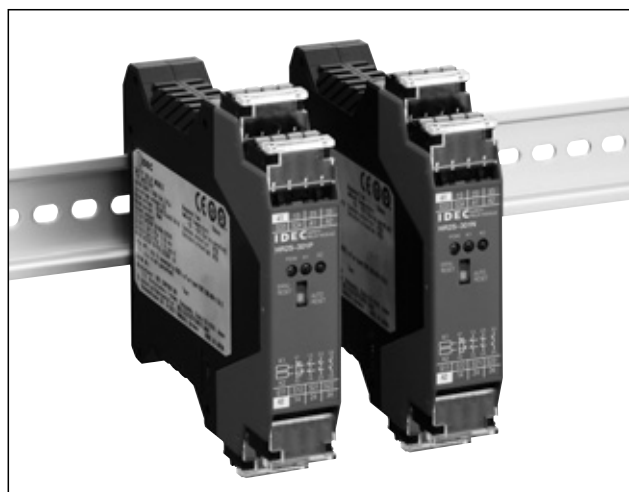


HR2S-301P/HR2S-301N Safety Relay Modules

Compact design and maintenance improvements for outstanding usability

- Compliant with EN ISO 13849-1 Performance level (PL) e, Category 4
- Compliant with categories 2 and 3 when used with a safety switch.
- Compliant with categories 2 (type 2) and 4 (type r) when used with a safety light curtain (HR2S-301P)
- Spring terminals enable easy wiring
- The terminal cover does not close if the terminal is not fully inserted into the module.
- Slim and compact 22.5mm-wide design
- Auxiliary output (NC) can be used for monitoring.
- TÜV SÜD compliant.



Package Quantity: 1

Contact Configuration		Input	Supply Voltage	Part No.
Safety Output	Auxiliary Contact			
3NO	1NC	+ common	24V DC -15% to +10%	HR2S-301P
		Inverse	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 (Note 1) CAN/CSA C22.2 No.14: 2005 (Note 1)
Applicable Standards for Use	EN 60204-1: 2006
Performance level (PL)	e (EN ISO 13849-1)
Safety Category (Note 2)	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 (Note 3)
Turn-On Time	50 ms maximum (Note 4)
Minimum Applicable Load	24V DC / 5 mA (Reference value)
Response Time	20 ms maximum (Note 4) (Note 5)
Overvoltage Category	III (IEC60664-1)
Pollution Degree	2 (IEC60664-1)

Rated Insulation Voltage (output contact)				250V AC (IEC60664-1)	
Output Contact Ratings	Terminals 13-14 23-24 33-34	Rated Load (Note 6) (Note 7)		250V AC / 30V DC (resistive load) (Note 8) 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)	
	Terminals 41-42	Rated Load (Note 7)		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)	
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	

Note 1: UL and CSA are approved by TÜV SÜD America Inc., an accredited NRTL.

Note 2: 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.

Note 3: Measured using 5 or 6V DC, 1A voltage drop method.

Note 4: When measured at the rated voltage (at 20°C), excluding contact bounce time.

Note 5: The time from when the safety input turns OFF to when the safety output turns OFF.

Note 6: Leave 5 mm of space between the sides of the module when more than 3A is continuously applied to the relay contact.

Note 7: 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.

Note 8: 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

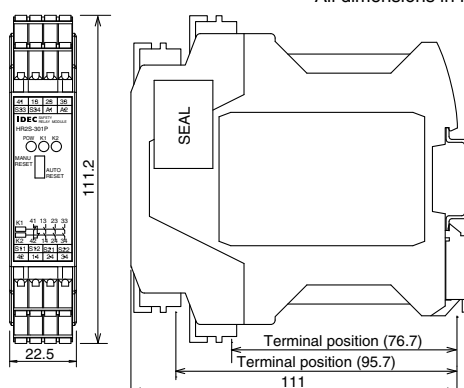
Category 3 HR2S-301P 5.0A

- 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.

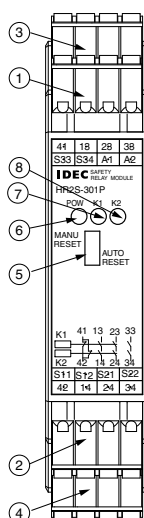
HR2S-301P/HR2S-301N Safety Relay Modules

