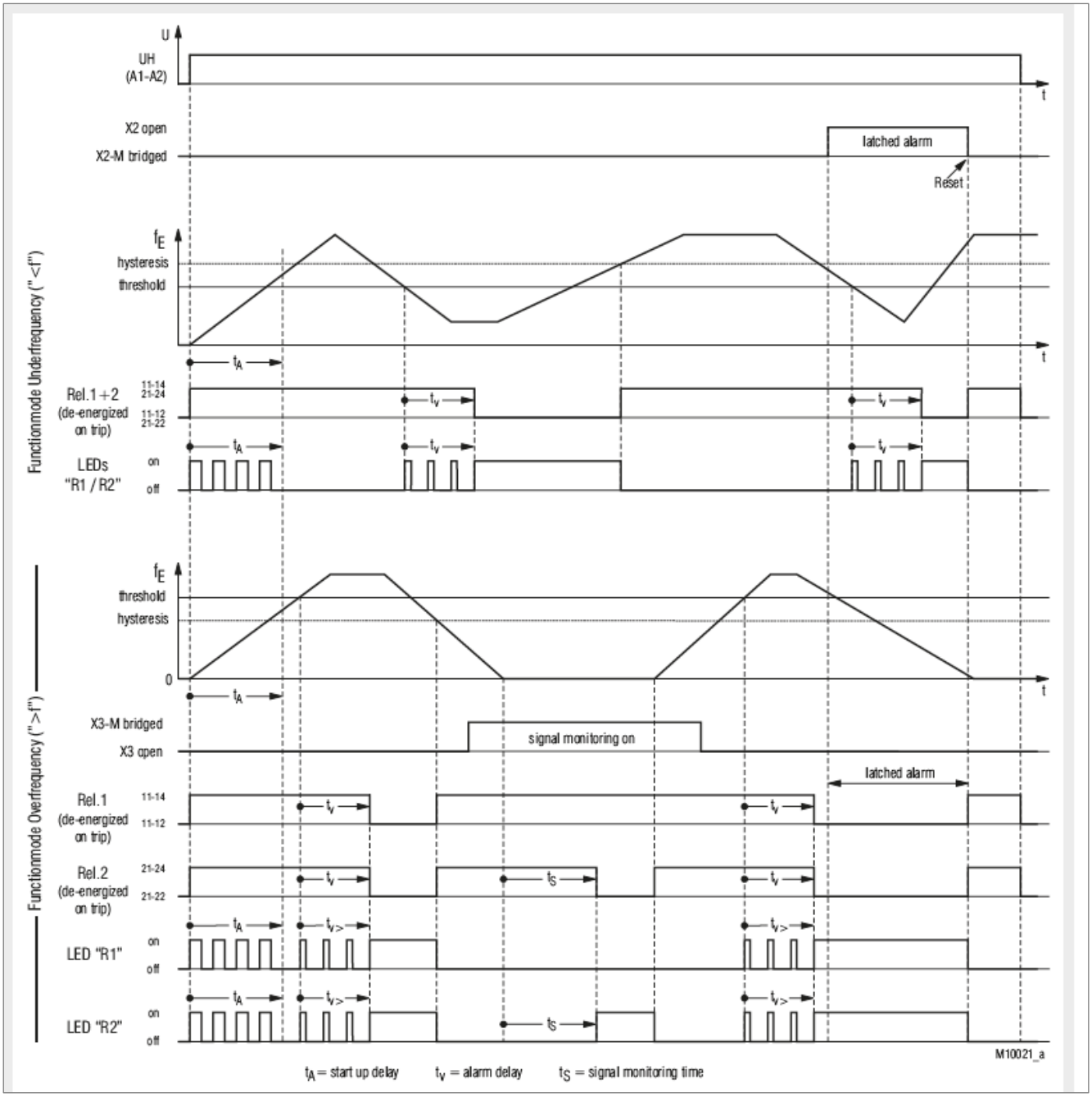
Connection



Setting



Function diagram



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Design and function

The rotation speed monitor is supplied via the terminals A1-A2 with AC-auxiliary voltage. An operation with alternatively 24V DC is possible via terminals +U / 0V.

Different sensors can be connected to the measuring input that detects the speed pulses.

The input frequency is compared to the set value (= fine tuning x range).

As the device measures the period duration, it is responsive even at low rpm.

In overfrequency mode (switch on device front in pos. ">f") the output relays switch to alarm state, if the input frequency rises above the response value for a longer time then selected on the terminals. If the measuring frequency drops again under the hysteresis value, the output relay switches back to good state without delay.
In underfrequency mode (switch in pos. "<f") the output relays switch to alarm state, if the input frequency drops below the response value for a longer time then selected on the terminals. If the measuring frequency rises again above the hysteresis value, the output relay switches back to good state without delay.
If manual reset is chosen, the output relay stays in tripped position, even if the frequency is back to normal. The reset is made by bridging terminals X2-M or by disconnecting the auxiliary supply.
In alarm state the yellow LEDs „R1" / „R2" are continuously on, during time delay they flash with short pulse.
The device operates with closed circuit principle, in good state the output relays are energized (contacts 11-14, 21-24 closed), in case of alarm they are de-energized.

