Safety Relay Modules

HR Series

The Global Standard for Safety

Wide variety of safety relay modules for the required safety category and safety equipment.

	Model	Features
	HR2S-301P/HR2S-301N	Compact design and maintenance improvements for outstanding usability!
	HR2S-332N-T075/T15/T30	Time delay output compliant with category 4.
	HR1S-AC	Transistor output available.
	HR1S-AF	Small and high function (welding detection switch)
	HR1S-AK	Four transistor outputs.
	HR1S-ATE	Compact safety relay modules. Size is reduced by 50% from conventional models. Plug-in terminal structure enables simple wiring.

HR2S
Safety Relay Modules

Slim safety relay module with spring terminals enables easy wiring!


HR2S-301P

SIMPLE

Simple wiring procedure

No complex work required. Just insert a ferrule into the terminal. The wire is locked into the spring terminal so a screwdriver is not required when inserting the wire.

Insert


1 No tools needed. Directly insert a ferrule into the terminal. The wire is locked.

Removal


1 Insert a flat screwdriver into the terminal entrance.
2 Remove the wire by releasing the lock with a screwdriver.

Removable terminal block enables easy replacement

The terminals can be attached and removed easily with a flat screwdriver allowing easy replacement of the module.

The terminal cover detects improper connection

The terminal cover does not close if the terminal is not fully inserted into the module.


Not fully inserted

Operation modes can be changed with a single action

The switch on the front panel allows switching between Auto and Manual modes.

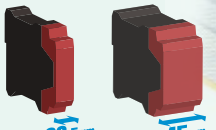
SAFETY

Complies with international standards

- Safety Category 4, Performance Level e according to EN ISO 13849-1: 2008
- TÜV SÜD European and North American (NRTL)

COMPACT

Compact design enables installation in a narrow space



HR2S-301P
HR2S-301N

HR2S-332NT

HR2S-301P

- Compliant with categories 2 and 3 when used with a safety switch.
- Compliant with categories 2 (type 2) and 4 (type 4) when used with a safety light curtain.

3NO and 1NC output contacts

Auxiliary output (NC) can be used for monitoring.

HR2S-301N

Compliant with Category 4

3NO and 1NC output contacts

Auxiliary output (NC) can be used for monitoring.

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

Time-delay output

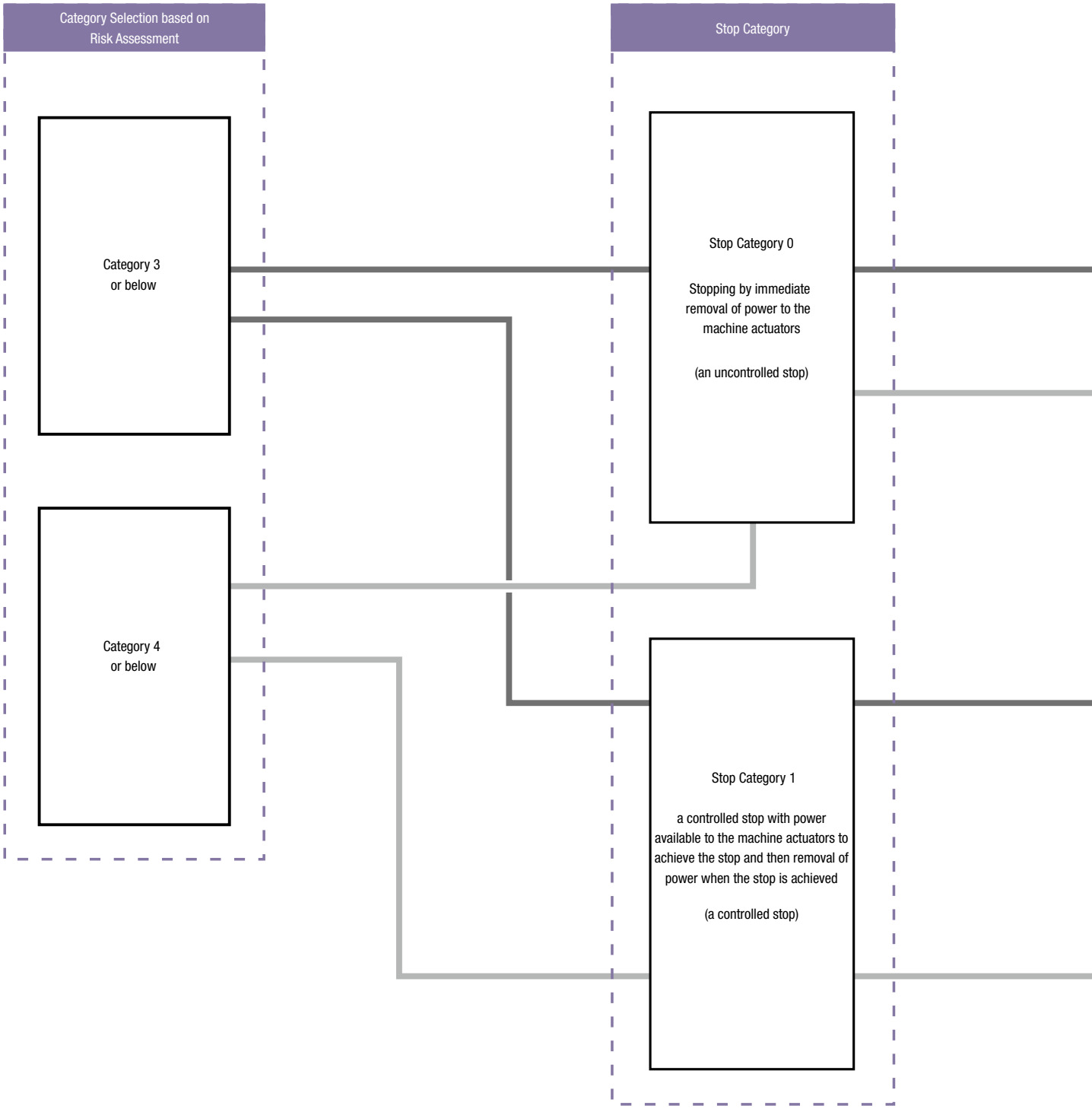
3NO (safety output) and 3NO (time-delay safety output)

Time-delay output compliant with category 4

Time setting can be selected from 31 different time ranges

- HR2S-332N-T075=0.5/1/1.5/2/2.5/3/3.5/4/4.5/5/5.5/6/6.5/7/7.5s
- HR2S-332N-T15=1/2/3/4/5/6/7/8/9/10/11/12/13/14/15s
- HR2S-332N-T30=2/4/6/8/10/12/14/16/18/20/22/24/26/28/30s

Safety Relay Module Selection Chart



Safety Equipment for Use

- Emergency Stop Switch
- Interlock Switch
- Interlock Switch with Solenoid
- Enabling Switch

- Emergency Stop Switch
- Interlock Switch
- Interlock Switch with Solenoid

- Enabling Switch

- Light Curtain

- Non-contact Interlock Switch

- Emergency Stop Switch
- Interlock Switch
- Interlock Switch with Solenoid

- Emergency Stop Switch
- Interlock Switch
- Interlock Switch with Solenoid

HR1S series

Model & Shape	Mark	Page
HR1S-AC Output: 3NO Tr 1NO Width: 22.5 mm		E-214
HR1S-AF Output: 3NO Width: 22.5 mm		E-219
HR1S-AK Output: 3NO+1NC Tr 4NO Width: 45.0 mm		E-223
HR1S-DMB/DME Output: 2NO Tr 2NO Width: 22.5 mm (DMB) 45.0 mm (DME)		E-102
HR1S-ATE Output: safety output 2NO off-delay 3NO Tr 4NO Width: 45.0 mm (DME)		E-229

HR2S series

Model & Shape	Mark	Page
HR2S-301P Output: 3NO+1NC Width: 22.5 mm		E-203
HR2S-301N Output: 3NO+1NC Width: 22.5 mm		E-203
HR2S-332N-T Output: safety output 3NO time-delay output 3NO auxiliary contact 2NC Width: 45.0 mm		E-208

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

Compact design and maintenance improvements for outstanding usability.

- Safety Category 4, Performance Level e according to EN ISO 13849-1: 2008.
- Compliant with categories 2 and 3 when used with a safety switch. Compliant with categories 2 (type 2) and 4 (type 4) when used with a safety light curtain. (HR2S-301P only)
- Removable terminal block enables easy replacement.
- The terminal cover detects improper connection.
- 22.5mm- wide compact design enables installation in a narrow space.
- Auxiliary output (NC) can be used for monitoring.

- See website for details on approvals and standards.

HR2S-301P/HR2S301N

Package Quantity: 1

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 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/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 (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 (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 cosø=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 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

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.

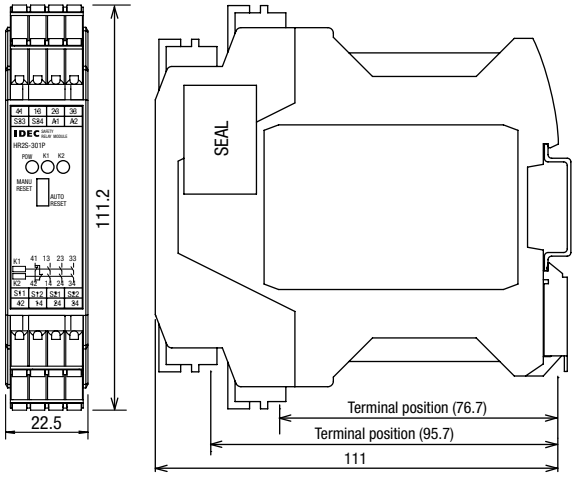
Note 8: The maximum current of the safety output contact is specified by the approved standard.