Dimensions

All dimensions in 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

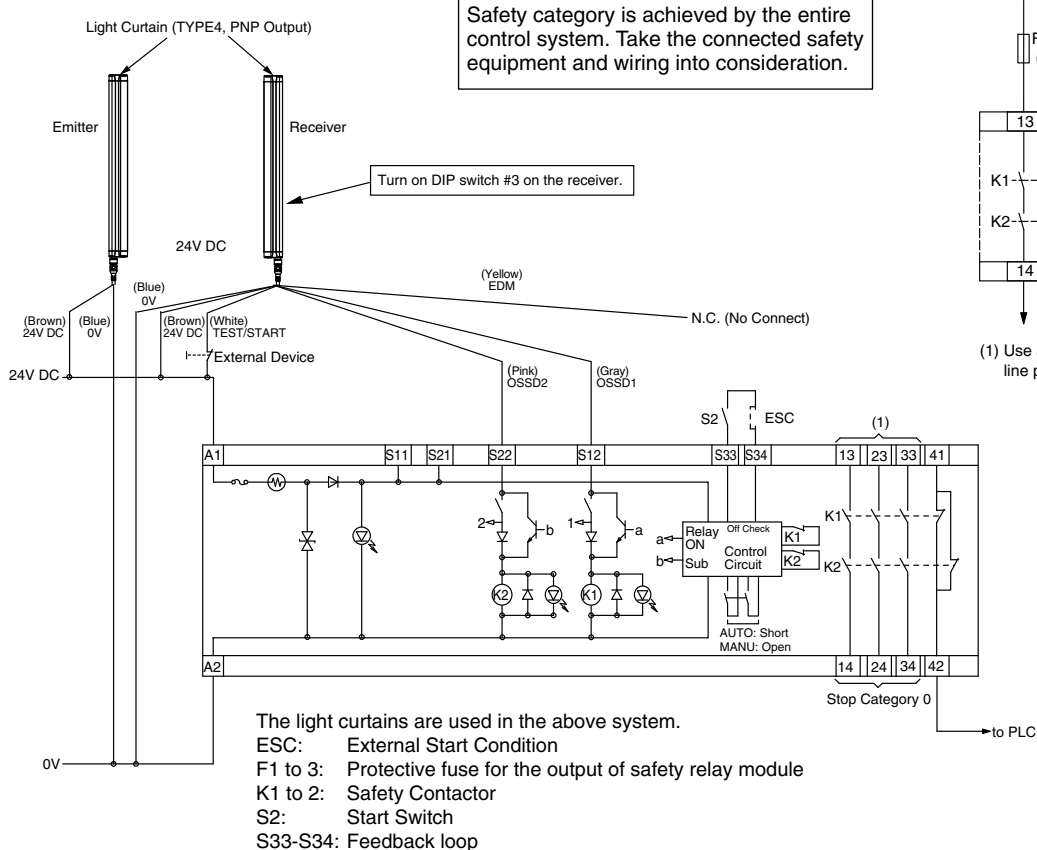
Terminal	Markings	I/O Signals		Notes
CN1	A1	Power supply +24V DC input		Use a dry contact.
	A2	Power supply 0V input		
	S33	Start/off-check input		
	S34			
CN2	S11	Safety input 1	Common	For HR2S-301N, use a dry contact. When connecting TYPE 4 safety light curtain to HR2S-301P, use only S12 (S22).
	S12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



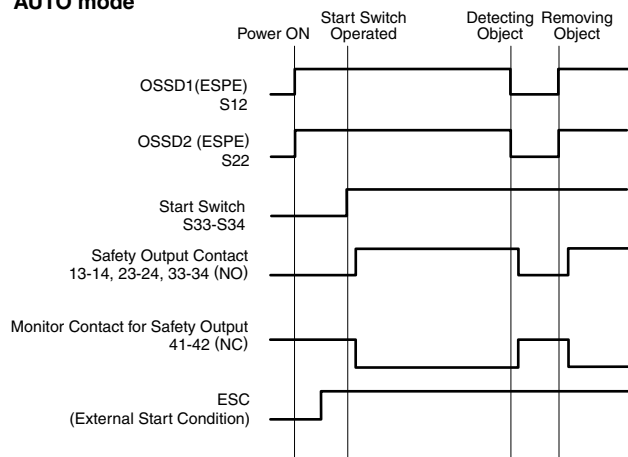
Flush Silhouette
Switches & Pilot Lights
Display Lights
LED Illumination Units
Display Units
Safety Products
Terminal Blocks
Comm. Terminals
AS-Interface
Relays & Timers
Sockets
Circuit Protectors
Power Supplies
PLCs & SmartRelay
Operator Interfaces
Sensors
Control Stations
Explosion Protection
References

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

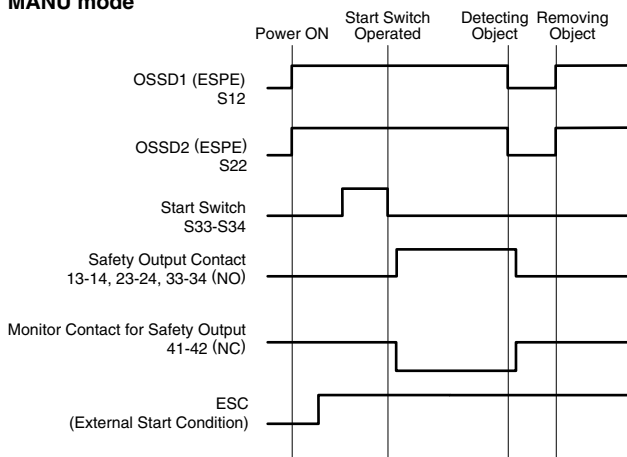
Operation Chart

Using OSSD outputs of a light curtain (EPSE)