If start up delay is selected, a timer is started after connection of auxiliary supply that disables the measuring circuit for the adjusted time on terminal X3. During this time the frequency measurement is disabled, the yellow LEDs "R1" and "R2" flash symmetrically and the output relays remain in "good" position. This start up delay avoids an alarm e.g. when starting a generator or motor.
In overfrequency mode missing input signal can be monitored as option: If the signal is missing longer than the selected monitoring time, relay 2 (contacts 21-22-24) and LED "R2" indicate alarm.

Status LED

Upper LED "UH/E": - green light: auxiliary supply is present, measuring input is low
- yellow light: auxiliary supply is present, measuring input is high
- yellow-green alternating light, if UH and pulse sequence present

Lower LED "R1" (yellow): - on, when alarm state (under- or. overfrequency)
- flashes (with short pulse) when time delay is active

Lower LED "R2" (yellow): - on, when alarm state (under- or overfrequency)
- flashes (with short pulse) when time delay is active
- flashes additionally at signal monitoring alarm in mode ">f"
- LEDs "R1" and "R2" flash simultaneously during startup bypass time

Universal measuring input

The universal input of the rotation speed monitor (terminals +U, P, E, 0V) can handle a large variety of sensors (inductive or capacitive proximity sensors, ultrasonic, hall-effect, optical sensors, light barriers, reed contacts etc.).
The input is suitable for all sensors acc. to IEC / EN 60947-5-2 (VDE 0660 part 208).

Depending on the sensor that is used (3-wire PNP or NPN, 2-wire, contact) the connection to the input terminals could be different (see connection examples).
As the speed monitor is suitable for a very high maximum frequency, RC elements need to be installed to suppress bouncing of contact sensors (see connection examples). It is possible to use standard RC elements suitable for contact protection or RF interference protection.

Sensor supply, alternative auxiliary supply 24V DC

The input circuit (+U, P, E, 0V) is galvanically separated to the auxiliary supply A1, A2 (e.g. AC 230V). By connecting AC 230V auxiliary voltage on terminals A1-A2, the unit provides a voltage of approx. 24V and up to 20mA to supply external sensors. If the auxiliary supply is DC 24V or sensors with higher power consumption are used, the DC 24V auxiliary supply is connected to terminals +U / 0V. The sensors are also supplied from this source. (In this case there is no galvanic separation between auxiliary supply and measuring input).

Monitoring the sensor input

The upper, 2-color LED shows the connected auxiliary voltage and the electrical state of the measuring input:

green: input terminal E is on Low level

yellow: input terminal E is on High level

Depending on the type of sensor (PNP, NPN, 2-wire, NO or NC contact), the actual state (active or inactive) is indicated.

green / yellow: input pulses from sensor present

Several rotation speed monitors on one sensor

Parallel operation of several speed monitors on one sensor, e.g. to monitor several speed levels is possible at the universal input: The corresponding terminals are connected in parallel.

Startup bypass time / Monitoring of measuring signal

The startup bypass time (t_A) can be adjusted with the lowest potentiometer on the front side of the unit and is activated when connecting the auxiliary supply. If no startup bypass time is required, the potentiometer is turned fully anti-clockwise (t=0).
In underfrequency mode (“<f”) the startup bypass time can be extended/restarted at any time with a control contact between terminals X3-M: As long as X3-M is bridged, the startup bypass time is continuously on and the frequency is not measured. As soon as the link between X3-M is opened, the startup bypass time restarts.
In overfrequency mode (“>f”) with a bridge on X3-M, the lowest potentiometer sets the measuring signal monitoring time (tS) (the adjusted time values tA / tS are identical).

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Notes

When signal monitoring in mode ">f" is selected by bridging X3-M the measuring input is monitored as follows:
If during the adjusted monitoring time (t_S) no measuring signal is detected, a special alarm „missing measuring signal" is indicated. As soon as a measuring signal returns, the alarm status is reset (auto reset selected) and the monitoring interval t_S starts again.

The alarm status is indicated on relay 2 (contacts 21-22-24) and LED "R2" and can be easily differentiated from under/overfrequency alarm, where both relays (contacts 11-12-14 and 21-22-24) and LEDs "R1"and "R2") are active.
The detection of missing measuring signal can increase the safety in critical applications on overfrequency: It can be checked if the frequency input still delivers pulses.

