

Safety Relay HR2S-301

HR2S-301P/HR2S-301N Safety Relay Modules

Key features:

- Simple wiring procedure
- Removable terminal block enables easy replacement
- Terminal cover detects improper connection
- Operation modes can be changes with a single action
- Compact design enables installation in a narrow space
- Safety Category 4, Performance Level e according to EN ISO 13849-1: 2008
- TÜV SÜD European and North American (NRTL)



Part Numbers

Contact Configuration		Input	Supply Voltage	Part No.
Safety Output	Auxiliary Contact			
3NO	1NC	Positive	24V DC –15% to +10%	HR2S-301P
		Negative	24V DC –15% to +10%	HR2S-301N

Specifications

Applicable Standards	EN ISO 13849-1: 2008 EN 954-1: 1996 EN 50178: 1997 EN 55011/A2: 2007 EN 61000-6-2: 2005 IEC/EN 61496-1: 2006 UL508/R2005-07 CAN/CSA C22.2 No.14: 2005
Applicable Standards for Use	EN 60204-1: 2006
Performance level (PL)	e (EN ISO 13849-1)
Safety Category ¹	3 or 4 (EN ISO 13849-1)
Stop Category	0 (IEC/EN 60204-1)
Operating Temperature	–10 to +55°C (no freezing)
Relative Humidity	30 to 85% (no condensation)
Altitude	0 to 2000m (operating)
Insulation Resistance	100Ω minimum (500V DC megger, same measurement positions as dielectric strength)
Dielectric Strength	Between outside housing and internal circuit: 3,750V AC, 1 minute
	Between outputs of different poles: 2,500V AC, 1 minute
	Between input and output terminals: 2,500V AC, 1 minute
	Between power supply and output terminals: 2,500V AC, 1 minute
Shock Resistance	300 m/s ² , pulse width 11m sec, 3 shocks in each of 3 axes
Bump	100 m/s ² , pulse width 16m sec, 1000 times in each of 3 axes
Vibration Resistance	10 to 55 Hz, 1 octave/minute, 0.7 mmp-p in each of 3 axes, 20 sweeps, 5 to 55 Hz, 30 m/s ² , for 2 hours in each of 3 axes
Degree of Protection	Terminals: IP20 Housing: IP40
Rated Voltage	24V DC –15% +10%
Power Consumption	2.2W (26.4V DC)
Overcurrent Protection	Built-in, electronic (approx. 0.9A)
Contact Resistance	200 mΩ maximum ²
Turn-On Time	50 ms maximum ³

Minimum Applicable Load			24V DC / 5 mA (Reference value)	
Response Time			20 ms maximum ^{3 4}	
Overvoltage Category			III (IEC60664-1)	
Pollution Degree			2 (IEC60664-1)	
Rated Insulation Voltage (output contact)			250V (IEC60664-1)	
Output Contact Ratings	Terminals 13-14 23-24 33-34	Rated Load ^{5 6}	250V AC / 30V DC (resistive load) ⁷ Category 3 or lower: 5.0A maximum Category 4 or lower: 3.6A maximum	
		Safety	AC15	240V AC / 2A cosø=0.3
		Circuit	DC13	24V DC / 1A L/R=48 ms
	No. of Outputs		3 (NO contact output)	
	Terminals 41-42	Rated Load ⁶	250V AC / 30V DC (resistive load) Category 3 or lower: 5.0A maximum Category 4 or lower: 3.6A maximum	
		Safety	AC15	240V AC / 2A cosø=0.3
Circuit		DC13	24V DC / 1A L/R=48 ms	
No. of Outputs		1 (NC contact output)		
Mechanical Durability			5,000,000 operations minimum	
Electrical Durability			100,000 operations minimum	
Wire Size			0.2 mm ² to 1.5 mm ² ^(24 to 16 AWG)	
Weight (approx.)			200g	

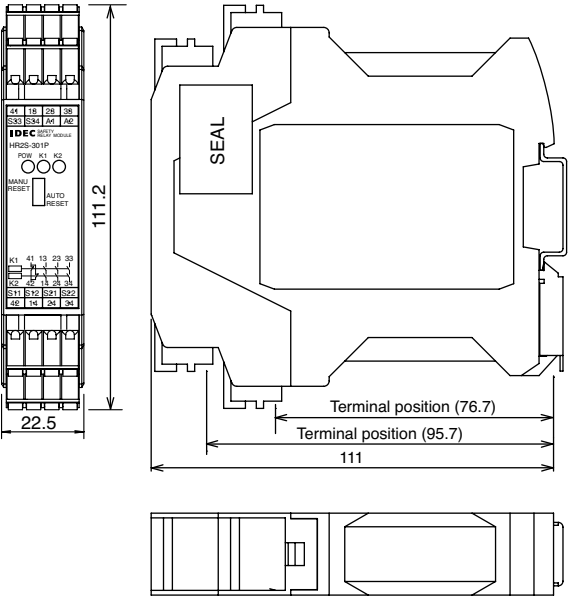


- HR2S-301N is recommended for use in category 4 safety applications. The requirements of the safety category must be determined according to the safety equipment. We recommend that you consult a third party organization. Categories may change depending on the combination of the safety equipment. Categories may also change depending on the output contact ratings.
- Measured using 5 or 6V DC, 1A voltage drop method.
- When measured at the rated voltage (at 20°C), excluding contact bounce time.
- The time from when the safety input turns OFF to when the safety output turns OFF.
- Leave 5 mm of space between the sides of the module when more than 3A is continuously applied to the relay contact.
- The module is not suitable for use with a load less than the minimum applicable load. Once a large load is applied, contacts may not operate with a small load.
- The maximum current of the safety output contact is specified by the approved standard.