AUTO mode

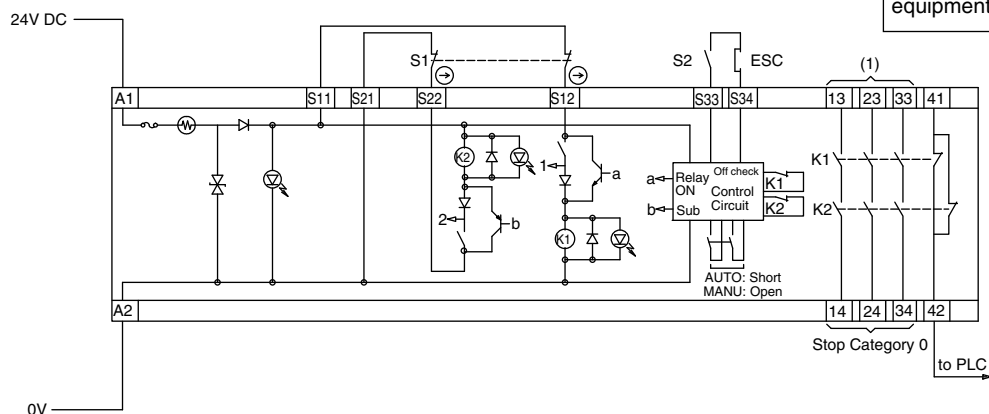


MANU mode

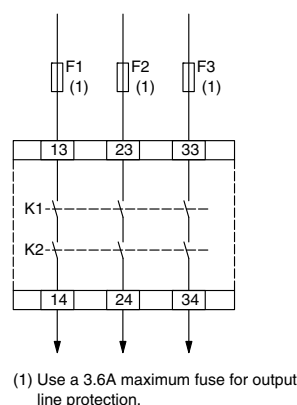


Wiring Diagram

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.