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

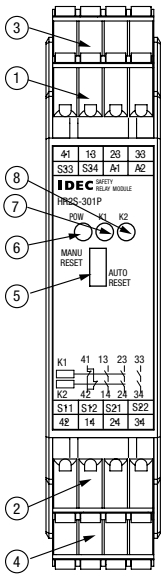
- To prevent the safety output contact from overcurrent, use a fuse. To satisfy Category 4, use a fuse with a maximum current of 3.6A. This fuse is not required if the short circuit current is less than 5A.

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

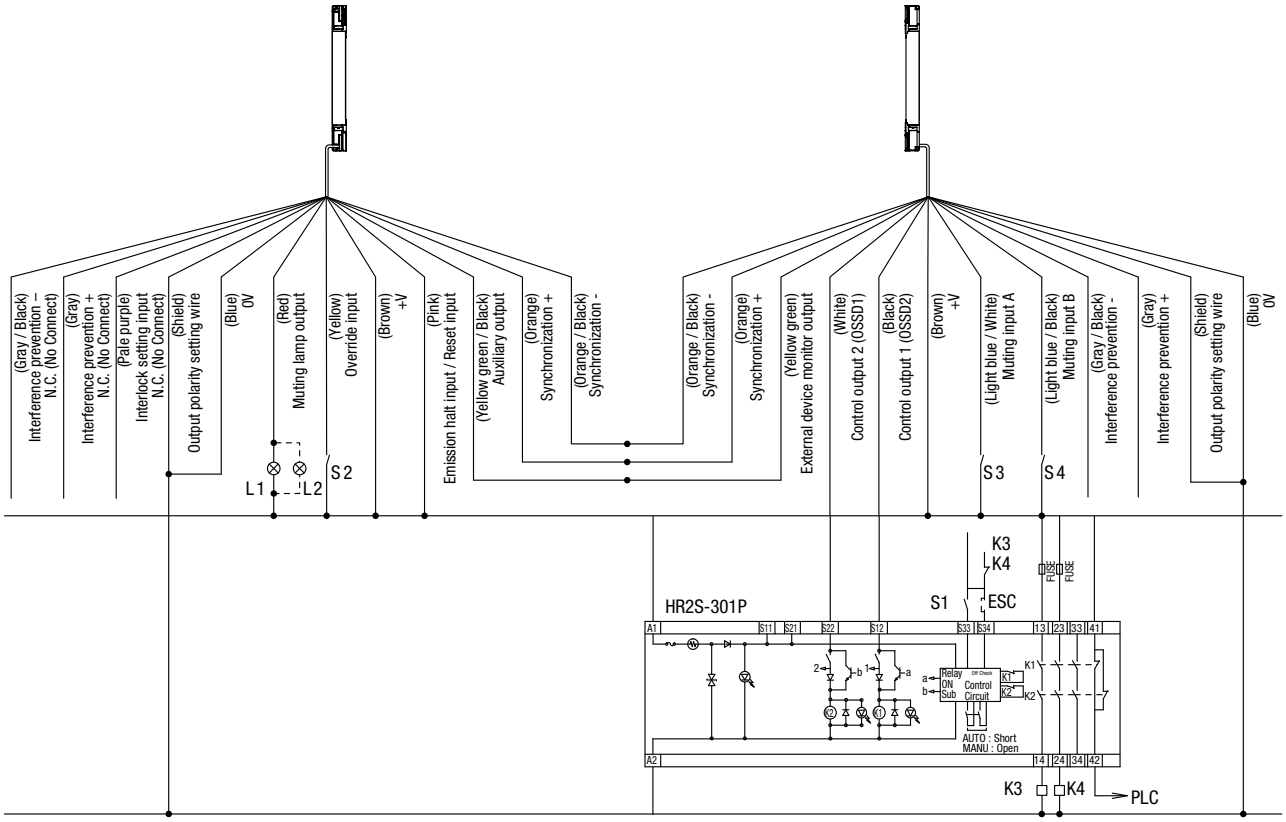
Terminal	Markings	I/O Signals		Notes
CN1	A1	Power supply +24V DC input		
	A2	Power supply 0V input		
	S33	Start/off-check input		Use a dry contact.
	S34			
CN2	S11	Safety input 1	Common	For HR2S-301N, use a dry contact. When connecting TYPE 4 safety light curtain to HR2S-301P, use only S12 (S22).
	S12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

Below are examples of wiring diagrams.

When using a safety light curtain

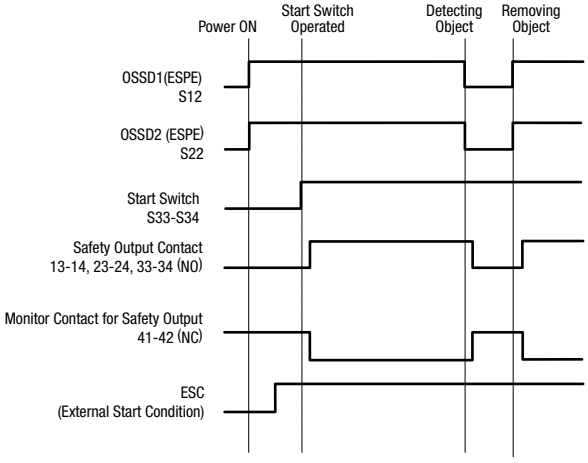


HR2S-301P Operation Chart

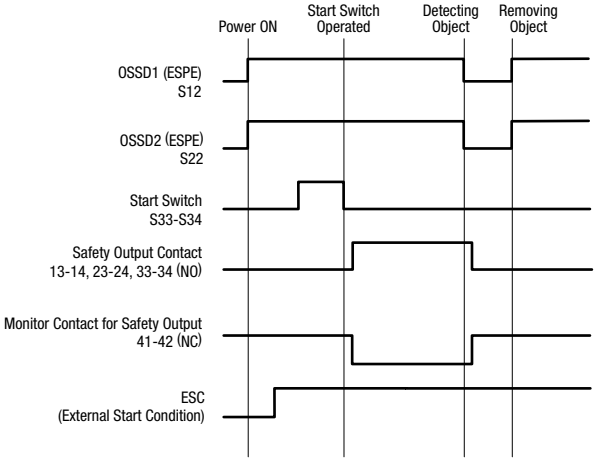
Below are examples of wiring diagrams.

When using OSSD output of safety light curtain

AUTO mode



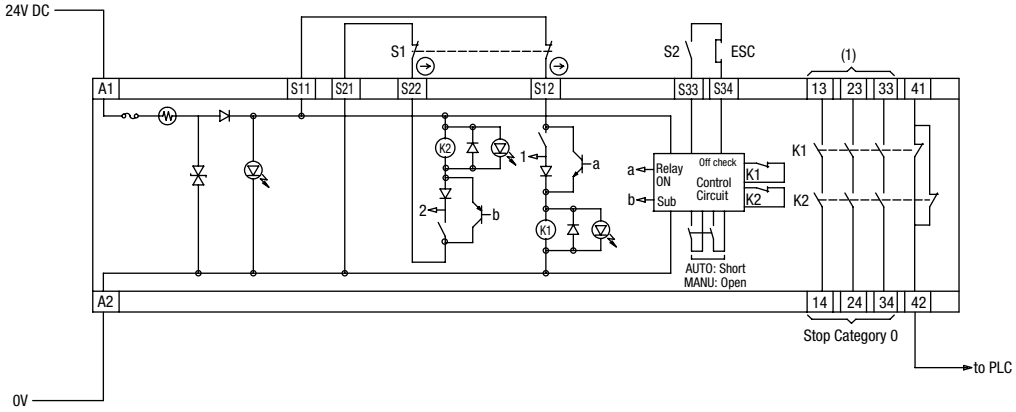
MANU mode



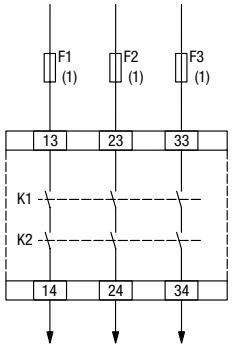
HR2S-301N Wiring Diagram

Below are examples of wiring diagrams.

When using an emergency stop switch

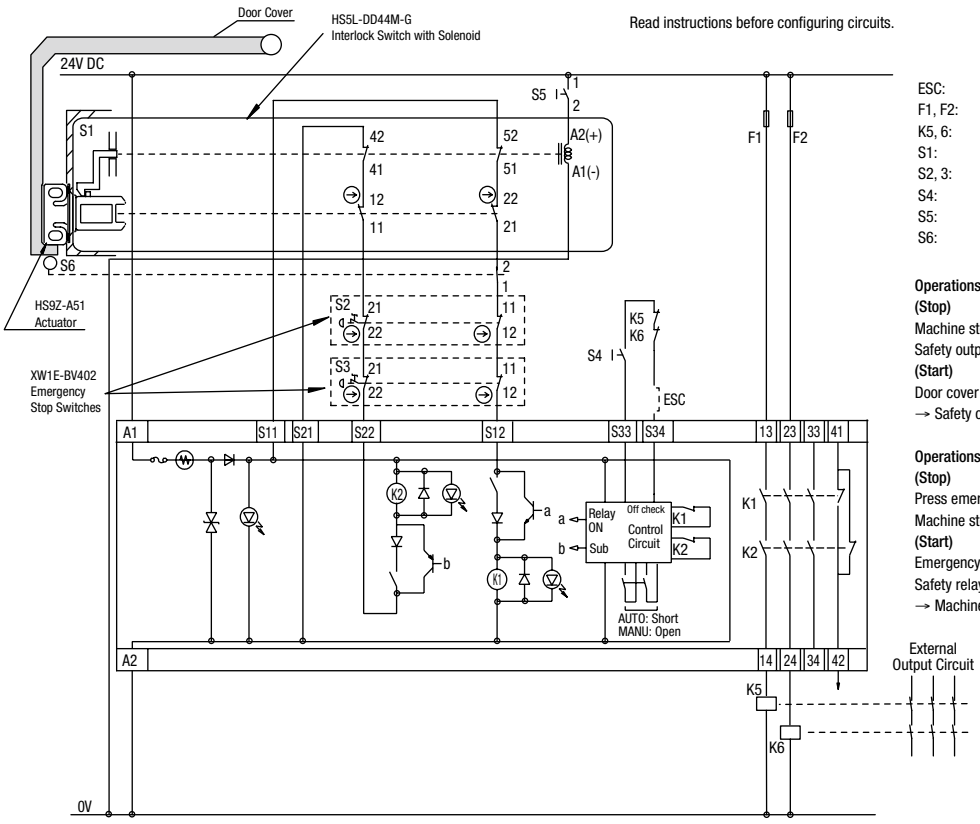


ESC: External start condition
F1 to 3: Protective fuse for the output of safety relay module
S1: Emergency stop switch with 2NC contacts, safety switch (recommended)
S2: Start Switch
S33-S34: Feedback loop



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

When using an emergency stop switch / interlock switch



Read instructions before configuring circuits.