Category 4	HR2S-301N, HR2S-301P + Type 4 OSSD's	3.6A
Category 3	HR2S-301P	5.0A

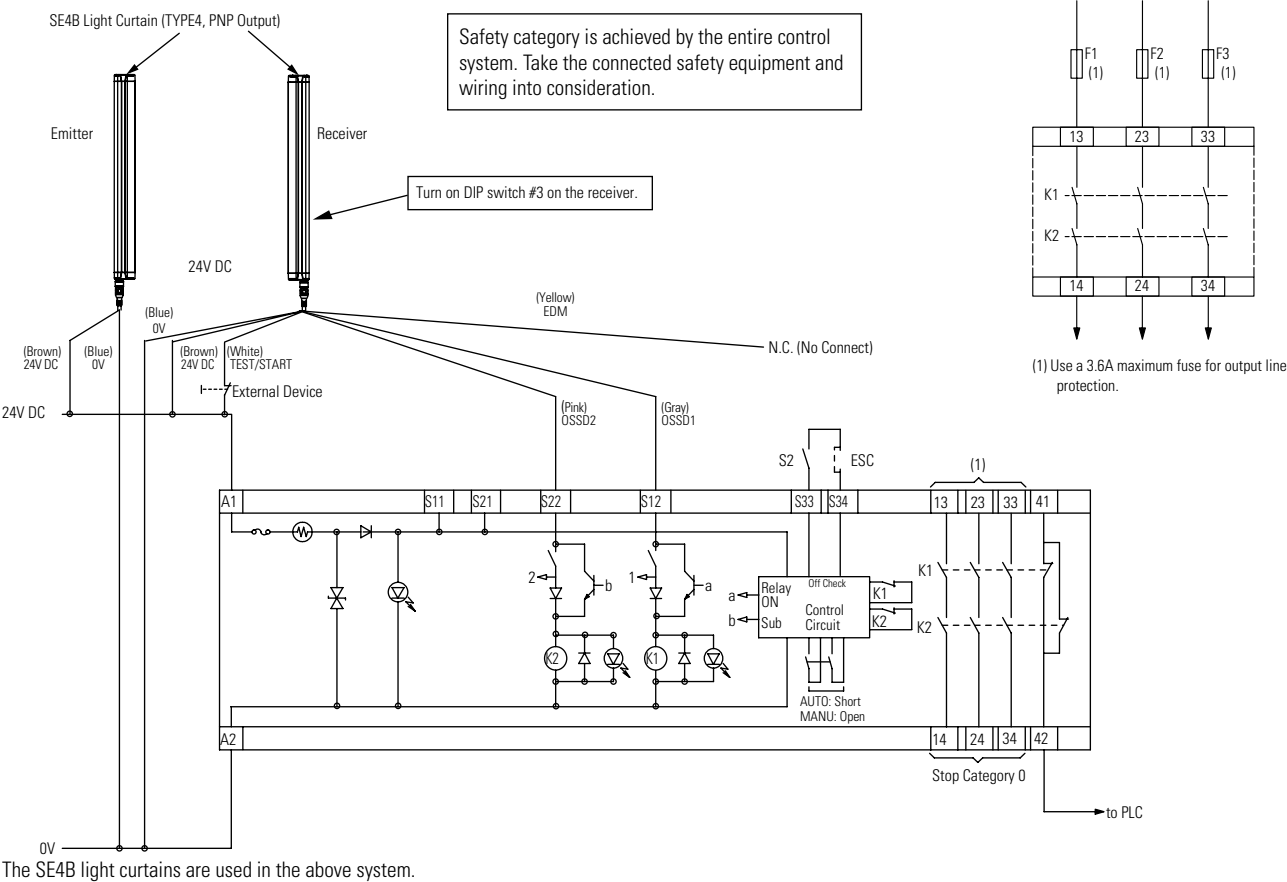
 To prevent the safety output contact from overcurrent, use a fuse. To satisfy Category 4, use a fuse with a maximum current of 3.6A. This fuse is not required if the short circuit current is less than 5A.