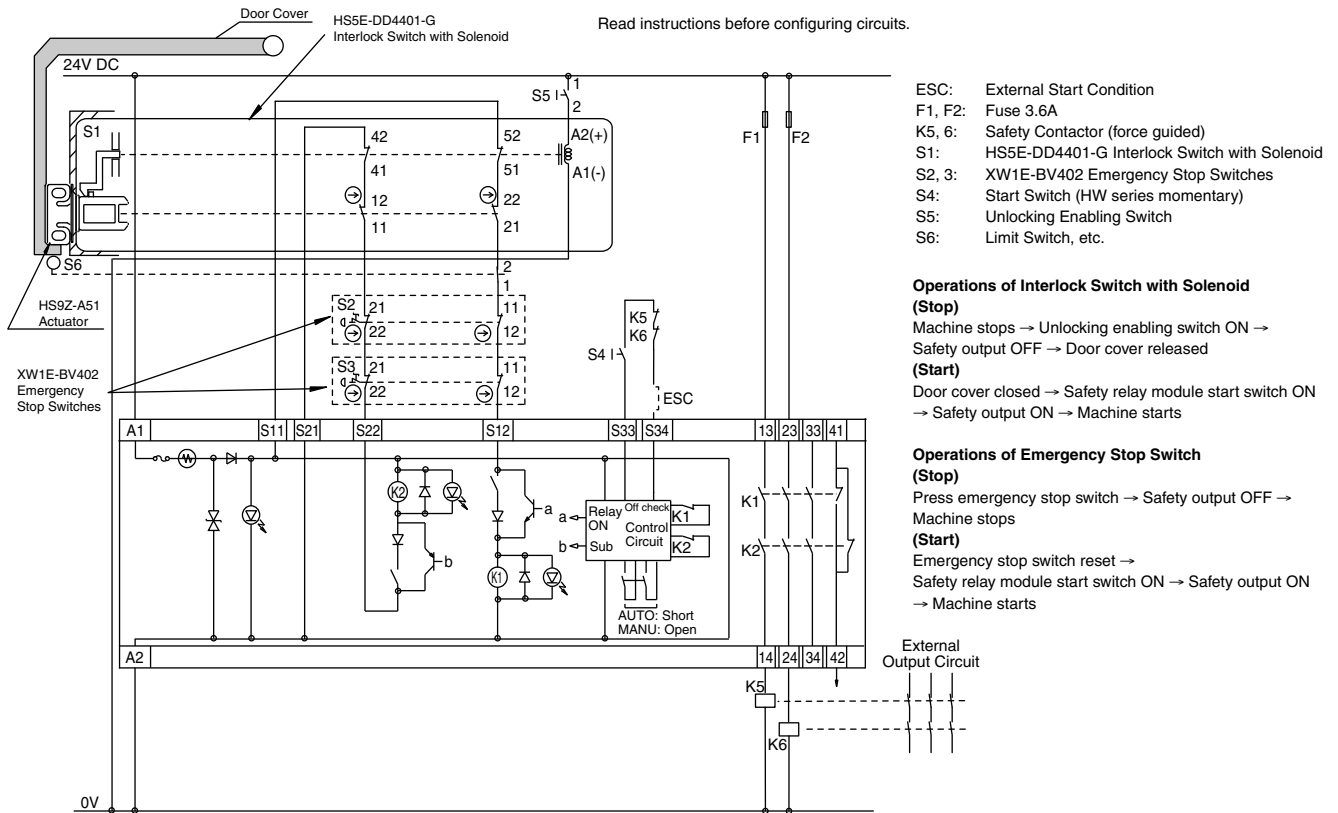


- ESC: External start condition
- F1 to 3: Protective fuse for the output of safety relay module
- S1: Emergency stop switch with 2NC contacts, safety switch (recommended)
- S2: Start Switch
- S33-S34: Feedback loop

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

Safety Category 3 Circuit Example (using multiple emergency stop switches and a safety switch)

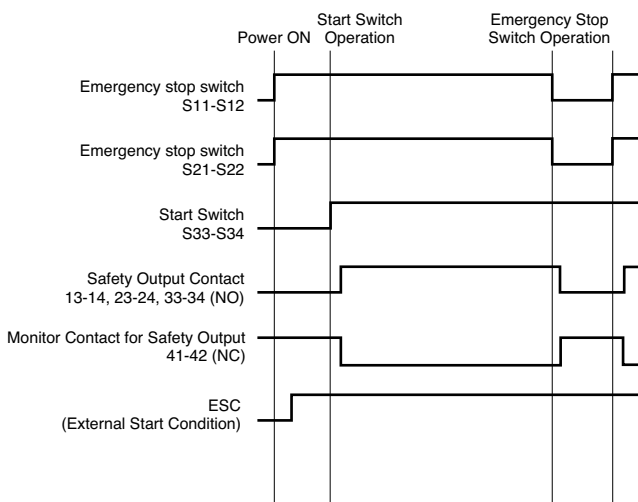
Safety category is achieved by the entire control system. Take the connected safety equipment and wiring into consideration.



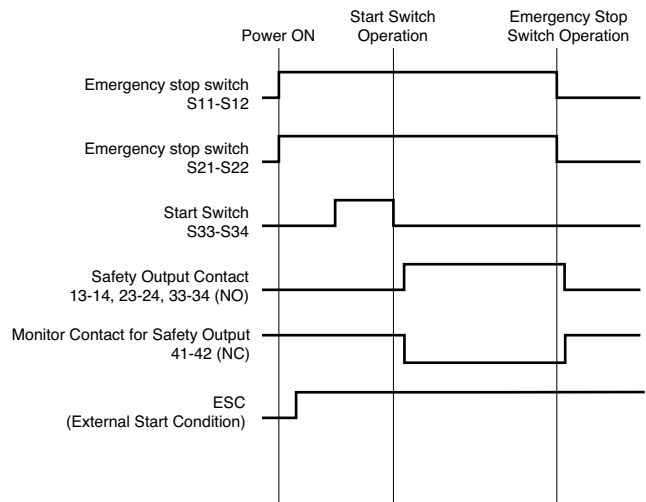
Operation Chart

Using an emergency stop switch

AUTO mode



MANU mode

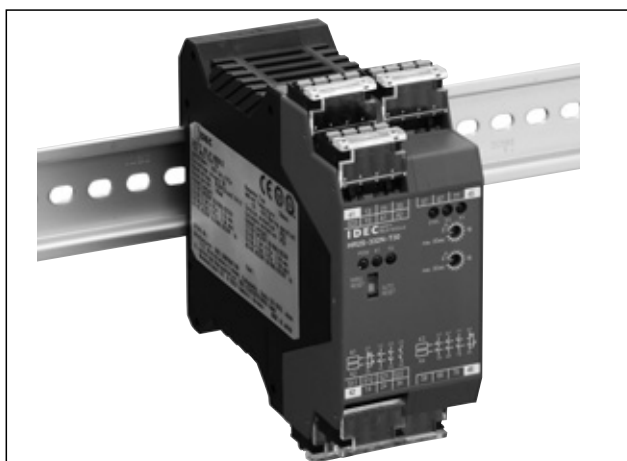


Flush Silhouette
Switches & Pilot Lights
Display Lights
LED Illumination Units
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Sockets
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Power Supplies
PLCs & SmartRelay
Operator Interfaces
Sensors
Control Stations
Explosion Protection
References

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

Time-delay output compliant with category 4

- Compliant with EN ISO 13849-1 Performance level (PL) e, Category 4
- Spring terminals enable easy wiring
- The terminal cover does not close if the terminal is not fully inserted into the module.
- 45mm-wide design
- 3NO (safety output) and 3NO (time-delay safety output)
- Time setting can be selected from 31 different time ranges
- TÜV SÜD compliant.



