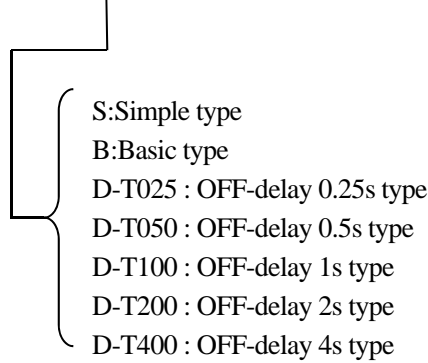


HR5S SERIES SAFETY RELAY MODULE

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TYPE HR5S-C2 □-T***



1. Applicable standards

EN ISO 13849-1 : 2015
EN ISO 13849-2 : 2012
EN 60947-5-1 : 2017
UL508
CSA C22.2 No.14
GB/T 14048.5

2. Operating conditions

(1) Surrounding air temperature in operation	-10°C to +55°C (no freezing ,no condensation)(notice 1)
(2) Storage temperature	-25°C to +85°C (no freezing ,no condensation)
(3) Operating humidity	5% RH to 85%RH (no condensation)
(4) Storage humidity	5% RH to 85%RH (no condensation)
(5) Altitude	0 to 2000m
(6) Pollution degree	2
(7) Operating atmosphere	Indoor use only (atmosphere free from corrosive gasses) (notice 1) UL maximum ambient temperature 40°C UL approved surrounding air temperature of enclosure. (For North America)

3. Ratings

(1) Over voltage category	II
(2) Rated insulation voltage	250V (contact outputs)
(3) Performance level	PL=c (HR5S-C2S) (EN ISO 13849-1) PL=d (HR5S-C2B , HR5S-C2D-T***) (EN ISO 13849-1)
(4) Category	2 (EN ISO 13849-1)
(5) Mean time to dangerous failure(MTTF _D)	330 years or more (100 years : Applying the limit value from EN ISO 13849-1) (MTTF _D of the fault outputs is 210 years or more)
(6) Diagnostic coverage(DC _{avg})	Medium (90% or more) (EN ISO 13849-1)
(7) Misson time(T _M)	20 years (EN ISO 13849-1)
(8) Stop category	<ul style="list-style-type: none"> • HR5S-C2S , HR5S-C2B 0 • HR5S-C2D-T*** 1 (Safety output2 with OFF-delay) 0 (Auxiliary output1 without OFF-delay)

3. 1 Power ratings

- | | |
|-----------------------------|--|
| (1) Rated operating voltage | 24V DC (Tolerance -15% to +10%) , Class 2 only (For North America) |
| (2) Current consumption | 100mA maximum at 24V DC (Without load) |
| (3) Turn ON time (at 20°C) | 0.05s maximum |

3. 2 Input

- | | |
|----------------------|---|
| (1) Input resistance | 30 Ω maximum (Between S11 to S##) (## : 12,13,14,34,35,36)
30 Ω maximum (Between Y1 of the previous module to S15)
(Excluding HR5S-C2S) |
|----------------------|---|

3. 3 Safety output/Auxiliary output

- | | |
|---------------------------------------|--|
| (1) Configuration | <ul style="list-style-type: none"> ▪ HR5S-C2S , HR5S-C2B 2NO(Without OFF-delay) : Safety output ▪ HR5S-C2D-T*** 1NO (Without OFF-delay) : Auxiliary output
+1NO (With OFF-delay) : Safety output |
| (2) Initial contact resistance | 200mΩ maximum each output contact
(6V DC 1A voltage drop method) |
| (3) Rated load(resistive load) | 250V AC 3A/contact , 30V DC 3A/contact |
| (4) Maximum operational voltage | 250V AC , 30V DC |
| (5) Minimum applicable load | 5V DC 1mA (reference value)[Failure rate level P (reference value)] |
| (6) Electrical life | 250V AC 3A resistive load : 100000 operation minimum (1200per hour)
30V DC 3A resistive load : 100000 operation minimum (1200per hour)
250V AC 1A resistive load : 500000 operation minimum (1800per hour)
30V DC 1A resistive load : 500000 operation minimum (1800per hour)
[AC-15]240V AC 2A inductive load : 100000 operation minimum
(operating frequency 1200 per hour $\cos \theta =0.3$)
[DC-13]24V DC 1A inductive load : 100000 operation minimum
(operating frequency 1200 per hour L/R=48ms) |
| (7) Mechanical life | 10 million operations minimum
(operating frequency 10800 per hour) |
| (8) Conditional short-circuit current | 1000A External fuse : 5AFH(IEC 60127-2) |