ESC: External Start Condition
F1, F2: Fuse 3.6A
K5, 6: Safety Contactor (force guided)
S1: HS5L-DD44M-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.

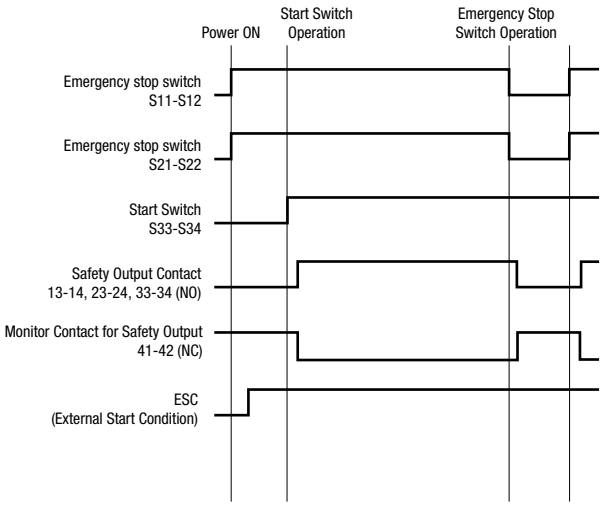
Operations of Interlock Switch with Solenoid
(Stop)
Machine stops → Unlocking enabling switch ON → Safety output OFF → Door cover released
(Start)
Door cover closed → Safety relay module start switch ON → Safety output ON → Machine starts

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

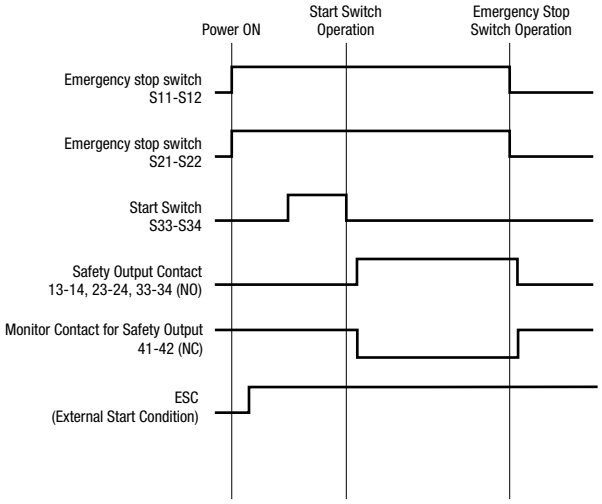
HR2S-301N Operation Chart

Using an emergency stop switch

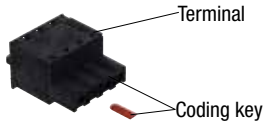
AUTO mode



MANU mode



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.

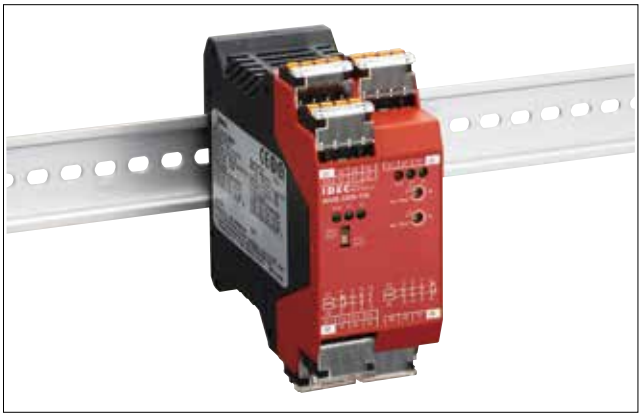
• See E-212 to E-213 on residual risk, safety precautions, and instructions.

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

Time-delay output compliant with category 4.

- Safety Category 4, Performance Level e according to EN ISO 13849-1: 2008
- Removable terminal block enables easy replacement.
- The terminal cover detects improper connection.
- 45mm- wide.
- 3NO (safety output) and 3NO (time-delay safety output).
- Time setting can be selected from 31 different time ranges

- See website for details on approvals and standards.



HR2S-332N-T075/T15/T30

Package Quantity: 1

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 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/s², pulse width 11m sec, 3 times 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% 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 (Note 3)
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 (IEC60664-1)

Output Contact Ratings	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 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 (Note 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 (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 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 (Note 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

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

Note 2: Safety output contact: Stop Category 0
Time-delay output contact: Stop Category 1

Note 3: When measured at the rated voltage (at 20°C), excluding contact bounce time.

Note 4: The time from when the safety input turns OFF to when the safety output turns OFF.

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

Note 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.

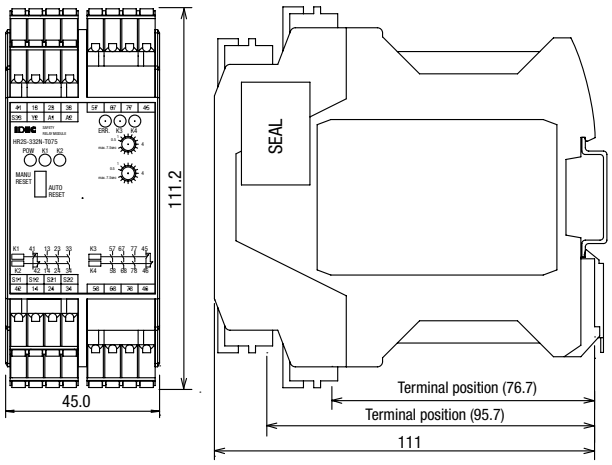
Note 7: The maximum current of the safety output contact is specified by the approved standard.
Category 4: 3.6A Category 3: 5.0A

- 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.

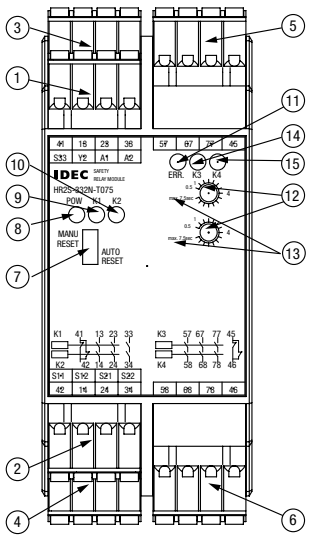
HR2S-332N-T075/T15/T30 Safety Relay Modules

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.
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

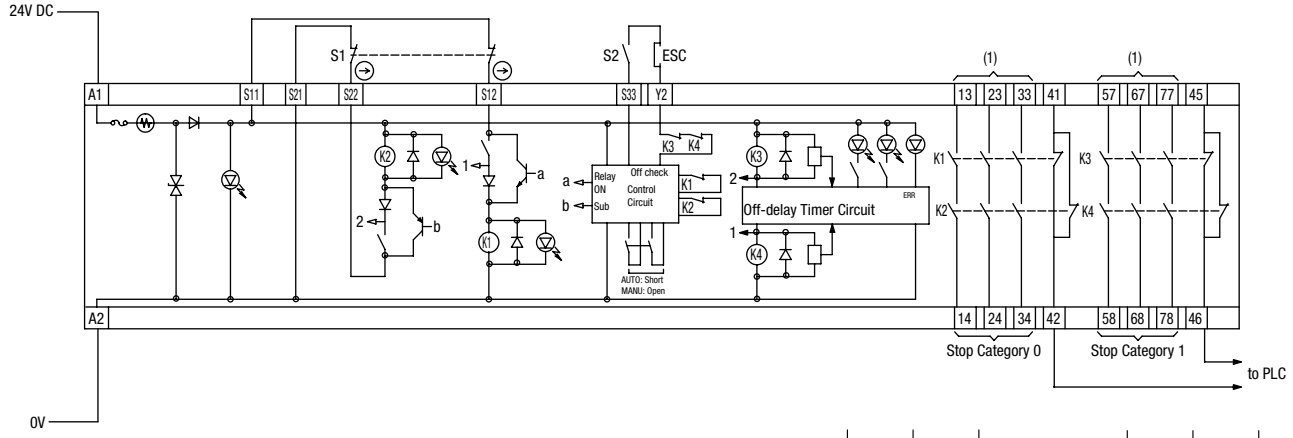
Terminals	Markings	I/O Signals		Remarks
CN1	A1	Power supply +24V DC input		
	A2	Power supply 0V input		
	S33	Start/off-check input		Use a dry contact.
	Y2			
CN2	S11	Safety input 1	Common	Use a dry contact.
	S12		Function	
	S21	Safety input 2	Common	
	S22		Function	
CN3 CN4	41–42	Monitor contact for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

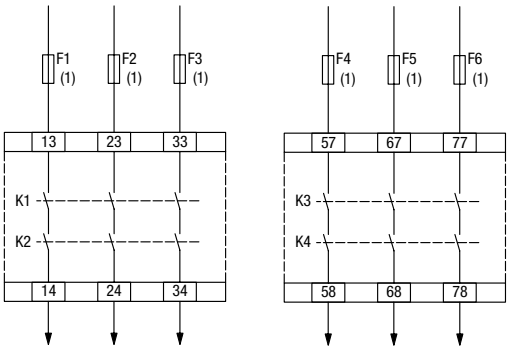
HR2S-332N-T075/T15/T30 Wiring Diagram

Below are examples of wiring diagrams.

