

Dold Standstill Monitor Relays



UG6946-02PS-40

Dold speed monitoring safety relay modules provide safe standstill detection on 3-phase and single-phase motors by monitoring remanence voltage.

- Can monitor motor voltages up to 690 VAC or VDC
- No external sensors necessary
- Independent of direction
- Broken wire detection
- Monitors rotation and linear movement
- 2-channel operation for standstill monitoring
- Up to 3 NO and 1 NC positive-guided safety contacts
- LED status indicator
- Adjustable voltage setting
- Adjustable standstill time delay
- Semiconductor outputs for monitoring

Safety Data – Values per EN ISO 13849-1

Category	4 according to EN ISO 13849-1
Performance level	PL _e according to EN ISO 13849-1
MTTF_d	>93 years for LH5946 >222 years for UG6946
DC_{avg}	99%

Safety Data – Values per IEC/EN 62061 /IEC/EN 61508

SIL CL	3 per IEC/EN 62061
SIL	3 per IEC/EN 61508
HFT (Hardware Failure Tolerance)	1
DC_{avg}	99%
PFH_D	4.10 x 10 ⁻¹⁰ for LH5946 4.20 x 10 ⁻¹⁰ for UG6946

Safety Standstill Monitor Relays Selection Chart

Part Number	Price	Marking Type	Voltage Monitor Range	Voltage	Outputs	Connection	Muting	Drawing
LH5946-48-24-04	\$526.00	Standstill-monitoring safety relay module	20mV to 400mV	24 VDC	3 NO / 1 NC	Fixed screw terminals	No	PDF
LH5946-PC-24-04	\$526.00			24 VDC		Push-in cage clamp	No	PDF
LH5946-48-115-04	\$526.00			115 VAC		Fixed screw terminals	No	PDF
LH5946-PC-115-04	\$526.00			115 VAC		Push-in cage clamp	No	PDF
UG6946-02PS-04	\$347.00			24 VDC	2 NO / 1 NC	Pluggable screw terminals	No	PDF
UG6946-02PS-001-04	\$367.00			24 VDC		Pluggable screw terminals	Yes	PDF
LH5946-48-24-40	\$526.00		200mV to 4V	24 VDC	3 NO / 1 NC	Fixed screw terminals	No	PDF
LH5946-PC-24-40	\$526.00			24 VDC		Push-in cage clamp	No	PDF
LH5946-48-115-40	\$526.00			115 VAC		Fixed screw terminals	No	PDF
LH5946-PC-115-40	\$526.00			115 VAC		Push-in cage clamp	No	PDF
UG6946-02PS-40	\$347.00			24 VDC	2 NO / 1 NC	Pluggable screw terminals	No	PDF
UG6946-02PS-001-40	\$367.00			24 VDC		Pluggable screw terminals	Yes	PDF

Note: The -04 models are recommended for applications where motors are controlled directly from contactors.

The -40 models are recommended for applications involving VFDs or soft starters where OFF-state leakage is present and higher voltage settings are required.

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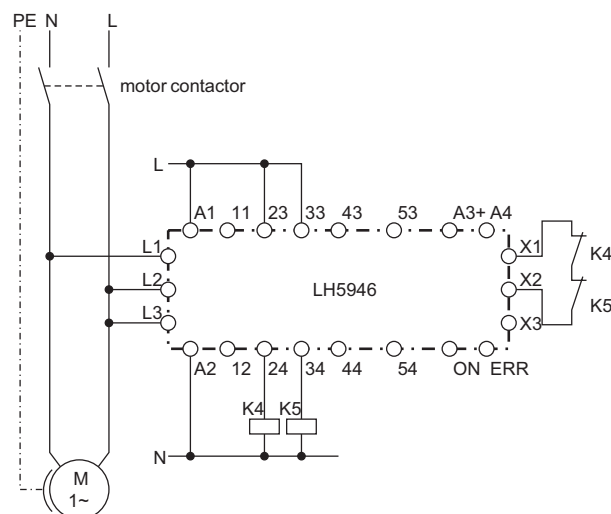
Safety Standstill Monitor Relays Specification Table

