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/s², pulse width 11m sec, 3 shocks in each of 3 axes
Bump	100 m/s², 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/s², 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]

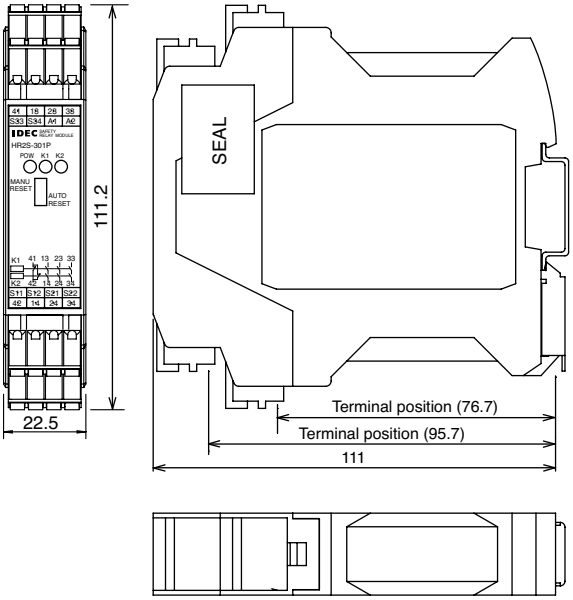
Minimum Applicable Load				24V DC / 5 mA (Reference value)
Response Time				20 ms maximum [3 4]
Overvoltage Category				III (IEC60664-1)
Pollution Degree				2 (IEC60664-1)
Rated Insulation Voltage (output contact)				250V (IEC60664-1)
Output Contact Ratings	Terminals 13-14 23-24 33-34	Rated Load [5 6]		250V AC / 30V DC (resistive load) [7] Category 3 or lower: 5.0A maximum Category 4 or lower: 3.6A maximum
		Safety Circuit	AC15	240V AC / 2A cosø=0.3
			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 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 mm² to 1.5 mm² (24 to 16 AWG)
Weight (approx.)				200g

1. 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.
2. Measured using 5 or 6V DC, 1A voltage drop method.
3. When measured at the rated voltage (at 20°C), excluding contact bounce time.
4. The time from when the safety input turns OFF to when the safety output turns OFF.
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.

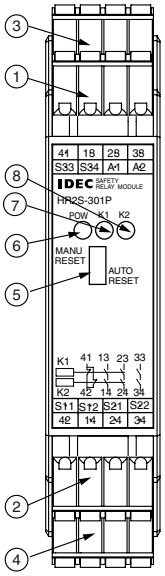
Category 4	HR2S-301N, HR2S-301P + Type 4 OSSD's	3.6A
Category 3	HR2S-301P	5.0A

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)



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	Switch: Select AUTO or MANU mode
6	POW: Power LED
7	K1: ON-LED for safety output
8	K2: ON-LED for safety output