When using an emergency stop switch

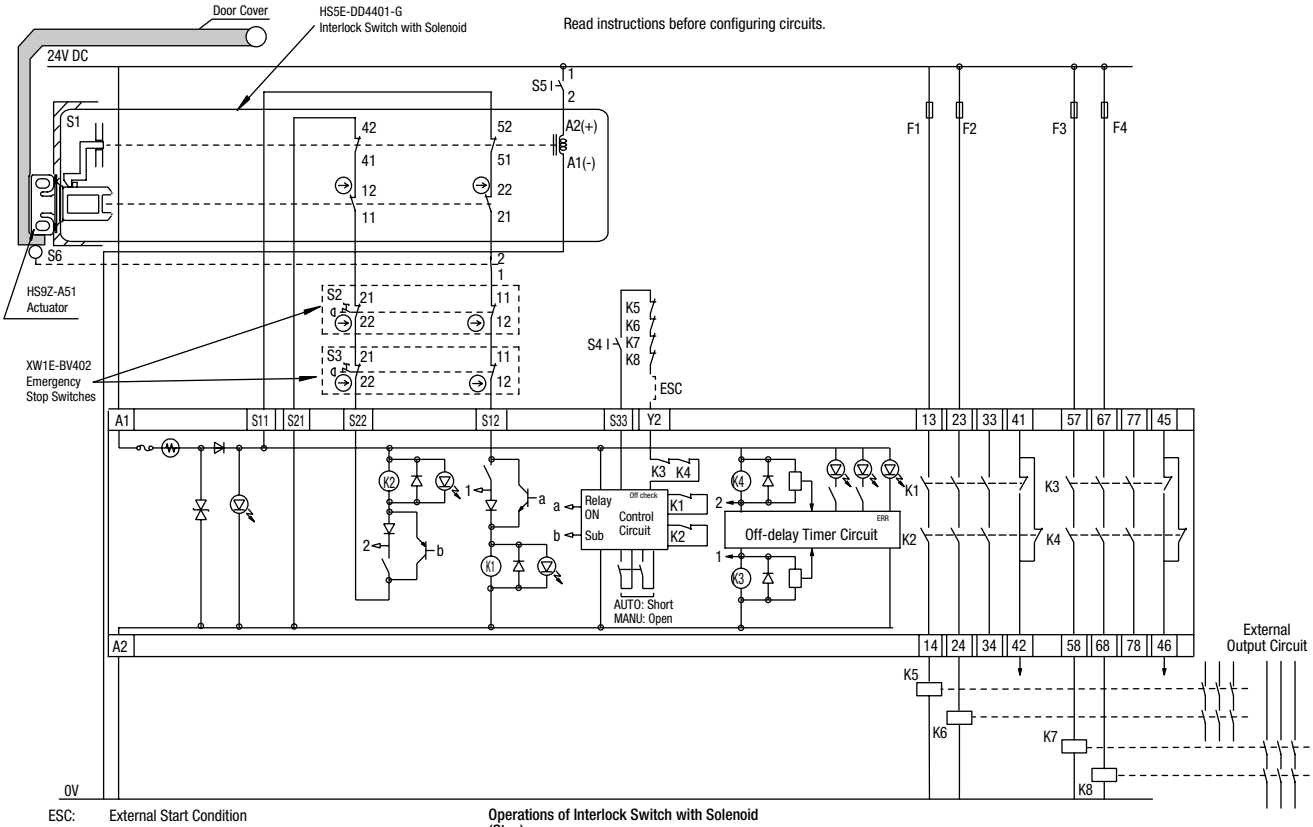


ESC: External Start Condition
F1 to 6: Protective fuse for the output of safety relay module
S1: Emergency stop switch with 2NC contacts, safety switch (recommended)
S2: Start Switch
S33-Y2: Feedback loop



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

When using multiple emergency stop switches



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.

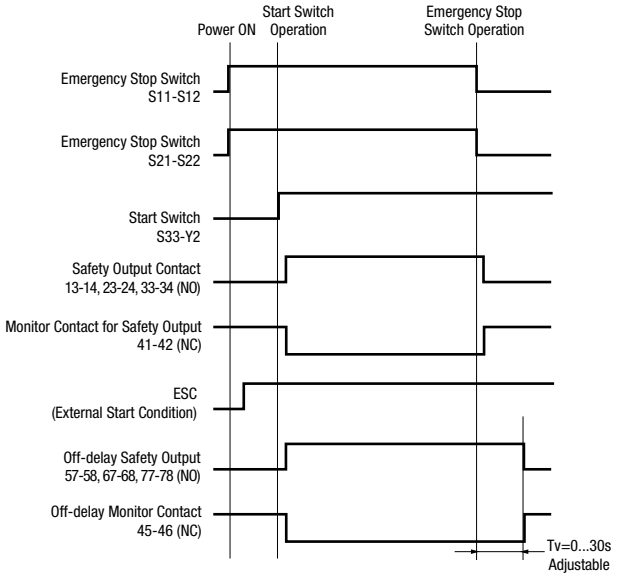
Operations of Interlock Switch with Solenoid
(Stop)
Machine stops → Unlocking enabling switch ON → Safety output OFF → Door cover released
(Start)
Door cover closed → Safety relay module start switch ON → Safety output ON → Machine starts

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

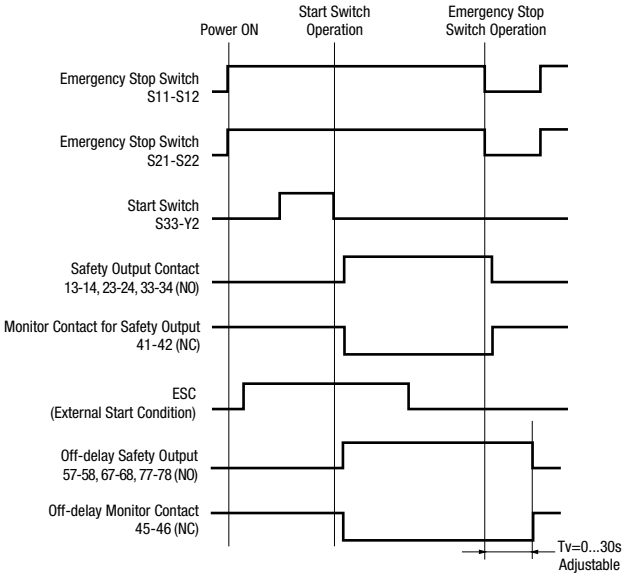
HR2S-332N-T075/T15/T30 Operation Chart

Using emergency stop switches

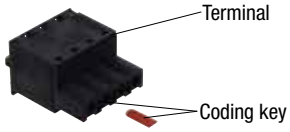
AUTO mode



MANU mode



Maintenance Parts

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.

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

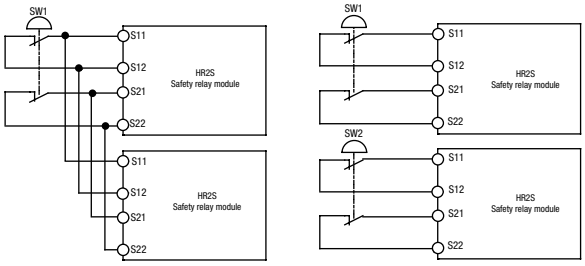
Mount the module to a panel using DIN rail (35 mm wide).
This module can be mounted in any direction. Install the module in a control panel with a protection degree of IP54 or better.
When mounting on DIN rails, use an end clip (IDEC BNL6 end clip, optional) to prevent the module from falling off.

Wiring

Wire size
Stranded wire: 0.2 to 1.5 mm^2, AWG 24 to 16
Solid wire: 0.2 to 1.5 mm^2, 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)

HR1S-AC Safety Relay Modules

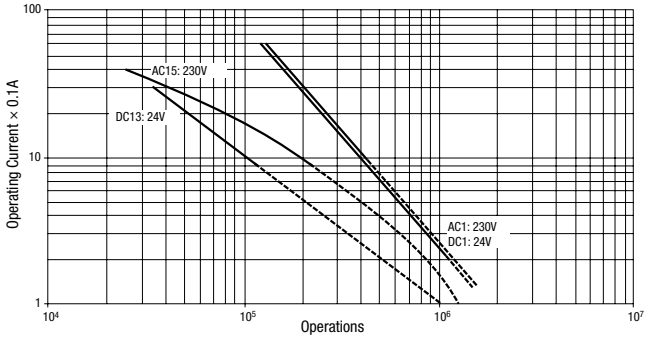
Transistor output provided.

- Removable terminal block (HR1S-AC5121P) allows for easy module replacement.
- Fault diagnosis function with dual safety circuits.
- Internal relay operations can be monitored with LED indicator.
- Finger-safe protection
- 35-mm-wide DIN rail mounting
- EN, IEC compliant.
- TÜV NORD approved.
- UL listed, CSA approved.

- See website for details on approvals and standards.