Second speed level / detection of overspeed and standstill

The signal monitoring time setting in the overfrequency mode can also be used as second speed level, e.g. to detect standstill in addition to overspeed. To achieve this, the monitoring time is adjusted on the lower potentiometer to the reverse value of the pulse frequency that indicates standstill.

Programming terminals (M-X1-X2-X3):

Attention! The terminals M-X1-X2-X3 don't have a galvanic separation to the measuring input (+U / P / E / 0V) or to the alternative 24V DC auxiliary voltage.

M: Common connection (ground) of the programming terminals (identically with 0V).

X1: alarm delay with under- or overfrequency alarm: By connecting terminal X1 with M via a potentiometer or a resistor (0.25W), the alarm delay time can be programed in a range of 0 ... 100s (see technical data).

The delay can be stopped at any time by bridging X1 and M with a switching contact. If no alarm delay is required, terminals X1 – M are bridged.

X2: Alarm memory with unconnected terminal X2; alarm reset by activating an external NO-button that is connected between X2 and M; not storing by bridging X2-M.

X3: In mode „underfrequency" when X3-M are bridged, the startup bypass or reset of the startup bypass time is continuously activated. By bridging X3-M in the „overfrequency" mode, monitoring of missing measuring signal is activated with the set monitoring time at the lowest potentiometer.

Adjustment aid for startup bypass time and alarm delay

During the elapse of the startup bypass time and alarm delay, the yellow LEDs „R1" und „R2" flash with a frequency of 2Hz. In order to set a specific delay in seconds, the number of flash pulses can be used as adjustment aid: number of flash pulses divided by 2 = time delay in seconds.

TECHNICAL DATA

frequency measuring input

universal input (+U / P / E / 0V)	for PNP-, NPN-, 2-wire sensors, contacts and voltage, connection see application examples; suitable for sensors acc. to IEC / EN 60947-5-2 (VDE 0660 part 208) integrated sensor power supply approx. 24V DC / max. 20mA to terminals +U / 0V; alternatively external auxiliary voltage supply 24V DC via terminals +U / 0V	
max. residual current	with 2-wire sensors	2mA (OFF)
max. voltage drop	with 2-wire sensors	8V (ON)
voltage activation	input resistance low-potential high-potential	approx. 17kΩ ≤ 8V ≥ 11V

COMMON INPUT DATA

response value (f1 / f2)	10 ranges	1 … 120.000 pulses per minute

range	1	2	3	4	5	6	7	8	9	10
pulses / min	1 to 4	3 to 12	10 to 40	30 to 120	100 to 400	300 to 1,200	1,000 to 4,000	3,000 to 12,000	10,000 to 40,000	30,000 to 120,000

fine adjustment: continuously 1:4 in every range

max. input frequency (pulse : pause = 1 : 1)	range 1 … 4 range 5 … 7 range 8 … 10	1.5kHz 5kHz 25kHz
min. pulse / pause duration	range 1 … 4 range 5 … 7 range 8 … 10	350µs 100µs 20µs (the „higher“ range of f1 and f2 determines the above value)
stability of the set thresholds at variation of auxiliary voltage and temperature	2%	
hysteresis	adjustable: 0.5 … 50% of the set response value	
reaction time of frequency monitoring (alarm delay set to 0)	1 period duration (inverse value of the set frequency threshold) + 10ms (at overfrequency: inverse value of the set signal frequency +10ms)	
alarm delay	adjustable from 0 ... 100s via resistor / potentiometer between terminals X1-M:	

R [kΩ]	0	15	22	33	47	68	100	150	220	470	∞
t_v [s]	0	0,3	0,7	1,3	2,3	5	9	15	25	50	∞

time between switching on the auxiliary voltage and ready to measure	approx. 0.4s (with setting the startup bypass time to 0)
startup bypass time / signal monitoring time:	adjustable on scale with logarithmic division; t_A: 0 … 50s, t_S: 0.1 … 50s
auxiliary circuit (A1-A2; or +U / 0V) auxiliary voltage U_H	230V AC + 24 V DC (via terminals +U / 0V) (terminals +U / 0V without galvanic separation to the measuring input)
voltage range	AC: 0.8 ... 1.1 U_H DC: 0.85 ... 1.2 U_H
frequency range	AC: 45 ... 440Hz
nominal consumption	AC: approx. 4VA DC: approx. 2W
contact output	(11-12-14, 21-22-24)
contact assembly	2 change-over contacts
thermal current I_{th}	4A