Dimensions (mm)



HR2S-301P Wiring Diagram
Safety Category 4 Circuit Example (using a safety light curtain)

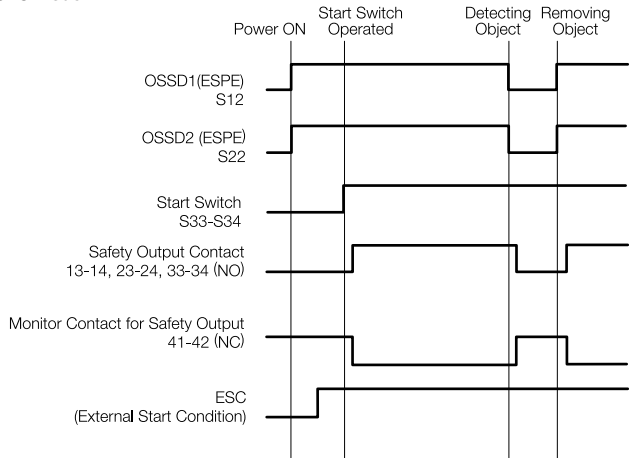
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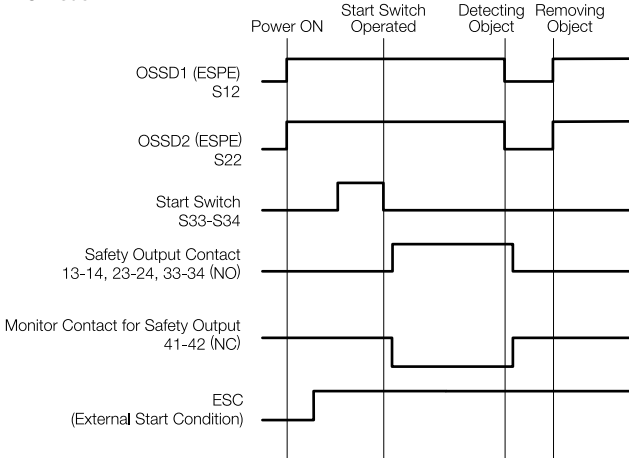
- ESC: External Start Condition
F1 to 3: Protective fuse for the output of safety relay module
K1 to 2: Safety Contactor
S2: Start Switch
S33-S34: Feedback loop

HR2S-301P Operation Chart
Using OSSD outputs of a light curtain (EPSE)

AUTO mode

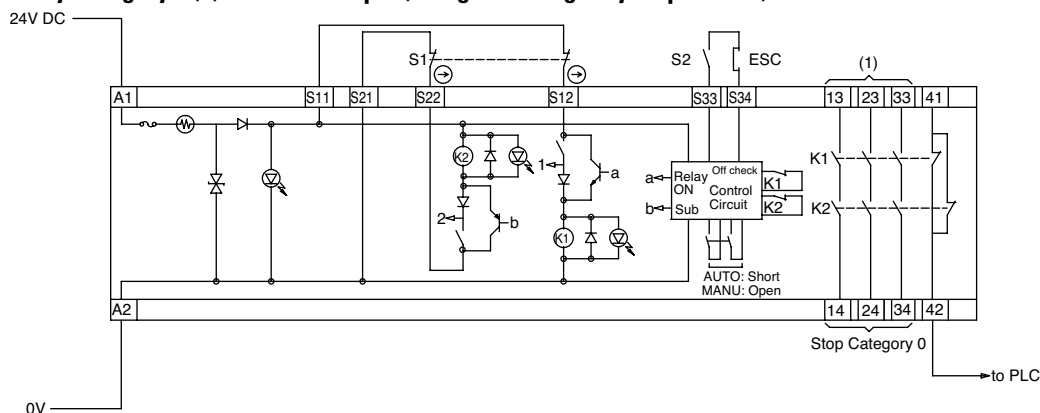


MANU mode



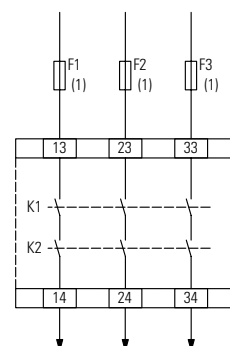
HR2S-301N Wiring Diagram

Safety Category 4 (3) Circuit Example (using an emergency stop switch)



- ESC: External start condition
 F1 to 3: Protective fuse for the output of safety relay module
 S1: Emergency stop switch with 2NC contacts, safety switch (recommended)
 S2: Start Switch
 S33-S34: Feedback loop