Part No.	Voltage	Terminal Style
HR1S-AC5121	24V AC, –20 to +10% 50/60 Hz 24V DC, ±20%	Integrated Terminal Block
HR1S-AC5121P		Removable Terminal Block

Output Contact Electrical Life



Specifications

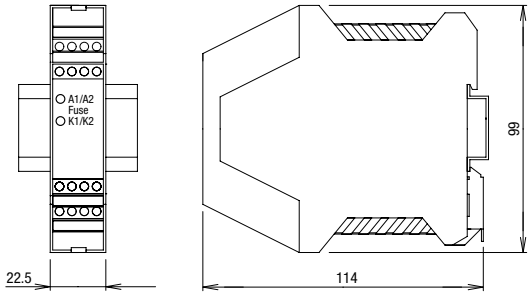
Operating Temperature			–10 to +55°C (no freezing)
Degree of Protection			Terminal: IP20, Housing: IP40
Rated Voltage			24V AC (–20 to +10%) 50/60 Hz 24V DC (±20%)
Power Consumption			AC: 2.2 VA (24V AC) maximum DC: 1.2W (24V DC) maximum
Overcurrent Protection			Electronic
Control Circuit Voltage			24V
Applicable Performance Level (PL)			e (EN ISO 13849-1)
Safety Category			3 (EN 954-1)
Safety Integrity Level (SIL)			3 (EN 62061)
Response Time			100 ms maximum
Input Synchronization Time			Unlimited
Overvoltage Category			III
Pollution Degree			2
Rated Insulation Voltage			300V
No. of Outputs	Safety Circuit		3NO
	Time-delay Circuit		—
	Auxiliary Circuit	Contact	—
		Transistor	1NO (transistor)
Output Contact Ratings	Safety Circuit	AC-15	C300: Ue = 230V AC / Ie = 0.75A
		DC-13	24V/2A: Ue = 24V DC / Ie = 2A
	Time-delay Circuit	AC-15	—
		DC-13	—
	Auxiliary Circuit	AC-15	—
		DC-13	—
	Transistor Circuit		24V/20mA
	Minimum Applicable Load		17V/10 mA (initial value)
Operating Frequency			1200 operations/h maximum
Mechanical Durability			10,000,000 operations minimum
Rated Current			Safety circuit output total: 10.5A maximum
Wire Size			HR1S-AC5121: 1 × 2.5mm², 2 × 0.75mm² maximum HR1S-AC5121P: 1 × 2.5mm², 2 × 1.5mm² maximum
Weight (approx.)			160g

- Use a 4A fuse (Type gL) for power line protection.
- Use a 4A fuse (Type gL) or a 6A fast blow fuse for output line protection.

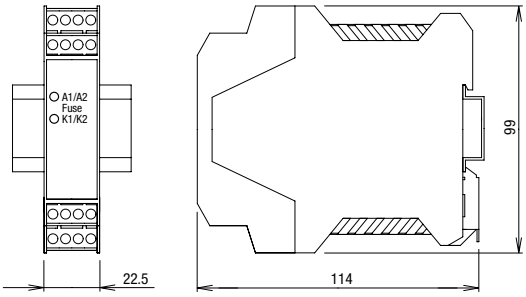
Dimensions

All dimensions in mm.

HR1S-AC5121 Integrated Terminal



HR1S-AC5121P Removable Terminal

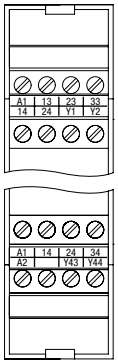


LED Indicator

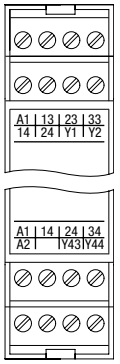
- A1/A2 Fuse:
  Turns on when power circuit is normal.
  Turns off when power is interrupted or the electronic fuse blows.
- K1: Turns on when K1 relay operates.
- K2: Turns on when K2 relay operates.

Terminal Arrangement

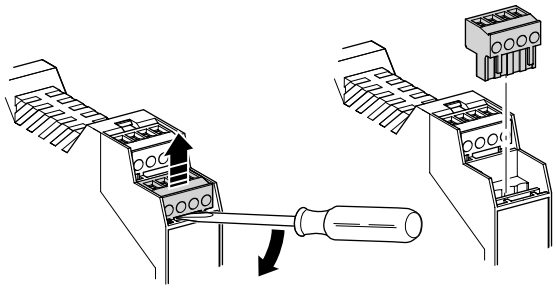
HR1S-AC5121



HR1S-AC5121P



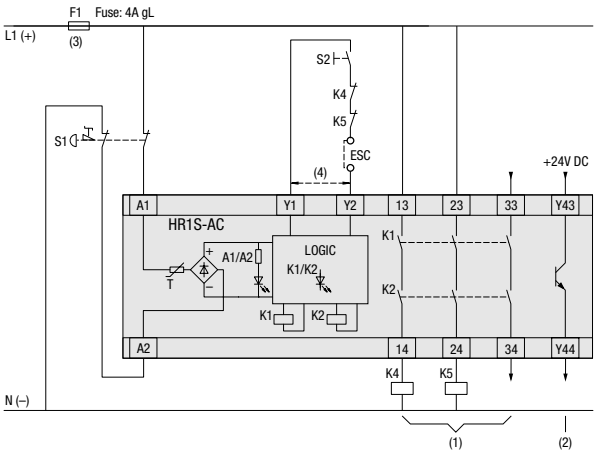
- The terminal block of the HR1S-AC5121P can be removed and installed as shown below, allowing for easy installation and replacement of modules.



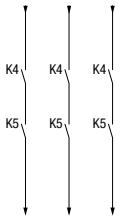
Wiring Diagram

Below are examples of wiring diagrams.

When using an emergency stop switch with 2NC contacts

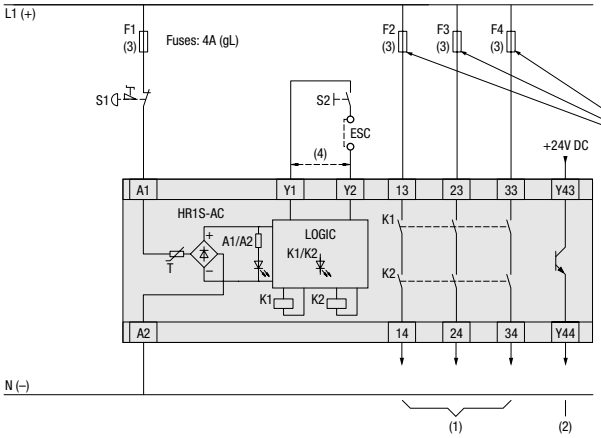


ESC: External Start Condition
S1: Emergency Stop Switch
S2: Start Switch
F1: Protection fuse for he power of safery relay module
K4, 5: Safety contactor



(1) Three safety outputs
(2) One transistor output
(3) See the specifications for maximum fuse size
(4) Jumper for terminal Y1-Y2 (for automatic start)

When using an emergency stop switch with 1NC contact



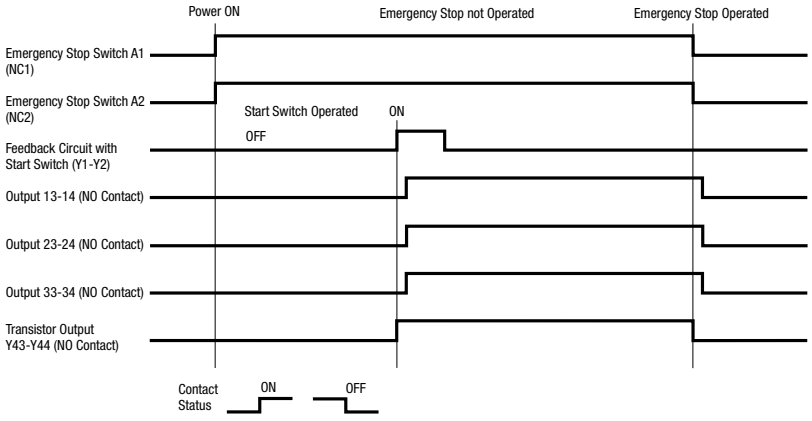
ESC: Exernal Start Condition
S1: Emergency Stop Switch
S2: Start Switch
F1: Protection fuse for the power of safety relay module
F2 to F4: Protection fuse for the output of safety relay module

Fuses: 4A (gL) or 6A fast blow type

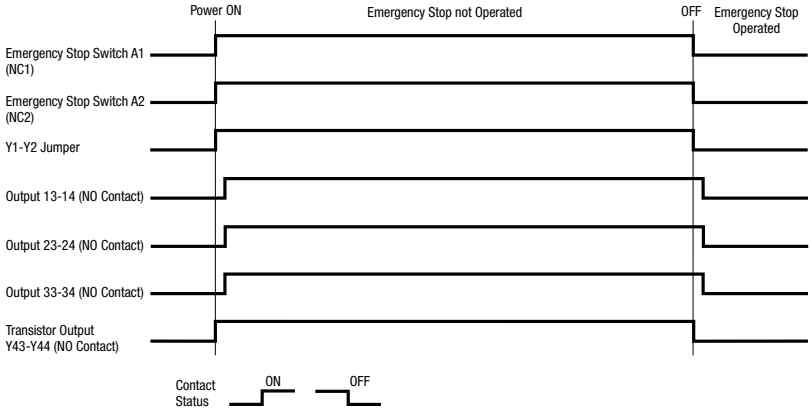
(1) Three safety outputs
(2) One transistor output
(3) See the specifications for maximum fuse size

