

Bul. 440R — Guardmaster® Safety Relays (DI, DIS, SI, CI, GLP, EM, and EMD)

Selection Guide



Allen-Bradley



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Next Generation Guardmaster® Safety Relays

DI, DIS, SI, CI, GLP, EM, and EMD



Description

The new generation of Guardmaster® safety relays addresses the broad scope of applications in the intricate safety world with a range of devices. Designed to meet new functional safety standards, such as EN ISO 13849-1 and EN 62061, the new family offers key functions to simplify installation and system complexity. A broad range of safety devices such as safety interlock switches, emergency stop devices, pressure sensitive safety mats, and OSSD devices such as safety light curtains are all compatible with the same relay without additional configuration. The functionality of two standard safety relays can be achieved in one Dual Input (DI) device, allowing connection of two dual-channel input devices into one safety relay.

A TÜV-approved single rotary switch sets the required function of the safety relay and eliminates the typical redundant switch setting process. Selectable functions include simple logic, reset, timing, and diagnostics.

The single-wire safety connection simplifies cascading and expanding safety functions by linking relays with a single-wire connection. A dynamic signal from device to device provides a linkage in accordance with SIL 3, PLe, allowing easy addition of extra I/O, which can be configured with simple logic combinations. Flexible AND/OR logic can be configured simply in a single relay or through a combination of relays via single-wire connection.

The family includes a module designed specifically for guardlocking applications. The GLP uses two proximity sensors to monitor machine motion, and unlocks the gate when safe speed is attained.

Expansion modules are available with four immediate or time-delayed outputs. The time delay module can be configured for on delay, off delay, or jog.

Features

- Suitable for applications up to PLe, SIL 3 Per ISO13849-1
- Stop Category 0 and Stop Category 1
- One or two dual-channel inputs
- Two or three safety contacts
- One auxiliary contact
- Cross-fault monitoring
- Rotary switch configures auto/manual or monitored manual reset
- Same rotary switch configures AND/OR logic of input to device
- Removable terminals
- Can be used with interlocks, light curtains, safety mats, E-stops, and SensaGuard™ switches
- Single-wire safety output connects to single-wire safety input relays while maintaining SIL 3, PLe
- Guardlocking with proximity sensors
- Timed ON delay, OFF delay, and Jog outputs on EMD

Specifications

Safety Ratings	
Standards	IEC 60204-1, EN ISO 13849-1, EN ISO 12100, IEC 61508
Safety Classification	DI/DIS/CI/SI/EM/EMD: Suitable up to PLe and CAT4 per EN ISO 13849-1:2006, SIL CL3 per IEC 61508:2010/IEC62061:2006 depending on architecture and application characteristics GLP: Suitable up to PLd and CAT3 per EN ISO 13849-1:2006, SIL CL2 per IEC 61508:2010 /IEC62061:2006 depending on architecture and application characteristics
Certifications	CE Marked for all applicable directives, cULus Listed and TÜV
Functional Safety Data	See next page
Power Supply	
Input Power Entry	24V DC (-15...+10%)
Power Consumption	DI/SI: 2.5 W DIS: 2 W CI/EM/EMD: 3.5 W GLP: 2.5 W
Inputs	
Safety Inputs	DI/DIS: 2 dual N.C., 2 dual OSSD, or safety mats and 1 single-wire safety input SI/CI: 1 dual N.C., 1 dual OSSD, or safety mats GLP: 1 dual N.C. or 1 dual OSSD and 1 single/wire safety EM/EMD: 1 single-wire safety input
Input Simultaneity	Infinite
Input Resistance, Max.	900 Ω
Reset	Configured automatic/manual or monitored manual
Reset Pulse Duration	250 ms...3 s
Power ON Delay Time	DI/DIS/SI/CI/EM/EMD: 5.5 s GLP: 11 s
Recovery Time	DI/DIS/SI/CI: 100 ms EM/EMD: 150 ms
Response Time (Safety Outputs)	DI: 35 ms (40 ms with mat input) DIS: 25 ms (30 ms with mat input) SI/CI: 35 ms (45 ms with mat input) GLP: overspeed detection time = 3/(speed limit [Hz]) EM/EMD: 35 ms
Response Time (Single-Wire Safety Outputs)	DI/DIS: 25 ms (30 ms with mat input) SI/CI: 25 ms (35 ms with mat input) GLP/EM/EMD: 25 ms
Outputs	
Safety Outputs	DI/SI: 2 N.O. CI: 3 N.O. DIS: 2 PNP (14, 24); 2 Decoupled (34, 44) EM: 4 N.O. EMD: 4 N.O. delayed DIS/GLP: 2 PNP safety, 2 PNP Lock
Solid State Output Rating	DIS: 2 x 1.5 A; 2 x 0.5 A; Total: max. 4 A GLP: 2 x 0.5 A; 2 x 0.3 A; Total: max 1.5 A
Contact Material	DI: AgNi + 0.2μ Au SI/CI/EM/EMD: AgNi
Auxiliary Contacts	DI/DIS/SI/GLP/EM/EMD: 1 PNP; 50 mA max CI: 1 N.C.
Thermal Current/ <i>I_{th}</i>	1 x 6 A
Rated Impulse withstand Voltage	2500V
Switching Current @ Voltage, Min.	DI/SI/CI/EM/EMD: 10 mA/10V
Fuses, Output	Relay Outputs: 6 A low blow or 10 A quick blow Power Supply GLP: 4A gG, tripping characteristic B or C
Mechanical Life	DI/SI/CI/EM/EMD: 10,000,000 operations