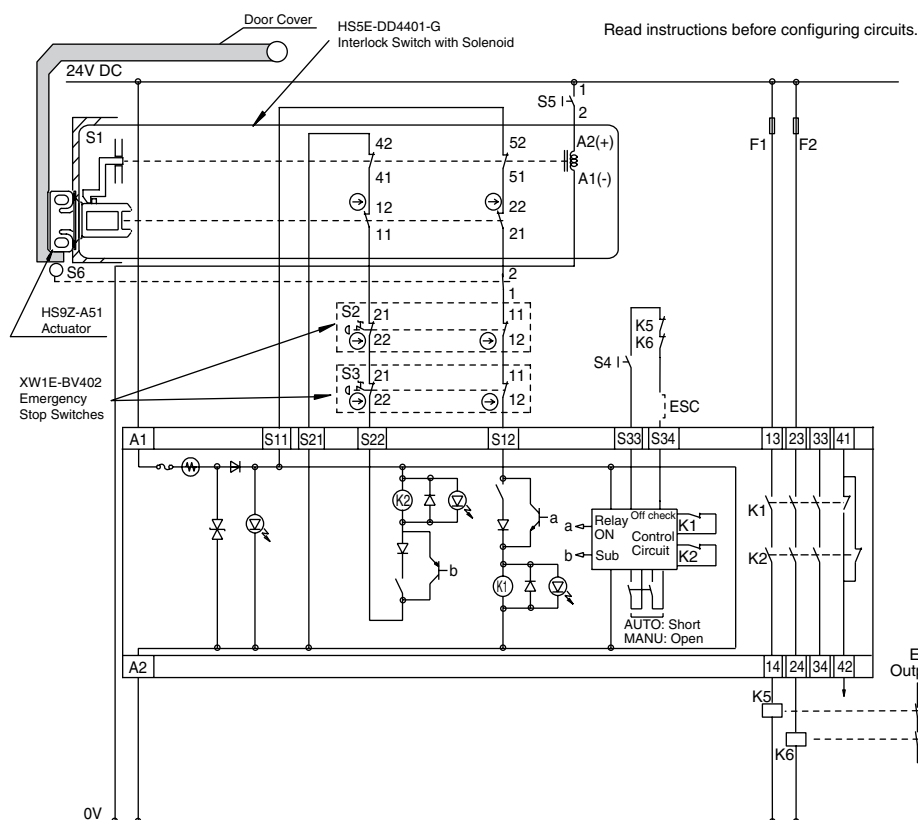
Safety category is achieved by the entire control system. Take the connected safety equipment and wiring into consideration.



(1) Use a 3.6A maximum fuse for output line protection.

HR2S-301N Wiring Diagram

Safety Category 4 (3) Circuit Example (using an emergency stop switch)



- ESC: External Start Condition
 F1, F2: Fuse 3.6A
 K5, 6: Safety Contactor (force guided)
 S1: HS5E-DD4401-G Interlock Switch with Solenoid
 S2, 3: XW1E-BV402 Emergency Stop Switches
 S4: Start Switch (HW series momentary)
 S5: Unlocking Enabling Switch
 S6: Limit Switch, etc.

Safety category is achieved by the entire control system. Take the connected safety equipment and wiring into consideration.

Operations of Interlock Switch with Solenoid (Stop)

Machine stops → Unlocking enabling switch ON → Safety output OFF → Door cover released

(Start)

Door cover closed → Safety relay module start switch ON → Safety output ON → Machine starts

Operations of Emergency Stop Switch (Stop)

Press emergency stop switch → Safety output OFF → Machine stops

(Start)

Emergency stop switch reset → Safety relay module start switch ON → Safety output ON → Machine starts

External Output Circuit

Overview

XW Series E-Stops

Interlock Switches

Enabling Switches

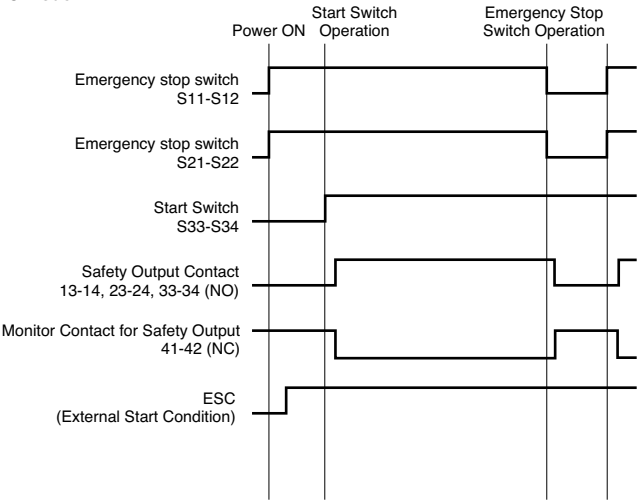
Safety Control

Light Curtains

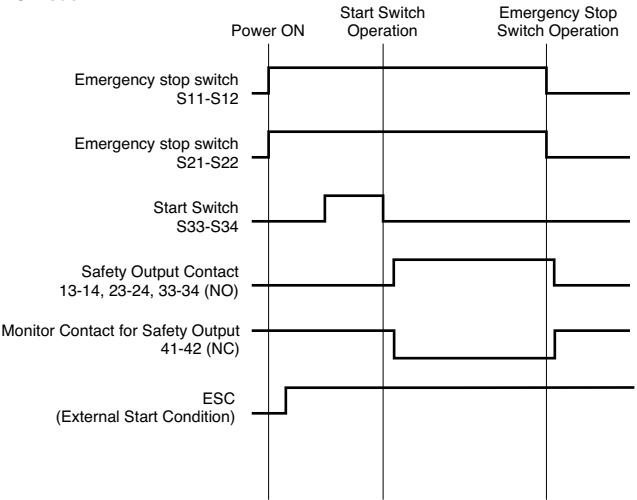
AS-Interface Safety at Work

HR2S-301N Operation Chart
Using an emergency stop switch

AUTO mode



MANU mode



HR2S-332N-T075/T15/T30 Safety Relay Modules

Key features:

- Simple wiring procedure
- Removable terminal block enables easy replacement
- Terminal cover detects improper connection
- Operation modes can be changes with a single action
- Compact design enables installation in a narrow space
- Safety Category 4, Performance Level e according to EN ISO 13849-1: 2008
- TÜV SÜD European and North American (NRTL)



Part Numbers

Contact Configuration			Input	Supply Voltage	Part No.
Safety Output	Time-delay Safety Output	Auxiliary Contact			
3NO	3NO	2NC	Negative	24V DC –15% to +10%	HR2S-332N-T075 HR2S-332N-T15 HR2S-332N-T30



Note: Time-delay duration can be set in 15 steps. 7.5 sec. (0.5, 1.0 ... 7.0, 7.5); 15 sec. (1, 2 ... 14, 15); 30 sec. (2, 4 ... 28, 30)

Specifications

Applicable Standards	EN ISO 13849-1: 2008 EN 954-1: 1996 EN 50178: 1997 EN 55011/A2: 2007 EN 61000-6-2: 2005 EN 61496-1: 2004 UL508/R2005-07 CAN/CSA C22.2 No.14: 2005	Shock Resistance	300 m/s ² , pulse width 11m sec, 3 times in each of 3 axes
Applicable Standards for Use	EN 60204-1: 2006	Bump	100 m/s ² , pulse width 16m sec, 1000 times in each of 3 axes
Performance level (PL)	e (EN ISO13849-1)	Vibration Resistance	10 to 55 Hz, 1 octave/minute, 0.7 mm-p in each of 3 axes, 20 sweeps, 5 to 55 Hz, 30 m/s ² , for 2 hours in each of 3 axes
Safety Category	4 (EN ISO13849-1)	Degree of Protection	Terminals: IP20 Housing: IP40
Stop Category	0, 1 (IEC/EN 60204-1) ¹	Rated Voltage	24V DC –15% to +10%
Operating Temperature	–10 to +55°C (no freezing)	Power Consumption	4.6W (26.4V DC)
Relative Humidity	30 to 85% (no condensation)	Overcurrent Protection	Built-in, electronic (approx. 0.9A)
Altitude	0 to 2000m (operating)	Contact Resistance	200 mW maximum (measured using 5 or 6V DC, 1A voltage drop method)
Insulation Resistance	100 MΩ minimum (500V DC megger, same measurement positions as dielectric strength)	Turn-On Time	50 ms maximum
Dielectric Strength	Between outside housing and internal circuit: 3,750V AC, 1 minute	Minimum Applicable Load	24V DC / 5 mA (reference value)
	Between outputs of different poles: 2,500V AC, 1 minute	Response Time	20 ms maximum ^{2,3}
	Between input and output terminals: 2,500V AC, 1 minute	Overvoltage Category	III (IEC60664-1)
	Between power supply and output terminals: 2,500V AC, 1 minute	Pollution Degree	2 (IEC60664-1)
		Rated Insulation Voltage (output contact)	250V (IEC60664-1)



1. Safety output contact: Stop Category 0
Time-delay output contact: Stop Category 1
2. When measured at the rated voltage (at 20°C), excluding contact bounce time.
3. The time from when the safety input turns OFF to when the safety output turns OFF.

Specifications, con't

Output Contact Ratings	Terminals 13-14 23-24 33-34	Rated Load ^{5,6}		250V AC / 30V DC (resistive load) ⁷ Category 3 or lower: 5.0A maximum Category 4 or lower: 3.6A maximum
		Safety Circuit	AC15	240V AC / 2A cosφ=0.3
			DC13	24V DC / 1A L/R=48 ms
		No. of Outputs		3 (NO contact output)
Output Contact Ratings	Terminals 41-42	Rated Load ⁶		250V AC / 30V DC (resistive load) Category 3 or lower: 5.0A maximum Category 4 or lower: 3.6A maximum
		Safety Circuit	AC15	240V AC / 2A cosφ=0.3
			DC13	24V DC / 1A L/R=48 ms
		No. of Outputs		1 (NC contact output)