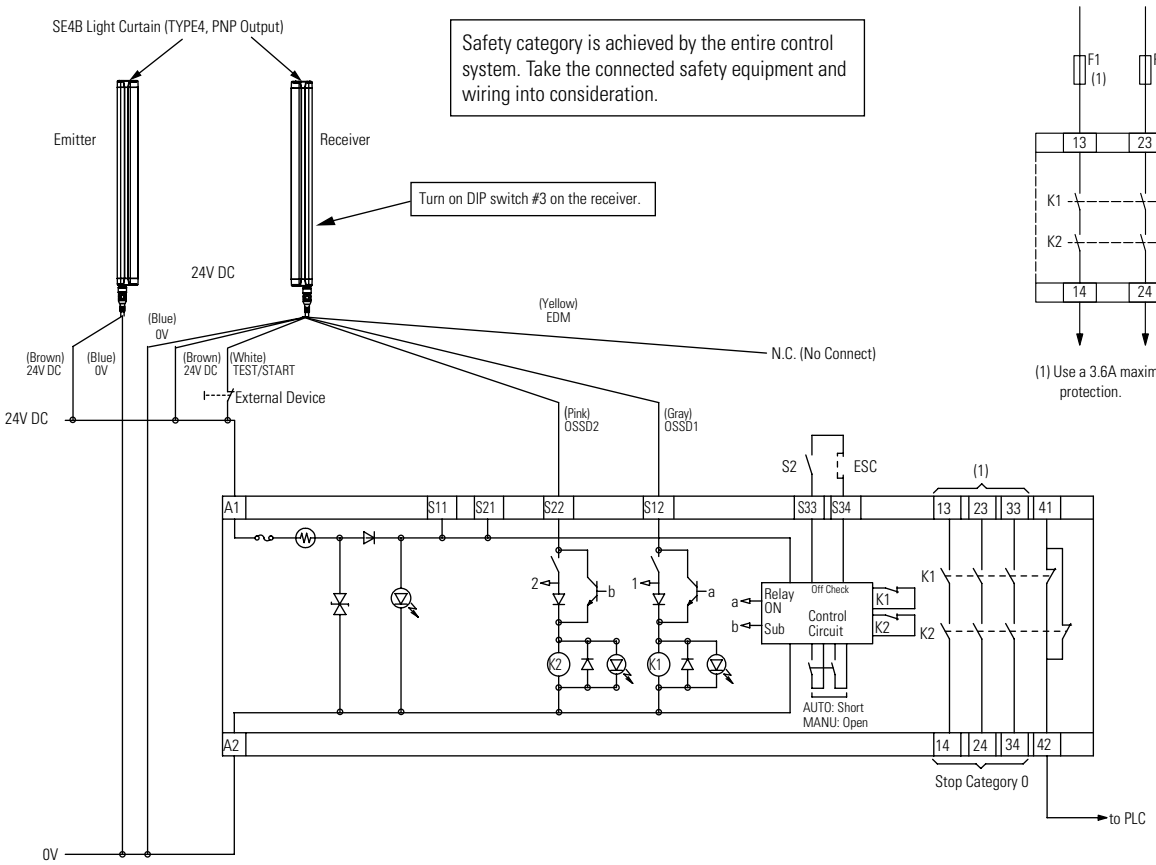
Terminal Arrangement

Terminal	Markings	I/O Signals		Notes
CN1	A1	Power supply +24V DC input		
	A2	Power supply 0V input		
	S33	Start/off-check input		Use a dry contact.
	S34			
CN2	S11	Safety input 1	Common	For HR2S-301N, use a dry contact. When connecting TYPE 4 safety light curtain to HR2S-301P, use only S12 (S22).
	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			

Note: 5.0A max. Category 3 or lower HR2S-301P
3.6A max. Category 4 HR2S-301N, HR2S-301P + Type 4 OSSD's

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

*EDM function disabled

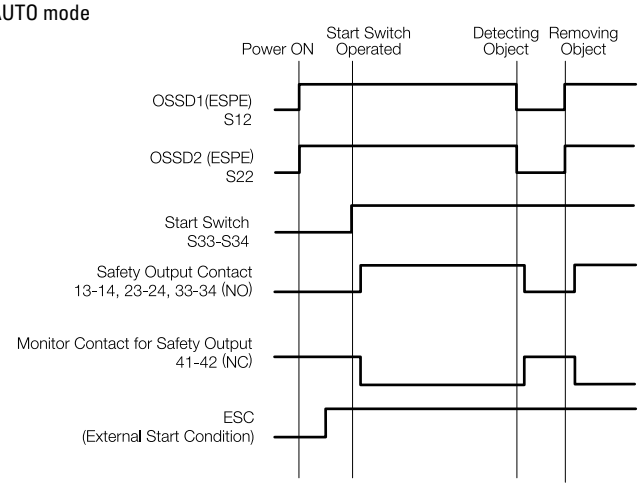


The SE4B light curtains are used in the above system.