3. 4 Fault output

- | | |
|----------------------------|---|
| (1) Fault monitor output | Semiconductor output Rated 24V DC 100mA maximum |
| (2) Fault detection output | Semiconductor output Rated 24V DC 100mA maximum
(Excluding HR5S-C2S) |

3. 5 Time

- | | |
|---|--|
| (1) Reaction time | <ul style="list-style-type: none"> ▪ HR5S-C2S , HR5S-C2B 0.02s maximum ▪ HR5S-C2D-T*** Output with OFF-delay
D-T025 (0.25s) : 0.25s ± 0.05s
D-T050 (0.5s) : 0.50s ± 0.07s
D-T100 (1s) : 1.00s ± 0.10s
D-T200 (2s) : 2.00s ± 0.15s
D-T400 (4s) : 4.00s ± 0.20s
Output without OFF-delay:0.02s maximum |
| (2) Response time by failure diagnosis function | <ul style="list-style-type: none"> ▪ Detection by EDM ▪ HR5S-C2S , HR5S-C2B 0.25s maximum ▪ HR5S-C2D-T*** D-T025 (0.25s) : 0.5s maximum
D-T050 (0.5s) : 0.8s maximum |

D-T100 (1s) : 1.3s maximum
 D-T200 (2s) : 2.4s maximum
 D-T400 (4s) : 4.5s maximum
 0.6s maximum (Excluding HR5S-C2S)

• Detection by SW monitor

4. Constructions

- (1) Outside view
- (2) Mounting
- (3) IP (protective structure specification)
- (4) Terminal style
- (5) Weight

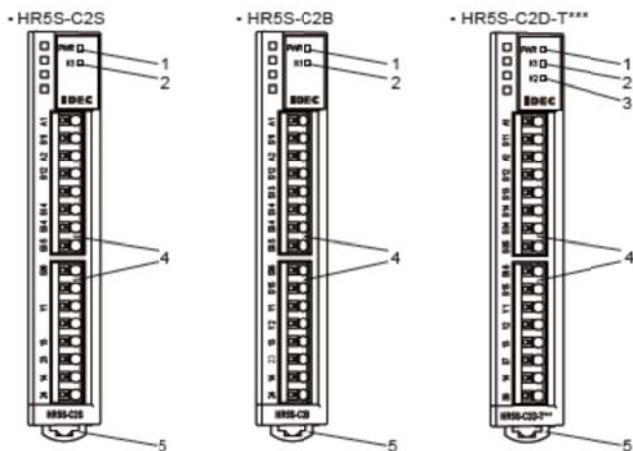
See attached sheet
 Mounting on DIN rail or direct
 Enclosure : IP40 , Terminals : IP20
 Push-in terminal
 Approx. 150g

5. Characteristics

- (1) Insulation
- (2) Rated impulse withstand voltage
- (3) Dielectric strength (1 minute)
- (4) Vibration resistance
- (5) Shock resistance

Basic insulation (Reinforced insulation : Between contact output Circuits and other circuits)
 2500V (Between different terminal contact outputs)
 (4000V: Between contact output circuits and other circuits)
 3750V AC (Between enclosure and internal circuit)
 2500V AC (Between different terminal contact outputs)
 (Between contact output circuits and other circuits)
 5Hz to 8.4Hz:3.5mm_{peak}, 8.4~150Hz:10m/s² peak
 1octave/min. , 10cycles for 3 axes
 150m/s², pulse width : 11msec , 3 times for 6