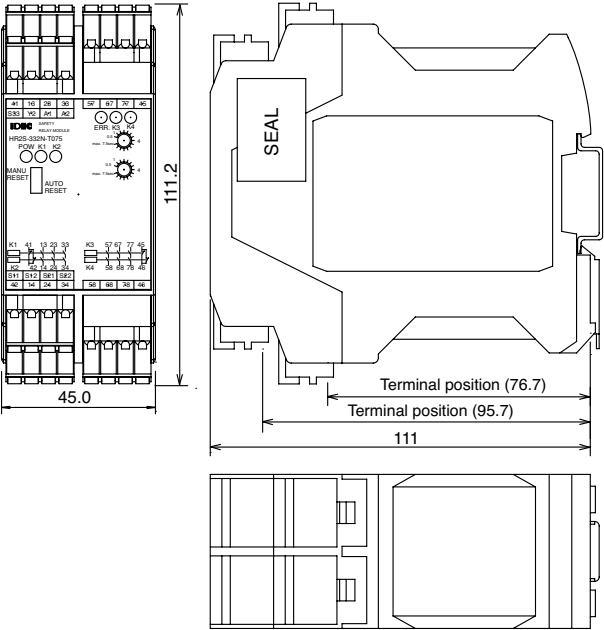
Time-delay Output Contact	Terminals 57-58 67-68 77-78	Rated Load ^{5,6}		250V AC / 30V DC (resistive load) ⁷ Category 3 or lower: 5.0A maximum Category 4 or lower: 3.6A maximum	
		Safety Circuit	AC15	240V AC / 2A cosø=0.3	
			DC13	24V DC / 1A L/R=48 ms	
		No. of Outputs		3 (NO contact output)	
	Terminals 45-46	Rated Load ⁶		250V AC / 30V DC (resistive load) Category 3 or lower: 5.0A maximum Category 4 or lower: 3.6A maximum	
		Safety Circuit	AC15	240V AC / 2A cosø=0.3	
			DC13	24V DC / 1A L/R=48 ms	
		No. of Outputs		1 (NC contact output)	
	Mechanical Durability				5,000,000 operations minimum
	Electrical Durability				100,000 operations minimum
Wire Size				0.2 mm ² to 1.5 mm ² (24 to 16 AWG)	
Weight (approx.)				320g	

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5. Leave 5 mm of space between the sides of the module when more than 3A is continuously applied to the relay contact.

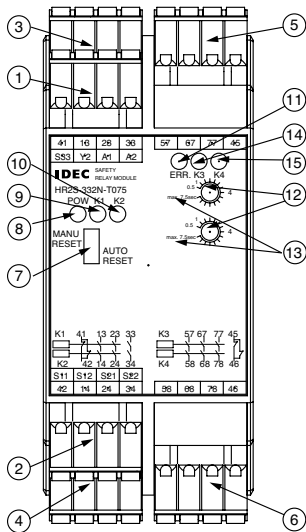
6. The module is not suitable for use with a load less than the minimum applicable load. Once a large load is applied, contacts may not operate with a small load.

7. The maximum current of the safety output contact is specified by the approved standard.
Category 4: 3.6A Category 3: 5.0A
To prevent the safety output contact from overcurrent, use a fuse. To satisfy Category 4, use a fuse with a maximum current of 3.6A. This fuse is not required if the short circuit current is less than 5A.

Dimensions (mm)



Terminal Arrangement



Part Description

Part No.	Part Names and Functions
1	CN1: Power supply input, start/off-check input
2	CN2: Safety input (dual channel)
3	CN3: Safety output contact
4	CN4: Safety output contact
5	CN5: Time-delay safety output contact
6	CN6: Time-delay safety output contact
7	Switch: Select AUTO or MANU mode
8	POW: Power LED
9	K1: ON-LED for safety output
10	K2: ON-LED for safety output
11	ERR: Error (timer) LED
12	Switches: Time-delay. The same value should be set for both switches. Otherwise, an error occurs.
13	Characters: Maximum time-delay duration is displayed. 0.75: 7.5 sec., 15: 15 sec., 30: 30 sec.
14	K3: ON-LED for safety output
15	K4: ON-LED for safety output

Terminal Arrangement

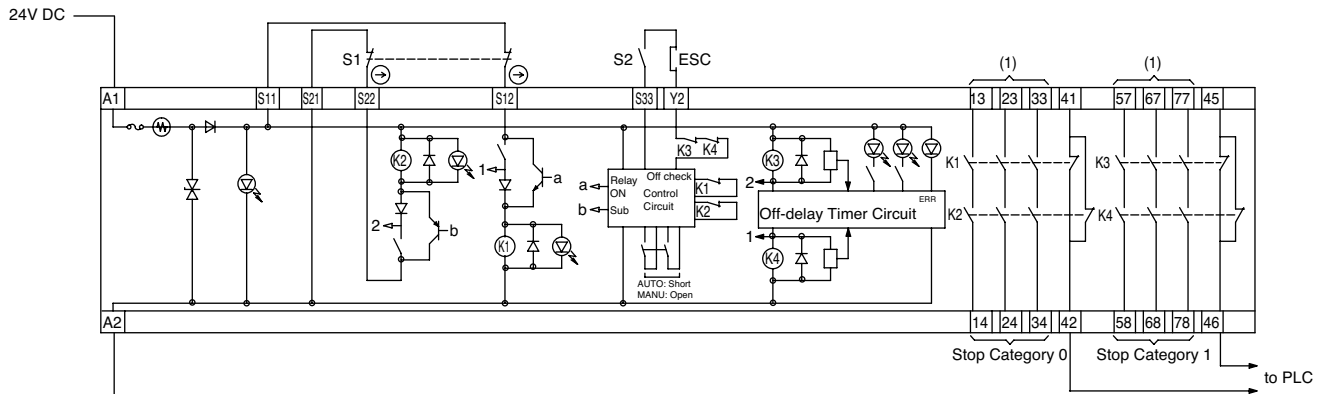
Terminals	Markings	I/O Signals	Remarks
CN1	A1	Power supply +24V DC input	Use a dry contact.
	A2	Power supply 0V input	
	S33	Start/off-check input	
	Y2		
CN2	S11	Safety input 1	Common
	S12		Function
	S21	Safety input 2	Common
	S22		Function
CN3 CN4	41–42	Monitor contact for safety output (NC)	Rated load 250V AC / 30V DC 1A (Resistive load)
	13–14	Safety output contact (NO)	Rated load 250V AC / 30V DC (Note) (Resistive load)
	23–24		
	33–34		
CN5 CN6	45–46	Time-delay safety output contact (NC)	Rated load 250V AC / 30V DC 1A (Resistive load)
	57–58	Time-delay safety output contact (NO)	Rated load 250V AC / 30V DC (Note) (Resistive load)
	67–68		
	77–78		