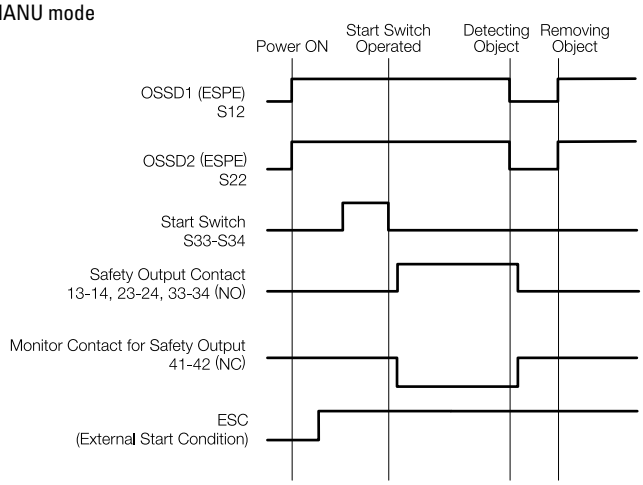
ESC: External Start Condition
F1 to 3: Protective fuse for the output of safety relay module
K1 to 2: Safety Contactor
S2: Start Switch
S33-S34: Feedback loop

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

AUTO mode

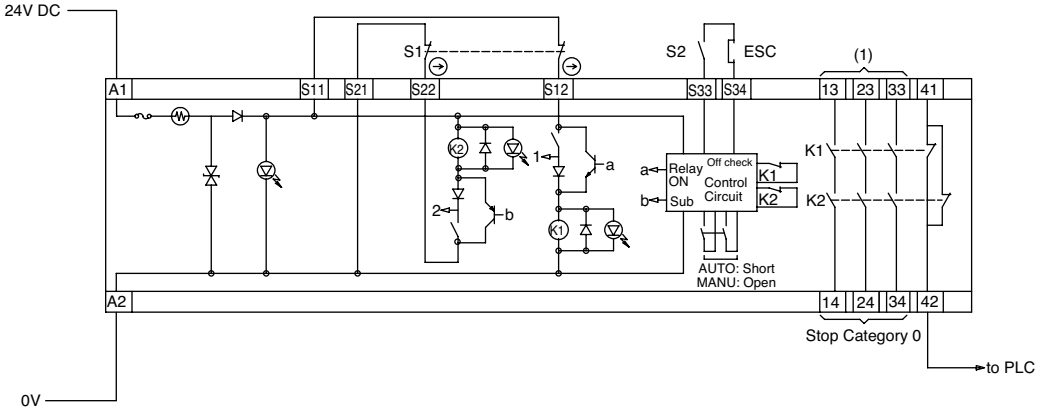


MANU mode

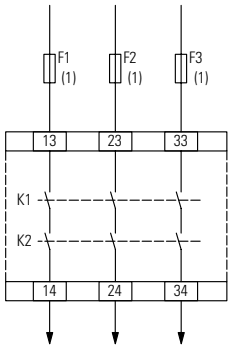


HR2S-301N Wiring Diagram
Safety Category 4 (3) Circuit Example (using an emergency stop switch)