Specifications, continued

Utilization Category	
Inductive: AC-15	DI: 3 A/250V AC SI/CI: 1.5 A/250V AC EM/EMD: 1.5 A/250V AC
Inductive: DC-13	DI: 4 A/24V DC (0.1 Hz) SI/CI: 2 A/24V DC (0.1 Hz) EM/EMD: 2 A/24V DC
Output Rating	DIS: 14, 24: 1.5 A each 34, 44: 0.5 A each GLP: X14, X24: 0.5 A each 51, L61: 0.3 A each
Environmental and Physical Characteristics	
Enclosure Type Rating/ Terminal Protection	IP40 (NEMA 1)/IP20
Operating Temperature [C (F)]	-5...+55 ° (23...131 °)
Vibration	10...55 Hz, 0.35 mm
Shock	10 g, 16 ms 100 shocks
Mounting	35 mm DIN Rail
Weight [g (lb)]	DI: 180 (0.40) DIS: 150 (0.33) SI: 150 (0.33) CI: 225 (0.5) GLP: 150 (0.33) EM: 225 (0.50) EMD: 220 (0.49)
Terminals	Removable (Screw)
Conductor Size, Max.	0.2...4 mm ² (24...12 AWG)

Product Selection Safety Relays

Relay Type	No. of Inputs	Inputs	Immediate Safety Outputs	Delayed Safety Outputs	Time Delay	Immediate Auxiliary Outputs	Power Supply	Cat. No.
Dual Input (DI)	2 dual- channel	1 N.C., 2 N.C., OSSD, Safety Mat	2 N.O.	—	—	1 S.S.	24V	440R-D22R2
Dual Input Solid-State Output (DIS)			2 S.S.					440R-D22S2
Single Input (SI)	1 dual- channel	1 N.C., 2 N.C., OSSD, Safety Mat	2 N.O.	—	—	1 S.S.	24V	440R-S12R2
Compatible Input (CI)			3 N.O.					440R-S13R2
Guardlocking Proximity (GLP)	1 dual- channel 2 PNP	2 N.C., OSSD	2 S.S.	—	—	1 S.S.	24V	440R-GL2S2P
Expansion Module (EM)	1 single-wire safety	—	4 N.O.	—	—	1 S.S.	24V	440R-EM4R2
Expansion Module Time Delayed (EMD)			—	—	100 ms ... 300 s on or off delay 100 ms ... 20 s jog			440R-EM4R2D

Accessories

Description	Cat. No.
Bag of four, 4-pin screw terminals	440R-ATP4

Functional Safety Data ★

Note: Subject to change. For up-to-date information, visit
<http://www.ab.com/safety/>

MTTFd		PFH _D
DI	355 yr	4.35 x 10 ⁻⁹
DIS	484 yr	4.39 x 10 ⁻⁹
SI	262 yr	3.98 x 10 ⁻⁹
CI	164 yr	4.26 x 10 ⁻⁹
GLP	395 yr	7.18 x 10 ⁻⁹
EM	190 yr	1.81 x 10 ⁻⁹
EMD	165 yr	4.4 x 10 ⁻⁹

★ Usable for ISO 13849-1: 2006 and IEC 62061. Data is based on the following assumptions:
 - Mission time/proof test interval of 20 yr
 - Functional test at least once within six-month period
 - The PFH_D given is the sum of the PFH_D of the electronic aspects and the PFH_D resulting from the B10d values of the two output relays based on 1 operation/hour, 365 days a year, 24 hours a day (8760 operations/year) at AC15 1 A 230V AC or at DC13 1.5 A 24V DC.

LED Indicators

Indicator on Housing	Function	LED Color(s)
PWR/FAULT	Status and diagnostics	Green/Red
IN1	Status of safety output IN1	Green
IN2	Status of safety output IN2	Green
LOGIC IN	Status of single wire safety input	Green
OUT	Status of safety output	Green
LOCK‡	Status of the lock command	Green
B1★	Status and diagnostics	Green

‡ GLP only
 ★ B1 on EMD only