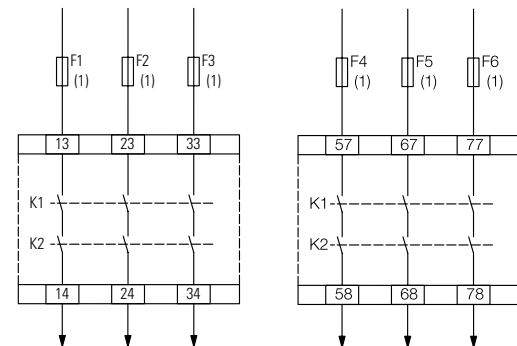
Note: 5.0A maximum Category 3 or lower
3.6A maximum Category 4

HR2S-332N-T075/T15/T30 Wiring Diagram

Safety Category 4 Circuit Example (using an emergency stop switch)



ESC: External Start Condition
F1 to 6: Protective fuse for the output of safety relay module
S1: Emergency stop switch with 2NC contacts, safety switch (recommended)
S2: Start Switch
S33-Y2: Feedback loop



(1) Use a 3.6A maximum fuse for output line protection.

Safety Category 3 Circuit (using multiple emergency stop switches)

Safety category is achieved by the entire control system. Take the connected safety equipment and wiring into consideration.

Overview

XW Series E-Stops

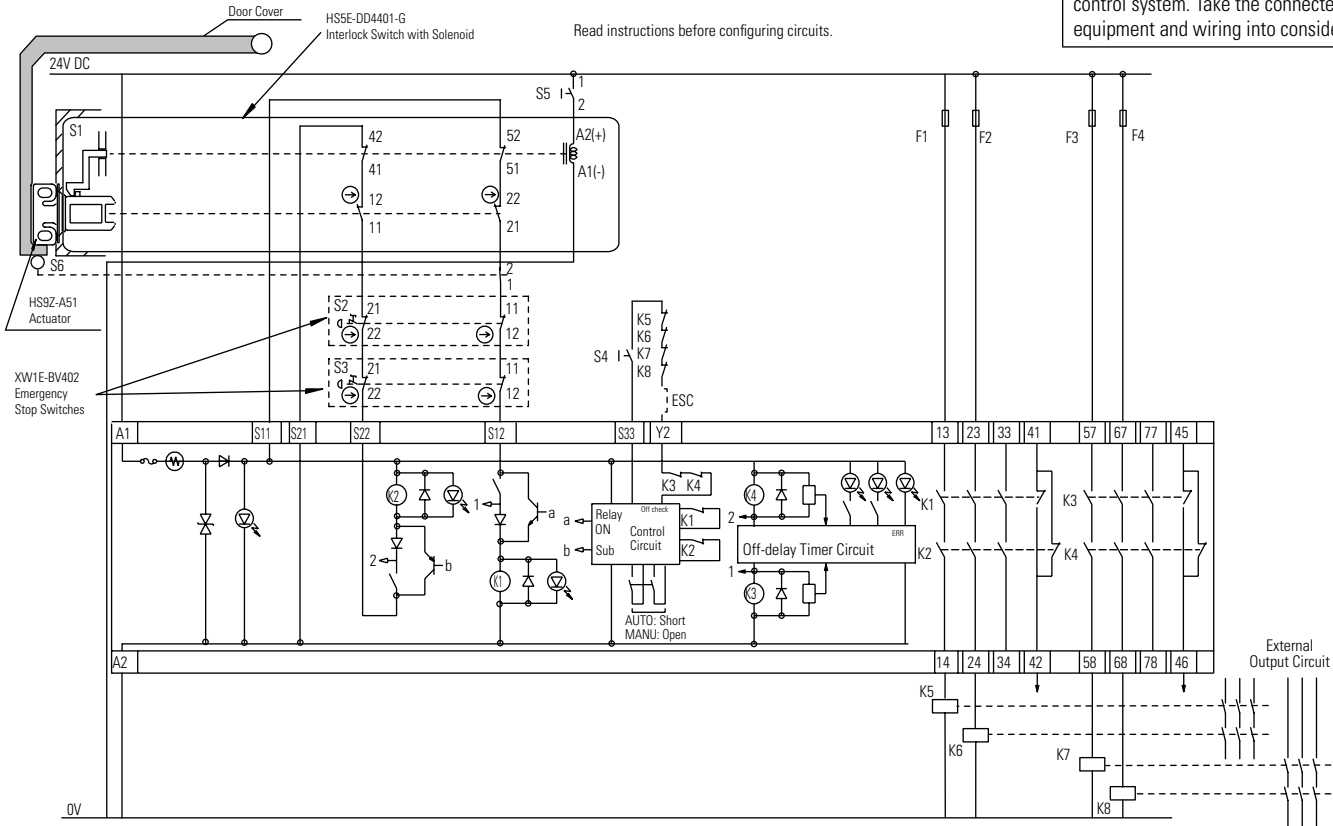
Interlock Switches

Enabling Switches

Safety Control

Light Curtains

AS-Interface Safety at Work



- ESC: External Start Condition

F1 to F4: Fuse 3.6A

K5 to 8: Safety Contactor

S1: HS5E-DD4401-G Interlock Switch with Solenoid

S2,3: XW1E-BV402 Emergency Stop Switches

S4: Start Switch (HW series momentary)

S5: Unlocking Enabling Switch