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



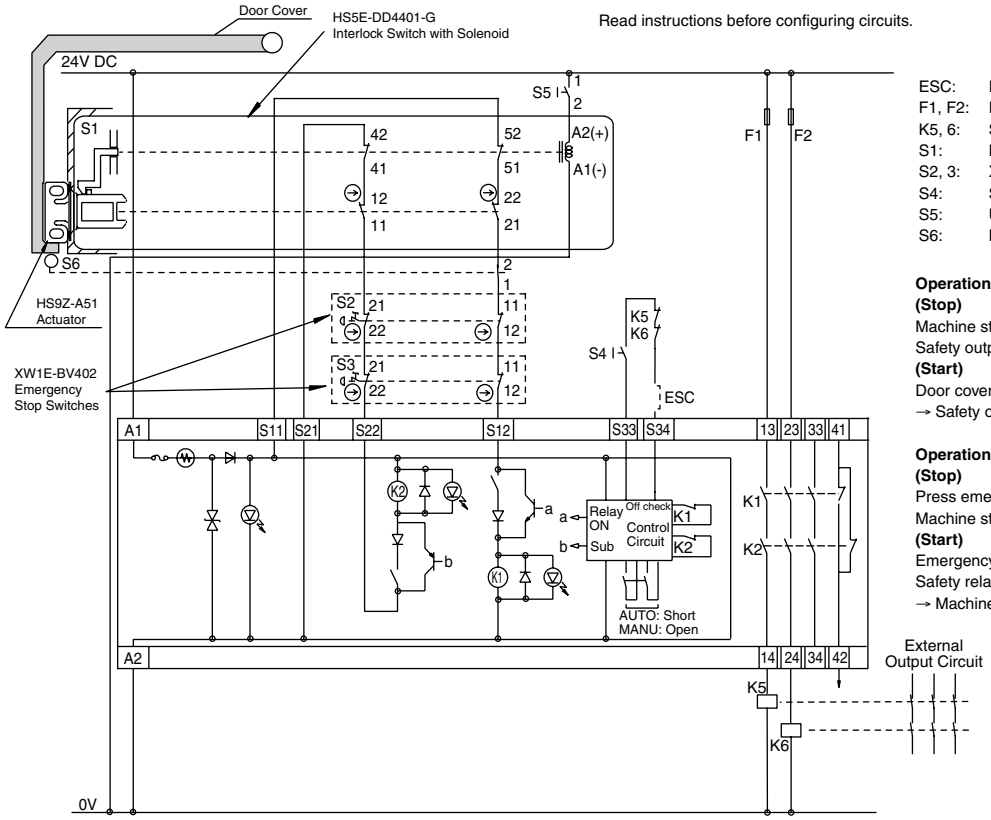
ESC: External start condition
F1 to 3: Protective fuse for the output of safety relay module
S1: Emergency stop switch with 2NC contacts, safety switch (recommended)
S2: Start Switch
S33-S34: Feedback loop



(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)

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



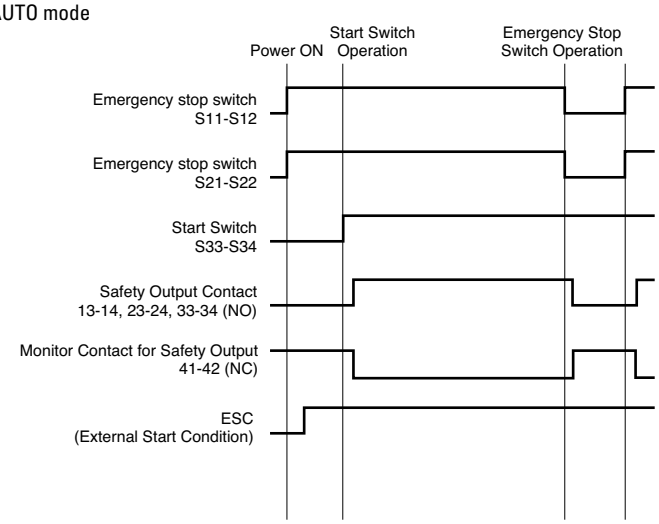
ESC: External Start Condition
F1, F2: Fuse 3.6A
K5, 6: Safety Contactor (force guided)
S1: HS5E-DD4401-G Interlock Switch with Solenoid
S2, 3: XW1E-BV402 Emergency Stop Switches
S4: Start Switch (HW series momentary)
S5: Unlocking Enabling Switch
S6: Limit Switch, etc.