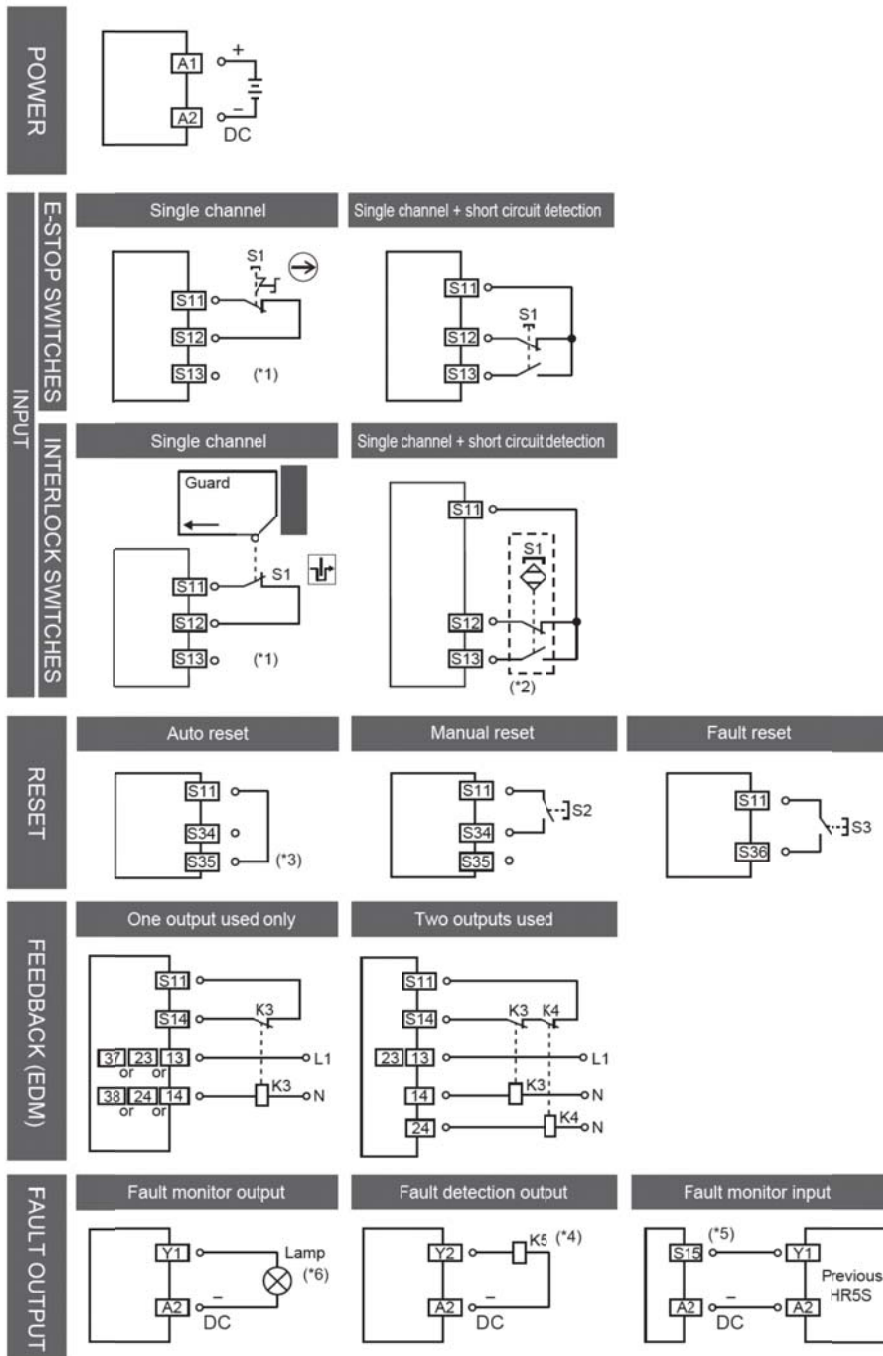
• Parts Description and Definition of Terminals



Parts No.	Parts Name and Functions
1	PWR LED: Power supply indicator
2	K1 LED: Indicator of Safety output(s) (or Auxiliary output) without OFF-delay
3	K2 LED: Indicator of Safety output with OFF-delay
4	Push-in terminal
5	DIN Rail mounting hook