Operation Chart

When Using a Start Switch



When not Using the Start Switch

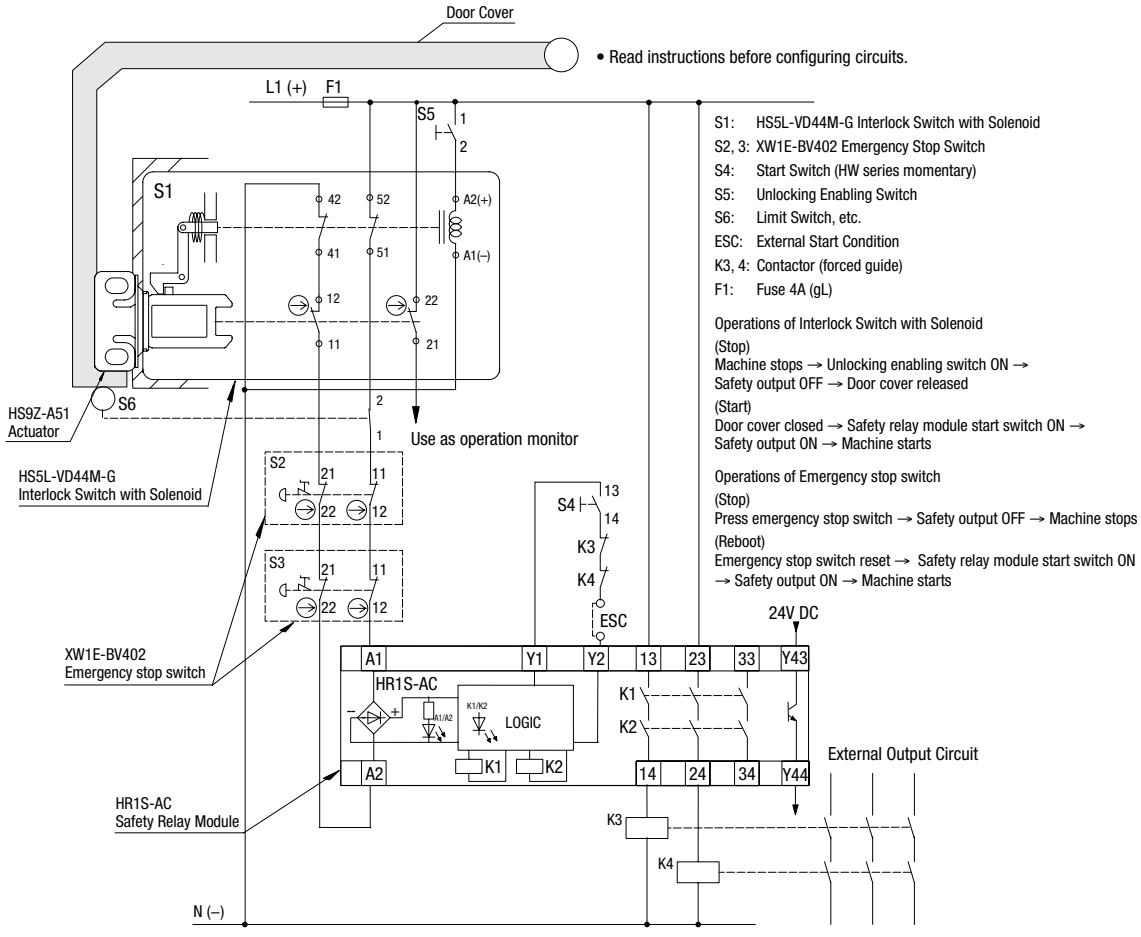


Semiconductor Manufacturing Equipment Example

When using HR1S-AC (safety relay module) and HS5L (solenoid type interlock switch) + XW1E (emergency stop switch)

Circuit Example

Below are examples of wiring diagrams



Note: Safety category is determined for the entire system. Take safety equipment and wiring into consideration.

⚠ Residual Risk (EN292-1, 5.5)

The wiring diagrams in this catalog have been tested under actual operating conditions. The HR1S 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 the maintenance schedule strictly).

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

Instructions

- Do not disassemble the safety relay modules. Do not damage the seal.
- Negligence to observe the following instructions may cause accidents that result in death or serious injuries.
  - Connect the wires according to the wiring diagrams shown in this catalog.
  - Connect the wires according to the applicable standards.
  - The contacts of relays and contactors to connect with safety outputs must be forced guided compliant with EN 50205.
  - When maintaining or adjusting the machines, observe the maintenance schedule.
- Turn the power off before installation, removal, wire connection, maintenance, or inspection of the safety relay module in order to avoid electric shock or fire. Otherwise death or serious injury may be caused.
- When installing and wiring, provide sufficient distance from inverter or power line.
- Use 13-14, 23-24, and 33-34 outputs for stop category 0 compliant with EN 60204-1/EN 418.
- In order to detect the failure of start switch such as contact welding, connect start switch to S33-S34. Contact welding cannot be detected when the start switch is connected to S33-S39, because the output circuit closes when the start switch closes.

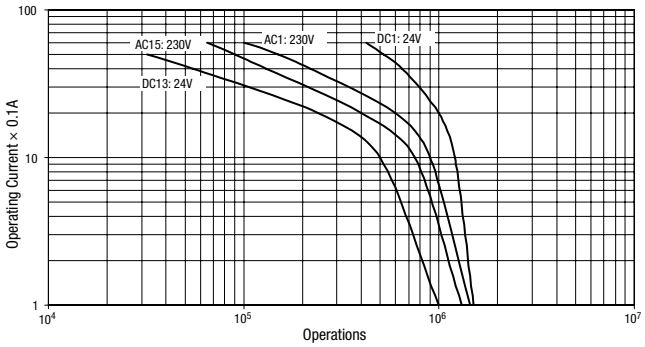
HR1S-AF Safety Relay Modules

Small and high function (welding detection of start switch)

- Removable terminal block (HR1S-AF5130PB) allows for easy module replacement.
- Fault diagnosis function with dual safety circuits.
- Internal relay operations can be monitored with LED indicator.
- Finger-safe protection
- 35-mm-wide DIN rail mounting
- EN, IEC compliant.
- TÜV NORD approved.
- UL listed, CSA approved.
- See website for details on approvals and standards.

Part No.	Voltage	Terminal Style
HR1S-AF5130B	24V AC, –15 to +10%, 50/60 Hz 24V DC, –15 to +10%	Integrated Terminal Block
HR1S-AF5130PB		Removable Terminal Block

Output Contact Electrical Life



Specifications

Operating Temperature			–25 to +55°C (no freezing)
Degree of Protection			Terminal: IP20, Housing: IP40
Rated Voltage			24V AC (–15 to +10%) 50/60 Hz 24V DC (–15 to +10%)
Power Consumption			5 VA maximum
Overcurrent Protection			Electronic (Note)
Control Circuit Voltage			24V
Applicable Performance Level (PL)			e (EN ISO 13849-1)
Safety Category			4 (EN ISO 13849-1)
Safety Integrity Level (SIL)			3 (EN 62061)
Response Time			When S11-S12, S21-S22 are interrupted: 20 ms maximum When power is interrupted: 60 ms maximum
Input Synchronization Time			Unlimited
Overvoltage Category			III
Pollution Degree			2
Rated Insulation Voltage			300V
Maximum Input Resistance			90Ω
No. of Outputs	Safety Circuit		3NO
	Time-delay Circuit		—
	Auxiliary Contact	Contact	—
		Transistor	—
Output Contact Ratings	Safety Circuit	AC-15	C300 Ue = 240V AC / Ie = 0.75A
		DC-13	24V/1.5A, Ue = 24V DC / Ie = 1.5A
	Time-delay Circuit	AC-15	—
		DC-13	—
	Auxiliary Circuit	AC-15	—
		DC-13	—
	Transistor Circuit		—
	Minimum Applicable Load		17V/10 mA (initial value)
Operating Frequency			1200 operations/h maximum
Mechanical Durability			10,000,000 operations minimum
Rated Current			Safety circuit output total: 18A maximum Each safety circuit output: 6A maximum
Wire Size			HR1S-AF5130B: 1 × 2.5 mm², 2 × 0.75 mm² maximum HR1S-AF5130PB: 1 × 2.5 mm², 2 × 1.5 mm² maximum
Weight (approx.)			250g

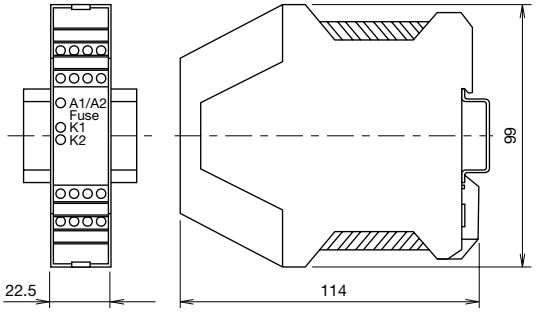
Note: Short-circuit of S11 and S21 activates the overcurrent protection circuit, interrupting the power supply. The safety output turns off. Normal status is restored when the short-circuit is removed.

- Use a 4A fuse (Type gL) for power line protection.
- Use a 4A fuse (Type gL) or a 6A fast blow fuse for output line protection.

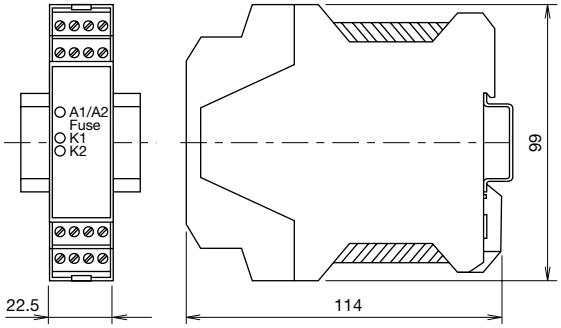
Dimensions

All dimensions in mm.

HR1S-AF5130B Integrated Terminal



HR1S-AF5130PB Removable Terminal

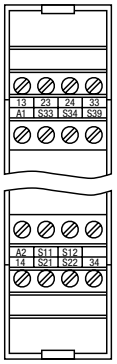


LED Indicators

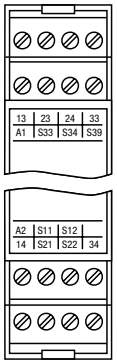
- A1/A2 Fuse:
  Turns on when power circuit is normal.
  Turns off when power is interrupted or the electronic fuse blows.
- K1: Turns on when K1 relay operates.
- K2: Turns on when K2 relay operates.