Package Quantity: 1

Contact Configuration			Input	Supply Voltage	Part No.
Safety Output	Time-delay Safety Output	Auxiliary Contact			
3NO	3NO	2NC	Inverse	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 (Note 1) CAN/CSA C22.2 No.14: 2005 (Note 1)
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) (Note 2)
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 mΩ 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 (Note 3) (Note 4)
Overvoltage Category	III (IEC60664-1)
Pollution Degree	2 (IEC60664-1)
Rated Insulation Voltage (output contact)	250V AC (IEC60664-1)

Terminals 13-14 23-24 33-34	Rated Load (Note 5) (Note 6)	250V AC / 30V DC (resistive load) (Note 7) Category 3 or lower: 5.0A maximum Category 4 or lower: 3.6A maximum
	Safety AC15	240V AC / 2A cosφ=0.3
	Circuit DC13	24V DC / 1A L/R=48 ms
Terminals 41-42	Rated Load (Note 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 cosφ=0.3
	Circuit DC13	24V DC / 1A L/R=48 ms
Terminals 57-58 67-68 77-78	Rated Load (Note 5) (Note 6)	250V AC / 30V DC (resistive load) (Note 7) Category 3 or lower: 5.0A maximum Category 4 or lower: 3.6A maximum
	Safety AC15	240V AC / 2A cosφ=0.3
	Circuit DC13	24V DC / 1A L/R=48 ms
Terminals 45-46	Rated Load (Note 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 cosφ=0.3
	Circuit DC13	24V DC / 1A L/R=48 ms
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

Note 1: UL and CSA are approved by TÜV SÜD America Inc., an accredited NRTL.

Note 2: Safety output contact: Stop Category 0

Note 3: Time-delay output contact: Stop Category 1

Note 4: When measured at the rated voltage (at 20°C), excluding contact bounce time.

Note 5: The time from when the safety input turns OFF to when the safety output turns OFF.

Note 6: Leave 5 mm of space between the sides of the module when more than 3A is continuously applied to the relay contact.

Note 7: 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.

Note 8: The maximum current of the safety output contact is specified by the approved standard.

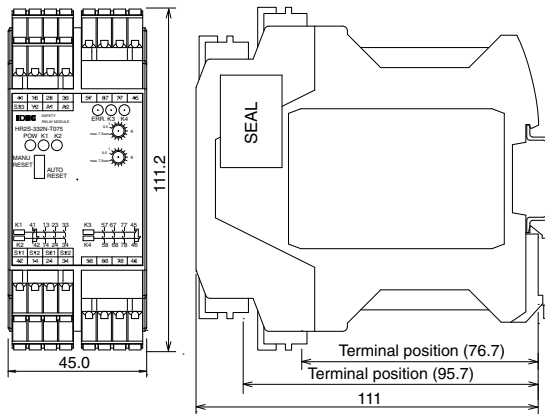
Category 4: 3.6A Category 3: 5.0A

- 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.

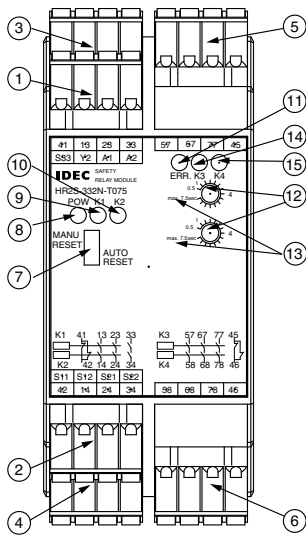
HR2S-332N-T075/T15/T30 Safety Relay Modules

Dimensions

All dimensions in 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. Characters: Maximum time-delay duration is displayed. 0.75: 7.5 sec., 15: 15 sec., 30: 30 sec.
13	K3: ON-LED for safety output
14	K4: ON-LED for safety output
15	K4: ON-LED for safety output

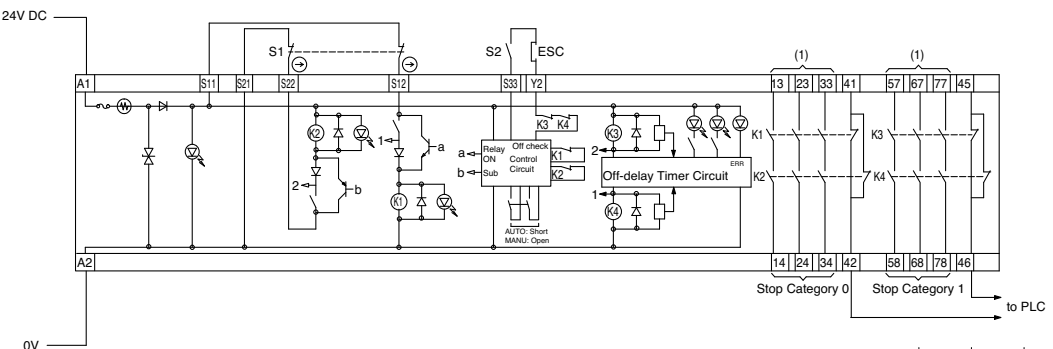
Terminal Arrangement

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	Start/off-check input	
CN2	S11	Safety input 1	Use a dry contact.
	S12	Safety input 1	
	S21	Safety input 2	
	S22	Safety input 2	
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		