Product Type letter	Number of Terminal			Name of Terminal	Function		
	S	B	D				
✓	✓	✓	✓	A1, A2	Power supply	24V DC for power supply (A1: 24V DC, A2: 0V)	
✓	✓	✓	✓	S11	Input driver	24V DC output for Safety input, Reset inputs, Switch monitor input, and EDM input	
✓	✓	✓	✓	S12	Safety input	Switches with a direct opening action mechanism shall be connected between S11 and S12.	
	✓	✓	✓	S13	Switch monitor input	NO contacts of interlock switches (such as non-contact safety switches) shall be connected between S11 and S13. In case of no use, S13 shall be opened.	
✓	✓	✓	✓	S14	EDM input	NC contacts of external contactors shall be connected between S11 and S14.	
	✓	✓	✓	S15	Fault monitor input	Fault monitor output (Y1) of a previous module shall be connected. In case of no use, S15 shall be opened.	
✓	✓	✓	✓	S34	Manual reset input	A switch shall be connected between S11 and S34. Only a rising edge followed by a falling edge triggers the reset event.	
✓	✓	✓	✓	S35	Auto reset input	A switch shall be connected between S11 and S35. A rising edge triggers the reset event.	
✓	✓	✓	✓	S36	Fault reset input	A switch shall be connected between S11 and S36. Only a rising edge followed by a falling edge triggers the fault reset event. When the fault reset event is triggered after a failure is cleared, the fault detection output (Y2) comes ON from OFF and the fault monitor output (Y1) comes OFF from ON.	
✓	✓	✓	✓	13 - 14	Safety output 1 Without OFF-delay	The contact configuration is NO. The contact is a part of the force guided relay (K1) contained in HR5S.	
		✓	✓		Auxiliary output 1 Without OFF-delay		
✓	✓	✓	✓	23 - 24	Safety output 2 Without OFF-delay	The contact configuration is NO. The contact is a part of the force guided relay (K1) contained in HR5S.	
		✓	✓	✓	37 - 38	Safety output 2 With OFF-delay	The contact configuration is NO. The contact is a part of the force guided relay (K2) contained in HR5S.
✓	✓	✓	✓	Y1	Fault monitor output	The output is kept on high level (Typ. 24VDC) when the module detects a fault. (Semiconductor output)	
	✓	✓	✓	Y2	Fault detection output	The output is kept on low level (Typ. 0V) when the module detects a fault. (Semiconductor output)	

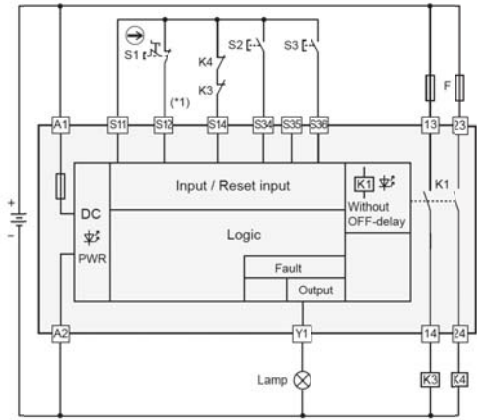
• Wiring Examples



- *1) When the switch monitor input (S13) is not used, it is necessary to exclude a short circuit between the cable of safety input (S12) and other cables (e.g. to protect the cables and/or to shield the cables).
- *2) Illustration of contacts with magnet present
- *3) When the auto reset input (S35) is used, it is necessary to do risk assessment to prevent an unexpected activation and the manual reset input (S34) must not be used.
- *4) The fault detection output (Y2) goes OFF when a fault is detected, i.e. it is possible for K5 (e.g. a contactor) to stop the hazard source (e.g. a motor).
- *5) The fault monitor input (S15) can be connected to the fault monitor output (Y1) of previous module (HR5S), i.e. it is possible to combine their fault outputs.
- *6) Leakage currents of the fault output may cause the LED lamp to illuminate dimly even when the output is off. In this case, insert a shunt resistor with the LED lamp.

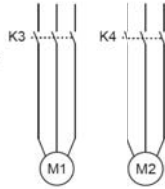
• Wiring Diagram(Typical application)

• HR55-C2S : The maximum achievable PL is "c".
(In the figure below, the manual reset input (S34) is used.)

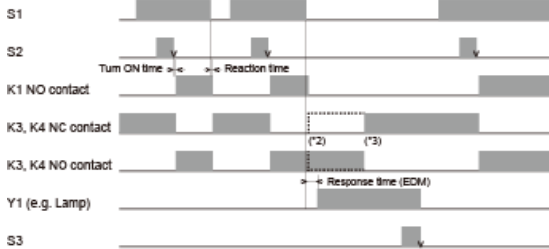


- S1 : Emergency stop switch
- S2 : Reset switch for start
- S3 : Reset switch for a fault
- K1 : Force guided relay contained in the module
- K3, K4 : Contactor
- M1, M2 : Motor
- F : External fuse

*1) It is necessary to exclude a short circuit between the cable of safety input (S12) and other cables (e.g. to protect the cables and/or to shield the cables).