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

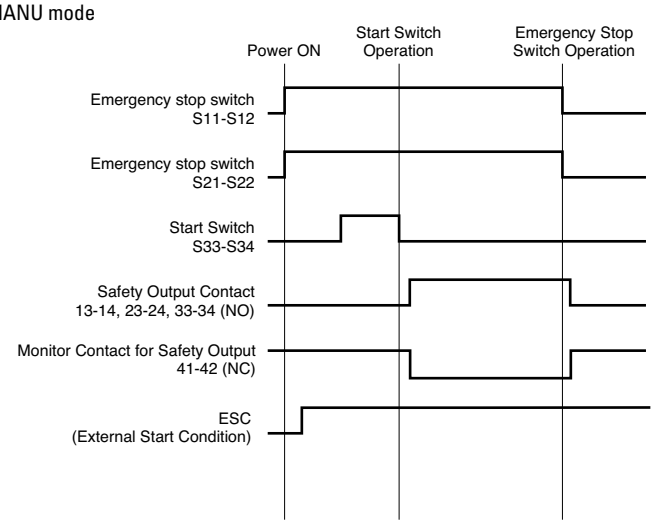
Operations of Emergency Stop Switch
(Stop)
Press emergency stop switch → Safety output OFF → Machine stops
(Start)
Emergency stop switch reset → Safety relay module start switch ON → Safety output ON → Machine starts

HR2S-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)

Specifcations

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
Applicable Standards for Use	EN 60204-1: 2006
Performance level (PL)	e (EN ISO13849-1)
Safety Category	4 (EN ISO13849-1)
Stop Category	0, 1 (IEC/EN 60204-1) [1]
Operating Temperature	–10 to +55°C (no freezing)
Relative Humidity	30 to 85% (no condensation)
Altitude	0 to 2000m (operating)
Insulation Resistance	100 MΩ 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 times 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% to +10%
Power Consumption	4.6W (26.4V DC)
Overcurrent Protection	Built-in, electronic (approx. 0.9A)
Contact Resistance	200 mW maximum (measured using 5 or 6V DC, 1A voltage drop method)
Turn-On Time	50 ms maximum
Minimum Applicable Load	24V DC / 5 mA (reference value)
Response Time	20 ms maximum [2 3]
Overvoltage Category	III (IEC60664-1)
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.

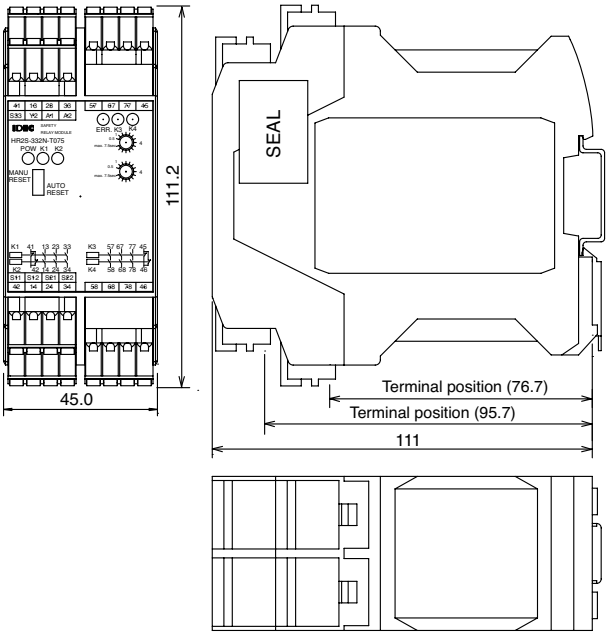
Specifications, con't

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 cosø=0.3
			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 Circuit	AC15	240V AC / 2A cosø=0.3
			DC13	24V DC / 1A L/R=48 ms
		No. of Outputs		1 (NC contact output)