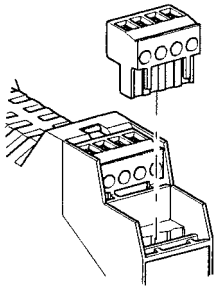
Terminal Arrangement

HR1S-AF5130B



HR1S-AF5130PB



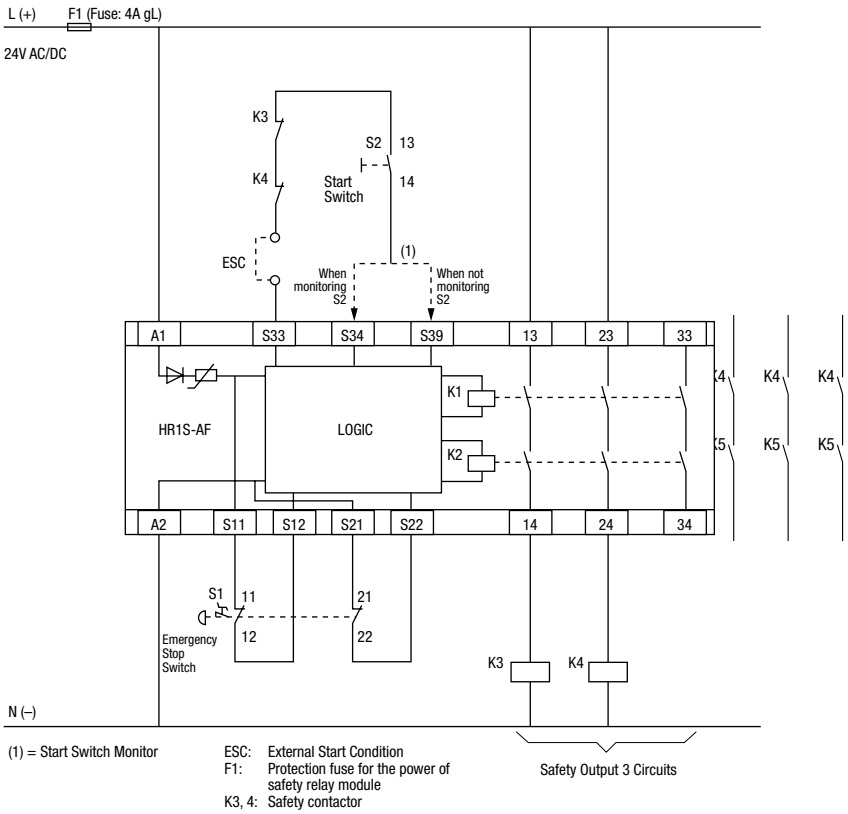


- The terminal block of the HR1S-AF5130PB can be removed and installed as shown below, allowing for easy installation and replacement of modules.

Wiring Diagram

Below are examples of wiring diagrams.

When using an emergency stop switch

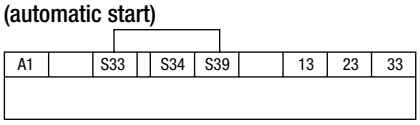


(1) = Start Switch Monitor

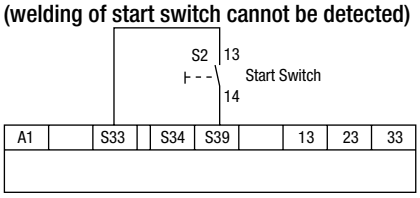
ESC: External Start Condition
F1: Protection fuse for the power of safety relay module
K3, 4: Safety contactor

Safety Output 3 Circuits

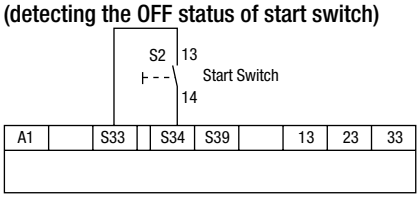
When not using a start switch (automatic start)



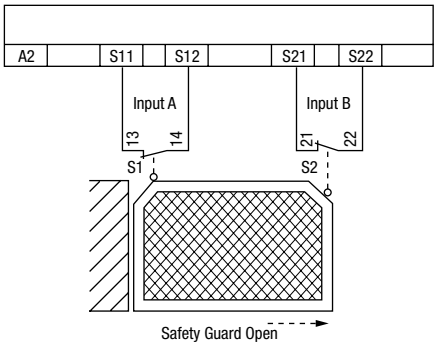
When not monitoring the start switch (welding of start switch cannot be detected)



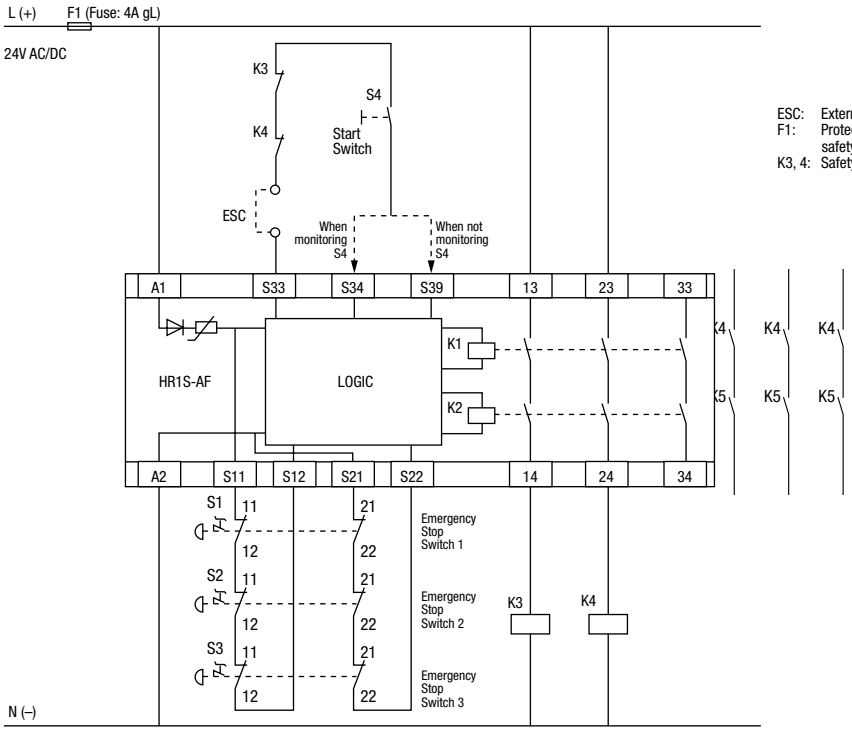
When monitoring the start switch (detecting the OFF status of start switch)



Limit switch or interlock switch for guard opening/closing



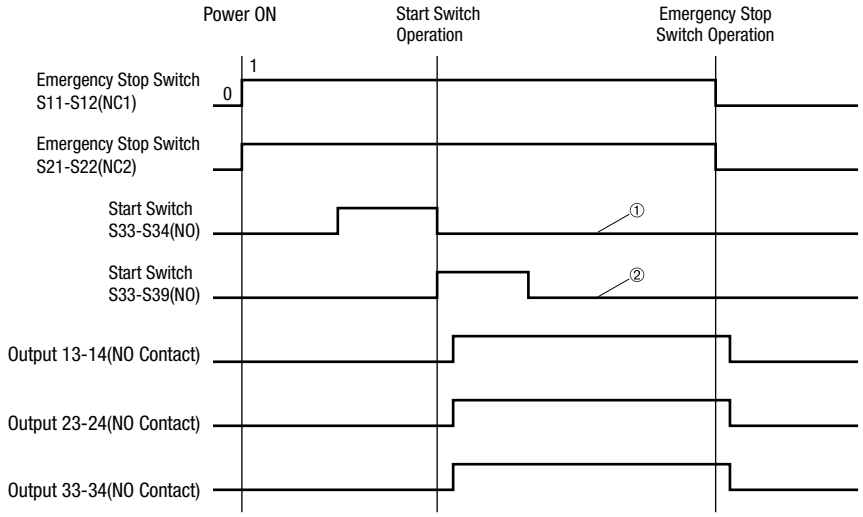
When using multiple emergency stop switches.



ESC: External Start Condition
F1: Protection fuse for the power of safety relay module
K3, 4: Safety contactor

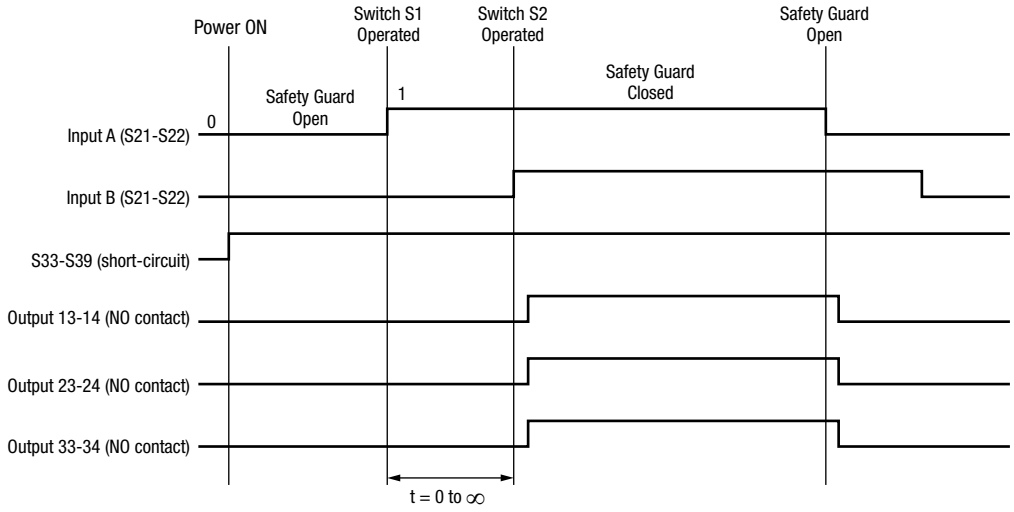
Operation Chart

When Using the Emergency Stop Switch



①When monitoring the start switch (detecting the OFF status of start switch)
②When not monitoring the start switch (contact welding of start switch cannot be detected)

When not Using the Safety Guard (Automatic Start)



⚠ Residual Risk (EN292-1, 5.5)

The wiring diagrams in this catalog have been tested under actual operating conditions. The HR1S 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 the maintenance schedule strictly).
c) When the contacts of relays and contactors for connecting with safety outputs are not forced guide compliant with EN 50205.