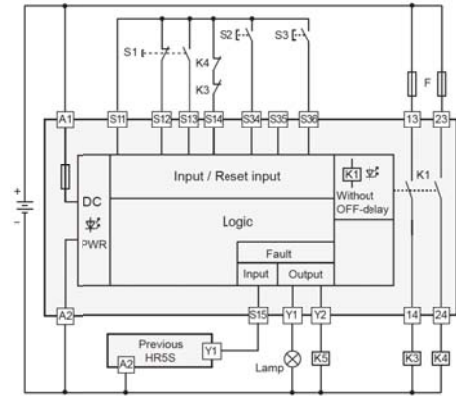


Timing Chart

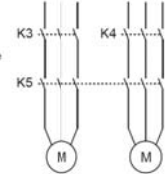


*2) Failure occurred.
*3) Failure removed.

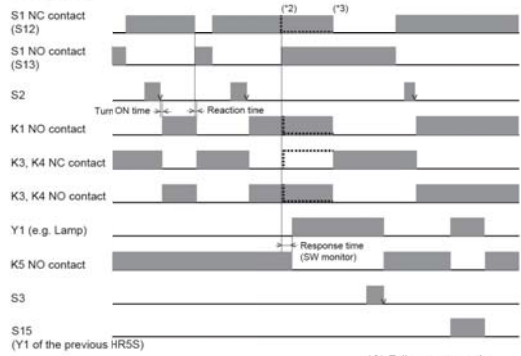
• HR55-C2B : The maximum achievable PL is "d".
(In the figure below, the manual reset input (S34) is used.)



- S1 : Emergency stop switch
- S2 : Reset switch for start
- S3 : Reset switch for a fault
- K1 : Force guided relay contained in the module
- K3, K4, K5 : Contactor
- M : Motor
- F : External fuse

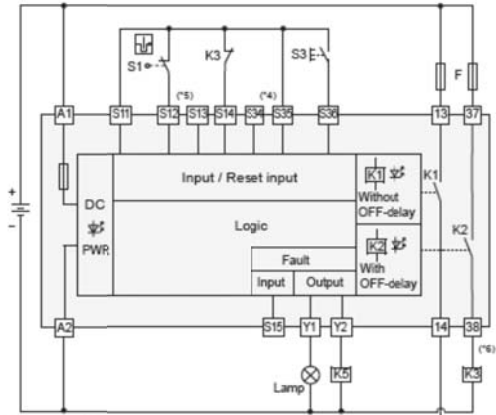


Timing Chart



*2) Failure occurred.
*3) Failure removed.

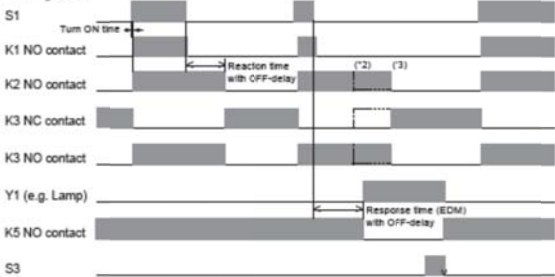
• HR5S-C2D-T*** : The maximum achievable PL is "d".
 (In the figure below, the auto reset input (S35) is used.)



- S1 : Interlock switch
- S3 : Reset switch for a fault
- K1, K2 : Force guided relay contained in the module
- K3, K5 : Contactor
- M : Motor
- F : External fuse

- *4) When the auto reset input (S35) is used, it is necessary to do risk assessment to prevent an unexpected activation.
- *5) When the switch monitor input (S13) is not used, it is necessary to exclude a short circuit between the cable of safety input (S12) and other cables (e.g. to protect the cables and/or to shield the cables).
- *6) "Stop category 1" of IEC 60204-1 is corresponding to "SS14" of IEC 61800-5-2.

Timing Chart



- *2) Failure occurred.
- *3) Failure removed.