General Specifications	LH5946		UG6946																								
Temperature	Storage: -40°C to 75°C [-40°F to 167°F]]																										
Altitude	< 2,000m [6562ft]																										
Vibration Resistance	Amplitude: 0.35 mm Frequency: 10 to 55 Hz (IEC/EN 60068-2-6)				Amplitude: 0.075 mm Frequency: 10 to 57 Hz (IEC/ EN 60068-2-6)																						
Degree of Protection	Housing: IP40 Terminals: IP20																										
Housing	Thermoplastic with VO behavior; DIN rail mount																										
Weight	400g [14.11 oz.]				295g [10.41 oz.]																						
Agency Approvals and Standards	cULus file E107778, CE, TUV																										
Wire Connections	1x AWG 20-12 solid or stranded 2x AWG 20-14 solid or stranded				1x AWG 24-12 solid or stranded 2x AWG 24-18 solid or stranded																						
Wire Fixing	Plus-minus terminal screws M3.5 box terminals with wire protection. Torque 0.8 Nm [7 lb•in]				Captive slotted screw. Torque 0.8 N•m [7 lb•in]																						
Input Specifications																											
Nominal Voltage	24VDC, 115VAC, 230VAC				24VDC																						
Measuring/Motor Voltage	690 VAC/VDC (for UL applications, max 600 VAC/VDC)																										
Input Resistance	500KΩ																										
Response Value U_{an}	20mV to 400mV, adjustable or 0.2 V to 4V adjustable																										
Response Value Dependent on Frequency	<table><tr><th>Input Frequency (Hz)</th><td>50</td><td>100</td><td>200</td><td>400</td><td>600</td><td>1k</td><td>1.5k</td><td>2k</td></tr><tr><th>Response Value U_{an}</th><td>1.0</td><td>1.1</td><td>1.2</td><td>1.5</td><td>2.0</td><td>2.8</td><td>5</td><td>8</td></tr></table>									Input Frequency (Hz)	50	100	200	400	600	1k	1.5k	2k	Response Value U_{an}	1.0	1.1	1.2	1.5	2.0	2.8	5	8
Input Frequency (Hz)	50	100	200	400	600	1k	1.5k	2k																			
Response Value U_{an}	1.0	1.1	1.2	1.5	2.0	2.8	5	8																			
Voltage Range	AC: 0.8 to 1.1 U_N At 10% residual ripple: 0.9 to 1.1 U_N DC: 0.9 to 1.2 U_N At 10% residual ripple: 0.9 to 1.1 U_N				DC: 0.9 to 1.2 U_N At 10% residual ripple: 0.9 to 1.1 U_N																						
Nominal Consumption	3W																										
Nominal Frequency	50 to 60 Hz. Frequency range: 45 to 65 Hz				N/A																						
Control Current	Control current typical at 24V over two relays: 75mA																										
Overvoltage Protection	Internal VDR (Voltage Dependent Resistor)																										
Output Specifications																											
Electrical Contact Life	To AC15 at 3A, 230V: 2x10 ⁵ switching cycles IEC/EN 60 947-5-1																										
Mechanical Life	50 x 10 ⁶ switching cycles				20 x 10 ⁶ switching cycles																						
Contact Type	3 NO positively driven and 1 NC relay contacts (NO contacts are safety contacts)				2 NO positively driven and 1 NC relay contacts (NO contacts are safety contacts)																						
Operate Delay on Standstill	Depends on setting; adjust by potentiometer																										
Release Delay for Detection of Running Motor	< 100ms																										
Nominal Output Voltage	250VAC				250VAC (for NO contacts) 24VDC (for NC contacts)																						
Thermal Current (I_{th})	5A per contact See continuous current limit curve in manual.				5A (for NO contacts) 2A (for NC contacts) See quadratic total current limit curves in manual.																						
Short Circuit Strength	Max fuse rating: 4 AGL (IEC/EN 60 9470-5-1), line circuit breaker C6A																										
Switching Capacity IEC/EN 60 947-5-1	AC 15: NO contacts: 3A/230V NC contacts: 1A/230VAC DC13: 4A/24V				AC 15: NO contacts: 3A/230V DC13: 4A/24V																						
Switching Frequency	Max. 1,200 switching cycles/hr																										
Semiconductor Monitoring	100 mA DC 24V; supply via A3+/A4				N/A																						

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The diagram shows a three-phase power supply (PE, L1, L2, L3) connected to a motor (M 3~). The L1, L2, and L3 lines pass through a "motor contactor". The L1 line continues to terminal A1, which connects to terminal 11, then 23, 33, 43, 53, and finally to terminals A3+A4. The L2 line passes through terminal L1, then L2, and then L3 before reaching terminal A2. The L3 line passes through terminal L1, then L2, and then L3 before reaching terminal A2. The A2 terminal connects to terminal 12, then 24, 34, 44, 54, and finally to terminal ON. The ON terminal is connected to terminal ERR. The motor (M 3~) is connected to the PE, L1, L2, and L3 lines. The motor contactor is connected to the L1, L2, and L3 lines. The motor contactor is also connected to the L1, L2, and L3 lines. The motor contactor is also connected to the L1, L2, and L3 lines.

With 3-phase motor



With single-phase motor

The timing diagram illustrates the sequence of events for the motor control system. The horizontal axis represents time (t), and the vertical axis represents various signals. The signals shown are:

- auxiliary voltage on U_H** : A square wave signal that is high during motor operation and low during standstill or reset.
- motor speed/voltage $L1/L2/L3$** : A signal that ramps up during start-up, remains constant at the voltage level U_{an} during operation, and ramps down during stop.
- line breakage $L1/L2/L3$** : A square wave signal that is high when a line breakage occurs.
- 23-24, 33-34, 43-44, 53-54, A3-ON**: A series of square wave signals representing different input conditions.
- 11-12**: A square wave signal representing another input condition.
- A3-ERR**: An error signal that is high during standstill delay time t_s and reset X3-X2.

Key time intervals and events are marked:

- start up delay time U_H** : The time interval from the start of the auxiliary voltage to the start of the motor speed ramp.
- standstill delay time t_s** : The time interval from the end of the motor speed ramp to the start of the standstill delay.
- $t_E = 2 \dots 2.5s$** : The time interval from the end of the standstill delay to the start of the reset X3-X2.

Connection Terminals	
<i>Terminal Designation</i>	<i>Signal Description</i>
L1-L2-L3	Connection to monitored motor
11-12	Safety contacts (NC)
23-24, 33-34, 43-44	Safety contacts (NO)
<u>53-54</u>	Monitoring contact (NO)
X1-X2	Connection of feedback circuit (for external contactors)
X2-X3	Manual reset for external faults
A1-A2	Auxiliary supply (UH)
<u>A3(+)</u> - <u>A4</u>	Supply for semiconductor outputs
<u>ON:</u>	Semiconductor output indicates state of safety contacts
<u>ERR:</u>	Semiconductor output indicates failures

Note: The outputs 53-54, ON and ERR are only monitoring outputs and must not be used in safety circuits.

Setting	
Potentiometer U_{an}	Adjustment of voltage level for standstill detection
Potentiometer t_s	Adjustment of time delay before activation of safety contacts

Safety Products



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