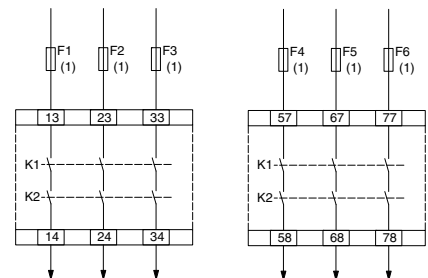
Note: 5.0A maximum
3.6A maximum
Category 3 or lower
Category 4

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

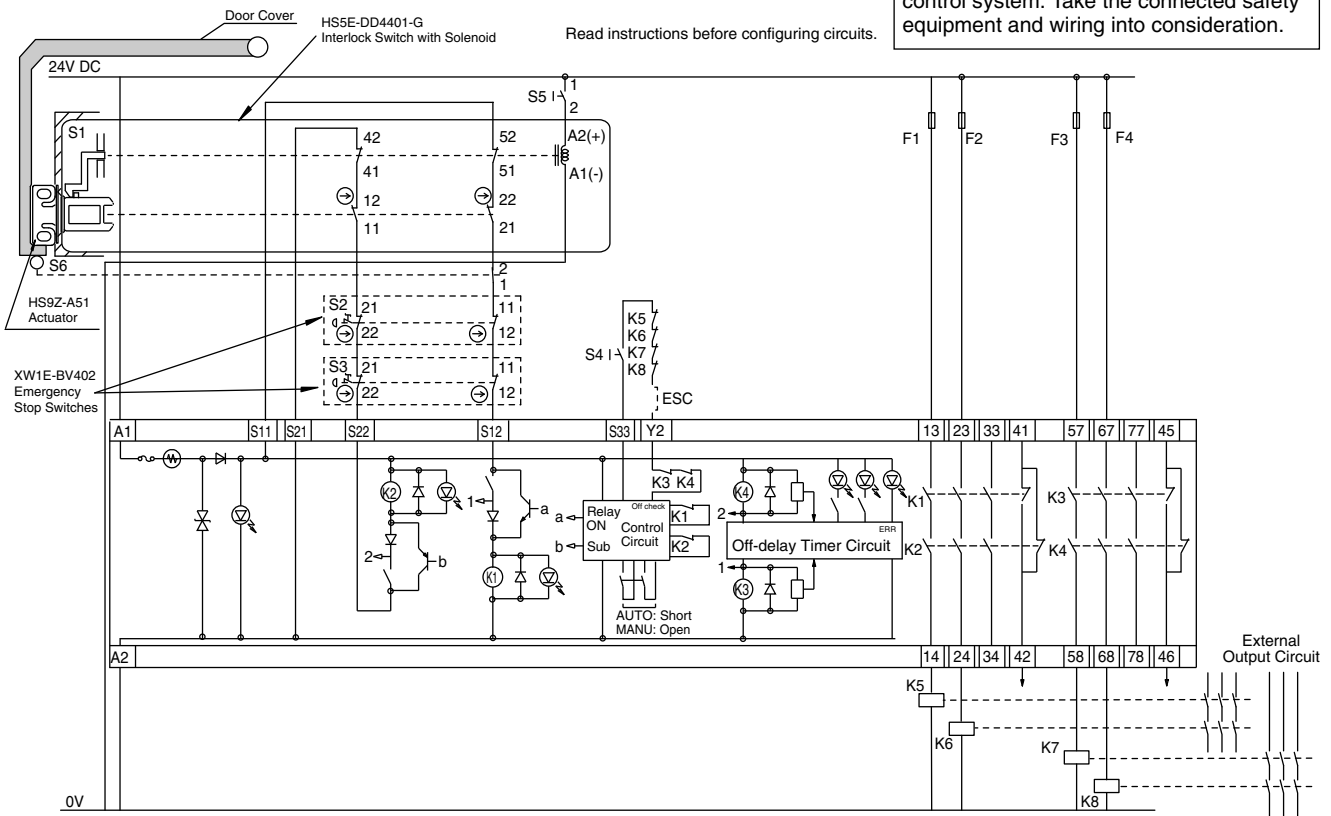


(1) Use a 3.6A maximum fuse for output line protection.