S6: Limit Switch, etc.
- Operations of Interlock Switch with Solenoid**

(Stop)

Machine stops Unlocking enabling switch ON Safety output OFF Door cover released

(Start)

Door cover closed Safety relay module start switch ON Safety output ON Machine starts
- Operations of Emergency Stop Switch**

(Stop)

Press emergency stop switch Safety output OFF Machine stops

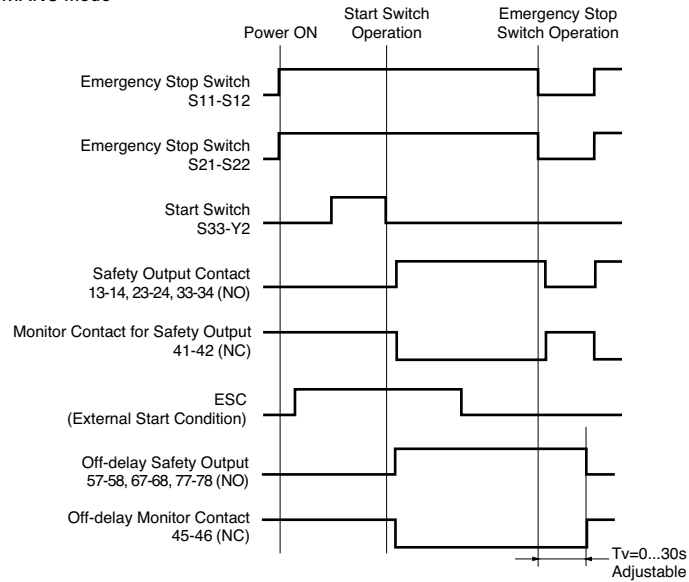
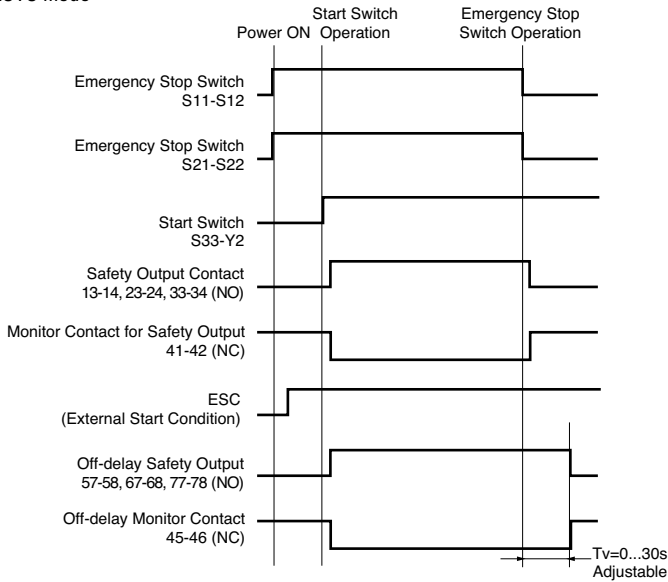
(Start)

Emergency stop switch reset Safety relay module start switch ON Safety output ON Machine starts

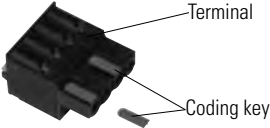
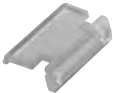
HR2S-332N-T075/T15/T30 Operation Chart
Using emergency stop switches

AUTO mode

MANU mode



Maintenance Parts

Item	Part Number	Remarks
Terminal / Coding Key Terminal Coding key	HR9Z-PMT1	Coding keys are used to prevent incorrect insertion of terminals.
Terminal Cover 	HR9Z-PMC1	Used to make sure that the terminals are fully inserted.
Protective Tape 	HR9Z-PE1	Used to protect the AUTO/MANU switch on the front of the module.