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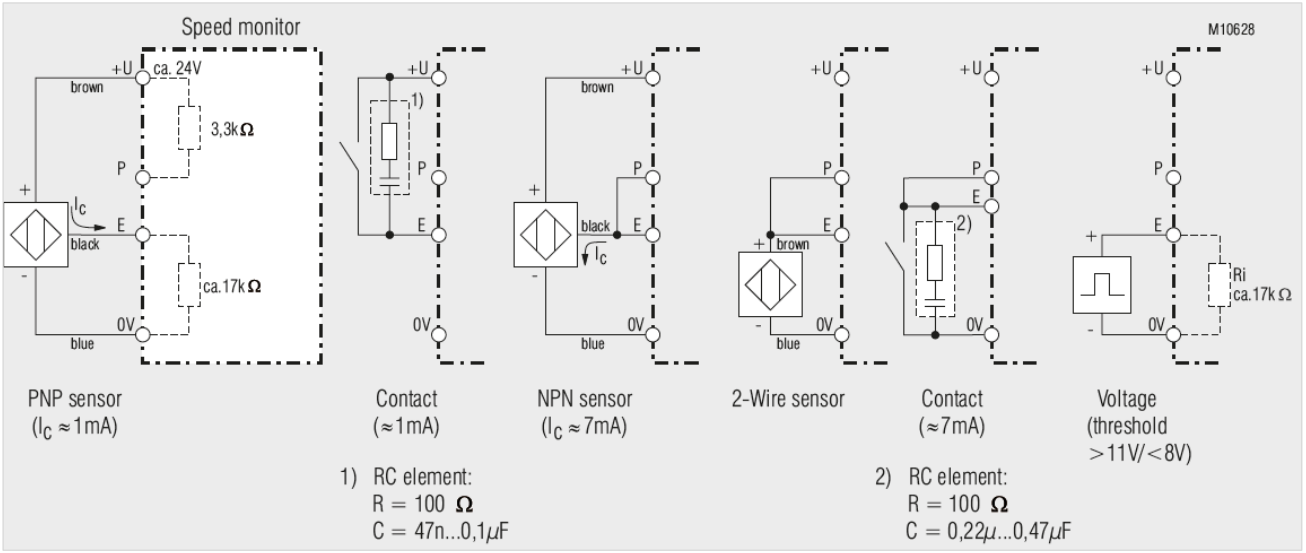
switching capacity	to AC 15	NO:	3A / 230V AC	IEC/EN 60 947-5-1
		NC:	1A / 230V AC	IEC/EN 60 947-5-1
	to DC 13	NO:	1A / 24V DC	IEC/EN 60 947-5-1
		NC:	1A / 24V DC	IEC/EN 60 947-5-1
electrical endurance	to AC 15 at 1A, 230V AC		1.5 x 10^5 op. cycles	IEC/EN 60 947-5-1
short-circuit protection				
max. fuse	4 A gL IEC/EN 60 947-5-1			
mechanical endurance	≥ 30 x 10^6 operating cycles			
nominal operating mode	continuous operation			
temperature range	- 20 ... + 60° C			
creepage and clearance distances	contacts to measuring input		4kV / 2	IEC 60 664-1
rated impulse withstand voltage /	contacts to auxiliary circuit:			4kV / 2 IEC 60 664-1
degree of soiling	contacts to contacts:		4kV / 2	IEC 60 664-1
	auxiliary circuit A1-A2 to measuring input:			4kV / 2 IEC 60 664-1
	programming terminals M-X1-X2-X3 without galv. separation to the measuring input			
	auxiliary voltage 24V DC (to +U / 0V) without galv. separation to the measuring input			
EMC	static discharge (ESD)		8kV (air discharge)	IEC/EN 61 000-4-2
	rapid transients		2kV	IEC/EN 61 000-4-4
	impulse voltages (Surge)			
	between supply cables		1kV	IEC/EN 61 000-4-5
	HF-conducted		10V	IEC/EN 61 000-4-6
	interference suppression		limit value class B	EN 55 011
degree of protection	housing		IP 40	IEC/EN 60 529
	terminals		IP 20	IEC/EN 60 529
housing	thermoplastic with V0-behavior acc. UL subject 94			
vibration resistance	amplitude 0.35mm, frequency 10 ... 55Hz			IEC/EN 60 068-2-6
climatic resistance	20 / 060 / 04			IEC/EN 60 068-1
terminal designation	EN 50 005			
wire designation	1 x 4mm² solid or 2 x 2.5mm² solid or 1 x 2.5mm² strand with sleeve DIN 46 228-1/-2/-3/-4 or 2 x 1.5mm² strand with sleeve DIN 46 228-1/-2/-3/			
wire fixing	plus-minus terminal screws M3, M5; box terminals with wire protection			
tightening torque	0.8Nm			
quick mounting	top hat rail IEC/EN 60 715			
housing dimensions	width x height x depth 22.5 x 90 x 97mm			

Application examples



Safety Warnings:

Before initial operation, please make sure to follow all safety instructions that may be provided in the product information!

Never use these articles in applications where the safety of a person depends on their functionality.

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