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

Safety Category 3 Circuit (using multiple emergency stop switches)

Safety category is achieved by the entire control system. Take the connected safety equipment 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

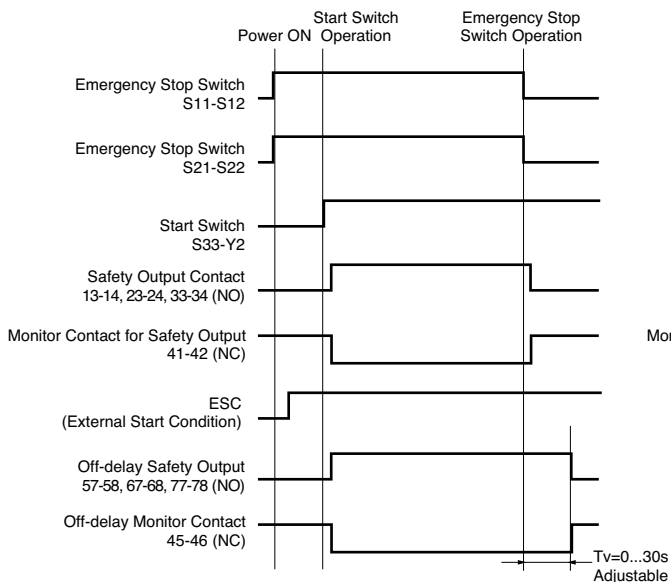
(Start)

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

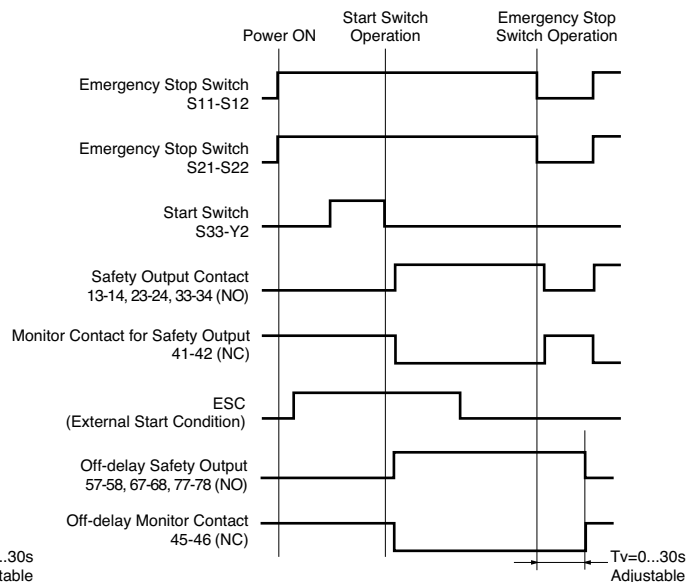
Operation Chart

Using emergency stop switches

AUTO mode

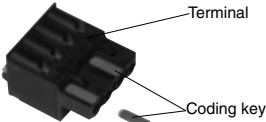
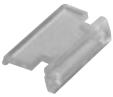



MANU mode



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

Maintenance Parts

Name	Part No.	Ordering No.	Package Quantity	Remarks
Terminal / Coding Key 	HR9Z-PMT1	HR9Z-PMT1PN04	1 set (4 terminals and 18 coding keys)	Coding keys are used to prevent incorrect insertion of terminals.
Terminal Cover 	HR9Z-PMC1	HR9Z-PMC1PN10	10	Used to make sure that the terminals are fully inserted.
Protective Tape 	HR9Z-PE1	HR9Z-PE1PN05	5	Used to protect the AUTO/MANU switch on the front of the module.

Residual Risk (EN ISO/ISO12100-1)

The wiring diagrams in this catalog have been tested under actual operating conditions. The HR2S safety relay module can be used in a safety circuit by connecting to the safety equipment compliant to applicable standards. Consider residual risk in the following circumstances.

a) When circuits other than described in this catalog are used.

b) When the applicable standards of machine operation are not observed, or when the machine is not adjusted or maintained properly (observe a maintenance schedule).

c) When the contacts of relays and contactors for connecting with safety outputs are not forced guided compliant with EN 50205.



Safety Precautions

- For safe operation, be sure to turn the power off before wiring or installation.
- Use within the specified voltage. Do not use power supplies that produce high ripple voltage or abnormal voltage.
- Do not use the module with an electrical load that exceeds the switching capacity.
- Do not use the module in places where inflammable or explosive gases exist. Otherwise, fire or explosion may occur due to a voltage arc caused by switching of contacts.
- The module is designed for use in typical machinery manufacturing facilities. The module shall not be used for nuclear controls, train, aeronautics, automobiles, engines, medical, or entertainment devices or facilities.
- Leave spaces of at least 5 mm from the sides of the module when electricity of 3A or more is continuously applied to the relay contact.
- The category of the control system (hereinafter called category) is determined based on the entire control system. Determination of the category and performance level for the control system (design of the safety-related parts of the control system) must be performed by safety experts.
- This module is classified as overvoltage category III. Make sure to take appropriate measures when designing the control system.
- Life of the module depends on conditions such as switching and electrical loads. Before operation, be sure to test under actual conditions and within the switching capacity.
- Use this module in a completely sealed control panel. Also, leave spaces of at least more than 50 mm from the top and the bottom of the module.
- Performance may be decreased when used in an environment where dust, cutting oil, or an organic solvent, are present. Contact IDEC for details.
- A resettable fuse, which does not require replacement is installed in the control circuit to prevent over current. If the switch is activated, turn off the module. When the problem is resolved, turn on the power again.