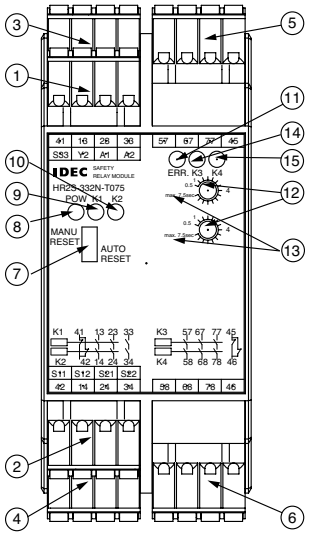
Time-delay Output Contact	Terminals 57-58 67-68 77-78	Rated Load [5][6]		250V AC / 30V DC (resistive load) [7] Category 3 or lower: 5.0A maximum Category 4 or lower: 3.6A maximum
		Safety Circuit	AC15	240V AC / 2A cosø=0.3
			DC13	24V DC / 1A L/R=48 ms
		No. of Outputs		3 (NO contact output)
	Terminals 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 mm² to 1.5 mm² (24 to 16 AWG)
Weight (approx.)				320g

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

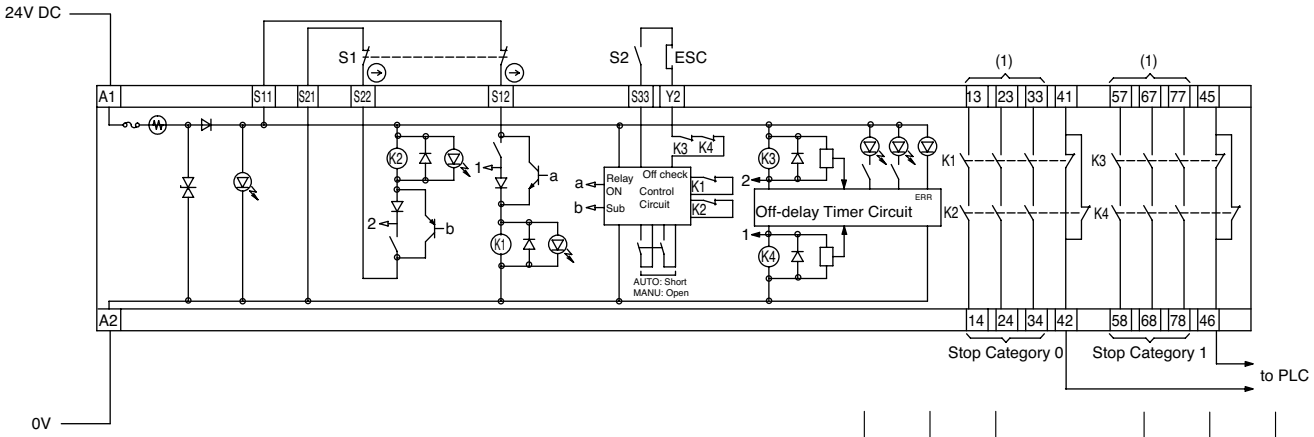
Part No.	Part Names and Functions
1	CN1: Power supply input, start/off-check input
2	CN2: Safety input (dual channel)
3	CN3: Safety output contact
4	CN4: Safety output contact
5	CN5: Time-delay safety output contact
6	CN6: Time-delay safety output contact
7	Switch: Select AUTO or MANU mode
8	POW: Power 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

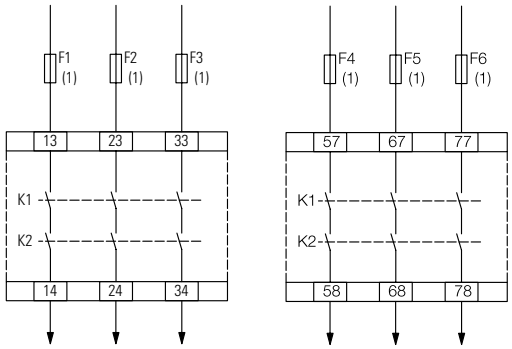
Terminals	Markings	I/O Signals		Remarks
CN1	A1	Power supply +24V DC input		
	A2	Power supply 0V input		
	S33	Start/off-check input		Use a dry contact.
	Y2			
CN2	S11	Safety input 1	Common	Use a dry contact.
	S12		Function	
	S21	Safety input 2	Common	
	S22		Function	
CN3 CN4	41–42	Monitor contact for 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)