Flush Silhouette

Switches & Pilot Lights

Display Lights

LED Illumination Units

Display Units

Safety Products

Terminal Blocks

Comm. Terminals

AS-Interface

Relays & Timers

Sockets

Circuit Protectors

Power Supplies

PLCs & SmartRelay

Operator Interfaces

Sensors

Control Stations

Explosion Protection

References

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

Instructions

Connecting Control Devices

Emergency stop switches

Use emergency stop switches with direct opening action compliant with EN /IEC 60947-5-1 or EN /IEC 60947-5-5.

Interlock switches

Use interlock switches with direct opening action mechanism compliant with EN /IEC 60947-5-1.

Safety light curtains and beam sensor switches

Use reliable devices compliant with the required category.

Limitation on safety light curtains:

Short-circuit diagnosis function between OSSDs for safety light curtains is not provided with this module.

Therefore, category 4 is satisfied by connecting TYPE 4 safety light curtains defined in EN / IEC 61496-1. (TYPE 4 safety light curtain: short-circuit diagnosis function between OSSDs installed)

OSSD: ESPE connected to the control system of machines that turns off when the detection device operates during normal machine operation.

Electromagnetic switches

Use reliable electromagnetic switches with force guided contact.

If a NC contact of electromagnetic switches, without it being a force guided contact, is connected to the start/off-check input, failure of the electromagnetic switch contacts cannot be detected.

Protection of contact output

For an inductive load, it is recommended to provide a surge absorber to the output contacts to prevent the contacts from welding.

When an overvoltage larger than the value rated for output contact is expected, protect the output contact with a fuse.

Other control devices

- When connecting other control devices make sure that the device complies with the required category.
- Be sure to turn the power off before switching between AUTO/MANU.

Below are warnings for the start/off-check input.

AUTO mode:

Do not use a start switch. Otherwise, the contacts of the start switch may weld and cause unexpected operation which may lead to hazards.

MANU mode:

When using a start switch, be sure to use NO (normally open) momentary switches.

For the start/off-check input, use devices with back check functions (mirror contact). Otherwise, damage may occur due to failures arising from the start switch and other causes.

After the AUTO/MANU mode is set, affix a protective tape to the switch to prevent the setting from being changed.

Installation

Mount the module to a panel using DIN rail (35 mm wide). This module can be mounted in any direction. Install the module in a control panel with a protection degree of IP54 or better.

When mounting on DIN rails, use an end clip (IDEC BNL6 end clip, optional) to prevent the module from falling off.

Wiring

Wire size

Stranded wire: 0.2 to 1.5 mm², AWG 24 to 16

Solid wire: 0.2 to 1.5 mm², AWG 24 to 16

Connect after terminating the stranded wire with a ferrule (sleeve type).

Use wiring compliant with applicable standards.

Close the terminal cover after the wiring is complete. If the terminal cover does not close, the connector may not be fully inserted.

Before wiring, make sure that there are no problems with the wires.

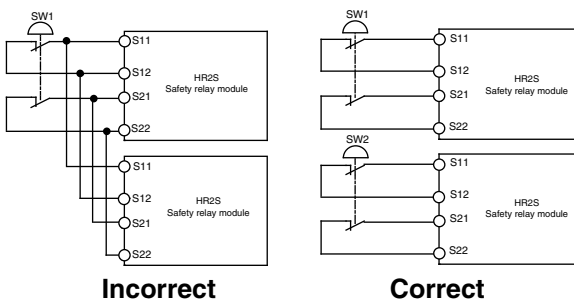
Connect dry voltage contacts to inputs S11 - S12 (S21 - S22), S33, S34, and Y2.

* Except when connecting safety light curtains.

Precautions when using multiple HR2S modules

A single switch (see SW1 in the diagram below) cannot be connected to multiple inputs. Use switches with independent contacts.

(Do not connect one safety device to two HR2S safety inputs in a parallel connection.)



Incorrect

Correct

Note: Same for start/off-check input

Power supply terminal

For an external power supply, be sure to use a switching power supply compliant with the EMC Directive, IEC 60950, and NEC CLASS2. Reverse connection of the power supply may result in damage.

Ferrule (sleeve type): Use crimping metal terminals of 8 to 10 mm in length.

(Reference)

Weidmuller : H0.5/14, H0.5/16, H0.75/14, H0.75/16, H1/14, H1/16, H1.5/14, H1.5/16

PHOENIX CONTACT: AI0.5-8, AI0.5-10, AI0.75-8, AI0.75-10, AI1-8, AI1-10, AI1.5-8, AI1.5-10

Wiring length

External wiring length of a safety stop input and start/off-check input is specified as follows:

IDEC does not guarantee normal operation if a wire of a length other than specified is used.

Safety stop input: Up to 50m in total

Start/off-check input: Up to 50m in total

(Wiring resistance: 5Ω maximum)