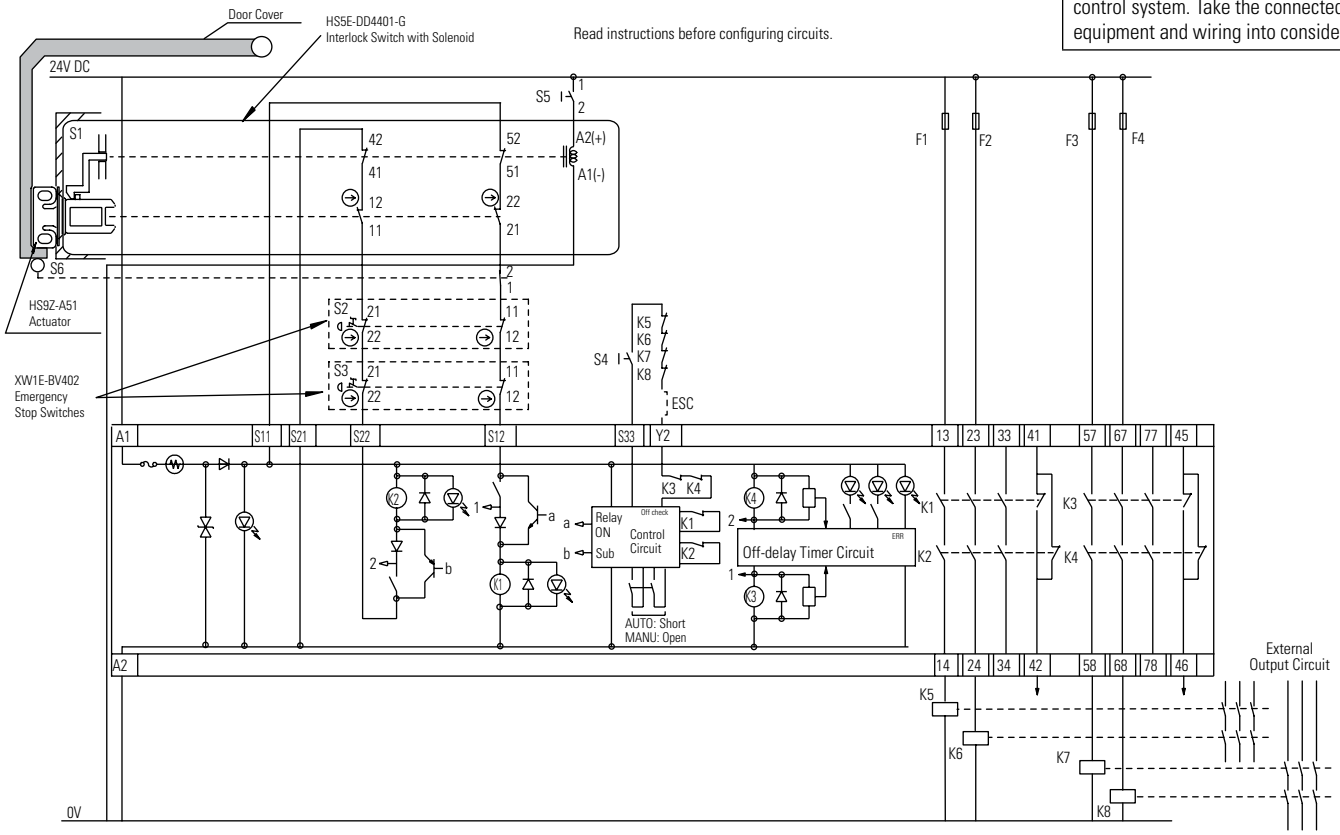
ESC: External Start Condition
F1 to 6: Protective fuse for the output of safety relay module
S1: Emergency stop switch with 2NC contacts, safety switch (recommended)
S2: Start Switch
S33-Y2: Feedback loop



(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.



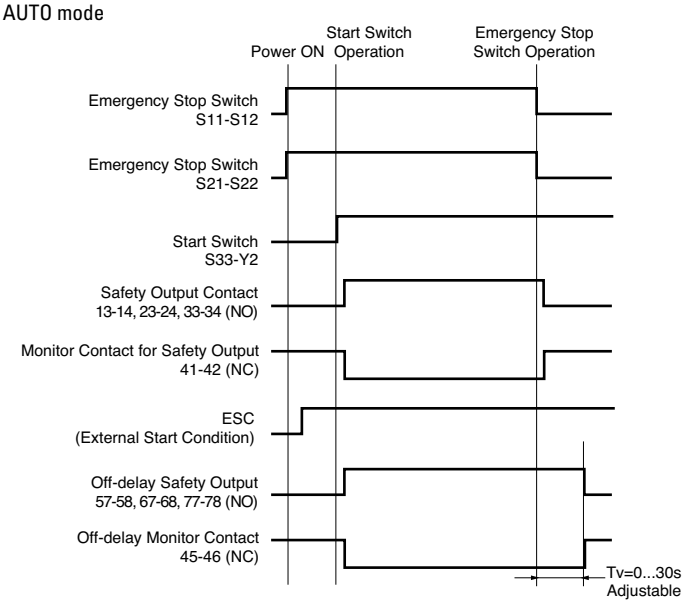
ESC: External Start Condition
F1 to F4: Fuse 3.6A
K5 to 8: Safety Contactor
S1: HS5E-DD4401-G Interlock Switch with Solenoid
S2,3: XW1E-BV402 Emergency Stop Switches
S4: Start Switch (HW series momentary)
S5: Unlocking Enabling Switch
S6: Limit Switch, etc.

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

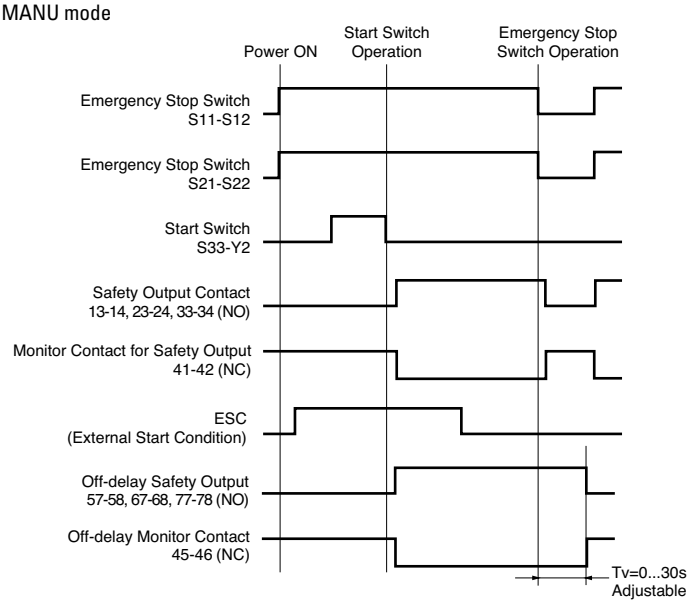
Operations of Emergency Stop Switch
(Stop)
Press emergency stop switch Safety output OFF Machine stops
(Start)
Emergency stop switch reset Safety relay module start switch ON Safety output ON Machine starts

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

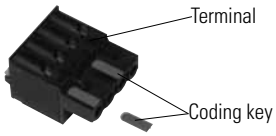
AUTO mode



MANU mode



Maintenance Parts

Item	Part Number	Remarks
Terminal / Coding Key 	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.