Instructions

- Do not disassemble the safety relay modules. Do not damage the seal.
- Negligence to observe the following instructions may cause accidents that result in death or serious injuries.
  - Connect the wires according to the wiring diagrams shown in this catalog.
  - Connect the wires according to the applicable standards.
  - The contacts of relays and contactors to connect with safety outputs must be forced guided compliant with EN 50205.
  - When maintaining or adjusting the machines, observe the maintenance schedule.
- Turn the power off before installation, removal, wire connection, maintenance, or inspection of the safety relay module in order to avoid electric shock or fire. Otherwise death or serious injury may be caused.
- When installing and wiring, provide sufficient distance from inverter or power line.
- Use 13-14, 23-24, and 33-34 outputs for stop category 0 compliant with EN 60204-1/EN 418.
- In order to detect the failure of start switch such as contact welding, connect start switch to S33-S34. Contact welding cannot be detected when the start switch is connected to S33-S39, because the output circuit closes when the start switch closes.

HR1S-AK Safety Relay Modules

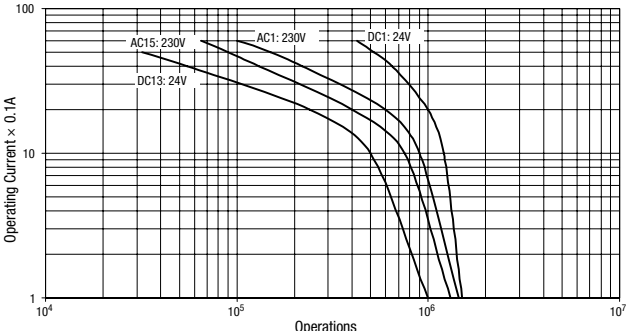
Four transistor outputs

- Removable terminal block allows for easy module replacement.
- Can be connected to light curtain.
- Fault diagnosis function with dual safety circuits.
- Internal relay operations can be monitored with LED indicator.
- Finger-safe protection
- 35-mm-wide DIN rail mounting
- EN, IEC compliant.
- TÜV NORD approved.
- UL listed, CSA approved.

- See website for details on approvals and standards.

Part No.	Voltage	Terminal Style
HR1S-AK311144	24V AC, –15 to +10%, 50/60 Hz 24V DC, –15 to +10%	Integrated Terminal Block
HR1S-AK351144		
HR1S-AK311144P		Removable Terminal Block
HR1S-AK351144P		

Output Contact Electrical Life



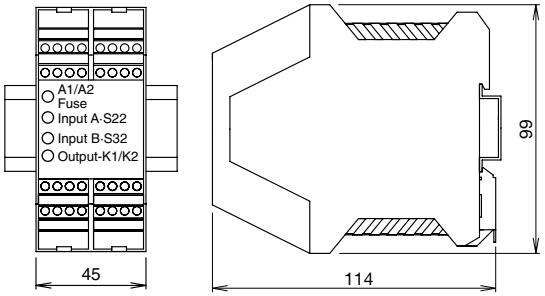
Specifications

Operating Temperature			–10 to 55°C (no freezing)
Degree of Protection			Terminal: IP20, Housing: IP40
Rated Voltage			HR1S-AK311144(P): 24V AC (–15 to +10%) 50/60 Hz 24V DC (–15 to +10%) HR1S-AK351144(P): 120V AC (–15 to +10%) 50/60 Hz 24V DC (–15 to +10%)
Power Consumption			120V AC: 6 VA maximum 24V AC: 5 VA maximum 24V DC: 3W maximum
Overcurrent Protection			Electronic
Control Circuit Voltage			24V
Applicable Performance Level (PL)			e (EN ISO 13849-1)
Safety Category			4 (EN ISO 13849-1)
Safety Integrity Level (SIL)			3 (EN 62061)
Response Time			40 ms maximum
Input Synchronization Time			S1 → S2: 2 sec S2 → S1: 4 sec Automatic start: unlimited
Overvoltage Category			III
Pollution Degree			2
Rated Insulation Voltage			300V
Maximum Input Resistance			28Ω
No. of Output circuits	Safety Circuit		3NO
	Time-delay Circuit		—
	Auxiliary Contacts	Contact	1NC
		Transistor	4NO
Output Contact Ratings	Safety Circuit	AC-15	C300 Ue = 230V AC / Ie = 0.75A
		DC-13	24V/1.5A, 24V DC / Ie = 1.5A
	Time-delay Circuit	AC-15	—
		DC-13	—
	Auxiliary Circuits	AC-15	C300 Ue = 230V AC / Ie = 0.75A
		DC-13	24V/1.5A, 24V DC / Ie = 1.5A
	Transistor Circuit		24V/20 mA
	Minimum Applicable Load		17V/10 mA (initial value)
Operating Frequency			1200 operations/h maximum
Mechanical Durability			10,000,000 operations minimum
Rated Current			Safety circuit output total: 18A maximum Each safety circuit output: 6A maximum
Wire Size			HR1S-AK311144: 1 × 2.5 mm², 2 × 0.75 mm² maximum HR1S-AK311144P: 1 × 2.5 mm², 2 × 1.5 mm² maximum HR1S-AK351144: 1 × 2.5 mm², 2 × 0.75 mm² maximum HR1S-AK351144P: 1 × 2.5 mm², 2 × 1.5 mm² maximum
Weight (approx.)			HR1S-AK311144(P): 300g HR1S-AK351144(P): 400g

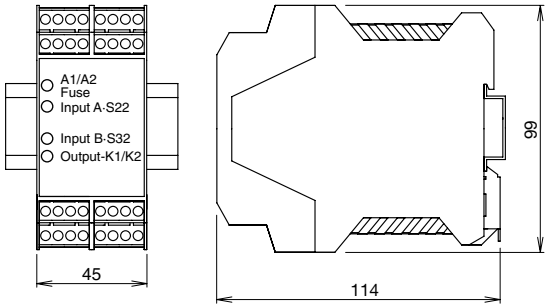
- Use a 4A fuse (Type gL) or a 6A fast blow fuse for power line and output line protection.

Dimensions

HR1S-AK311144/-AK351144 Integrated Terminal



HR1S-AK311144P/-AK351144P Removable Terminal



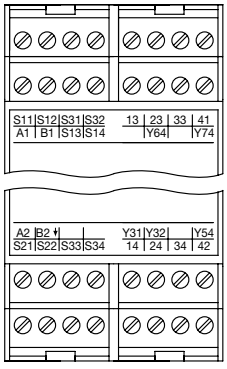
All dimensions in mm.

LED Indicator

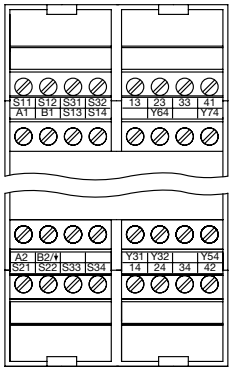
- A1/A2 Fuse:
  Turns on when power voltage is normal.
  Turns off when power is interrupted or the electronic fuse blows.
- Input A-S22: Turns on when S21-S22 is closed.
- Input B-S32: Turns on when S31-S32 is closed.
- Output K1/K2: Turns on when the safety outputs of 13-14, 23-24, and 33-34 are closed.

Terminal Arrangement

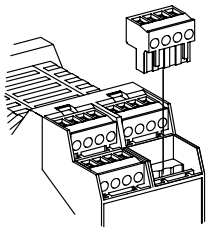
HR1S-AK311144
HR1S-AK351144



HR1S-AK311144P
HR1S-AK351144P



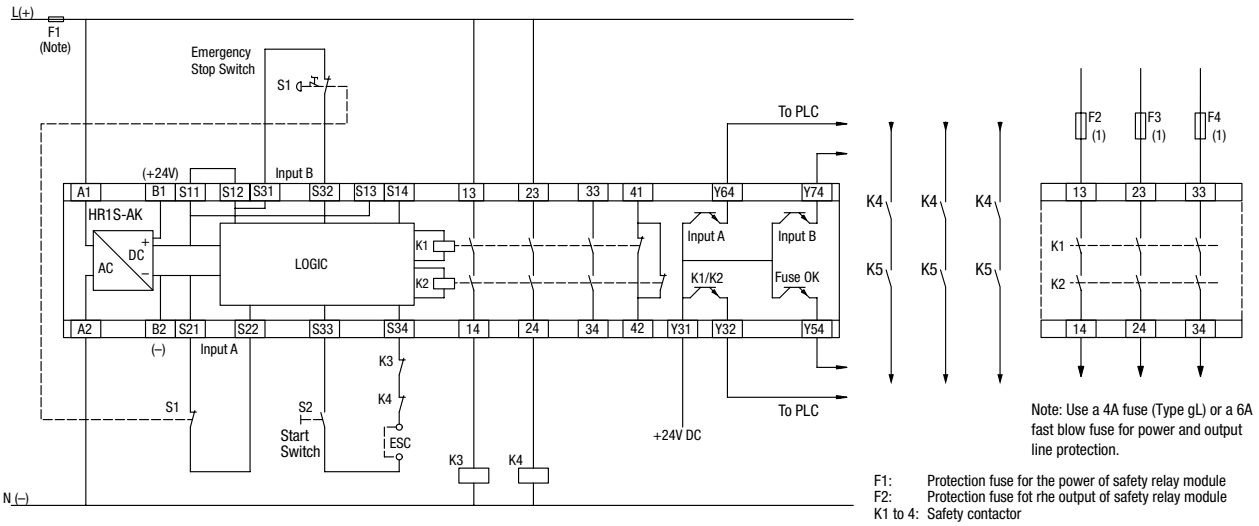
- The terminal blocks of the HR1S-AK311144P/-AK351144P can be removed and installed as shown below, allowing for easy installation and replacement of modules.



Wiring Diagram

Note: Be sure to connect terminals to correct power supply.
AC power: A1-A2
DC power: B1-B2

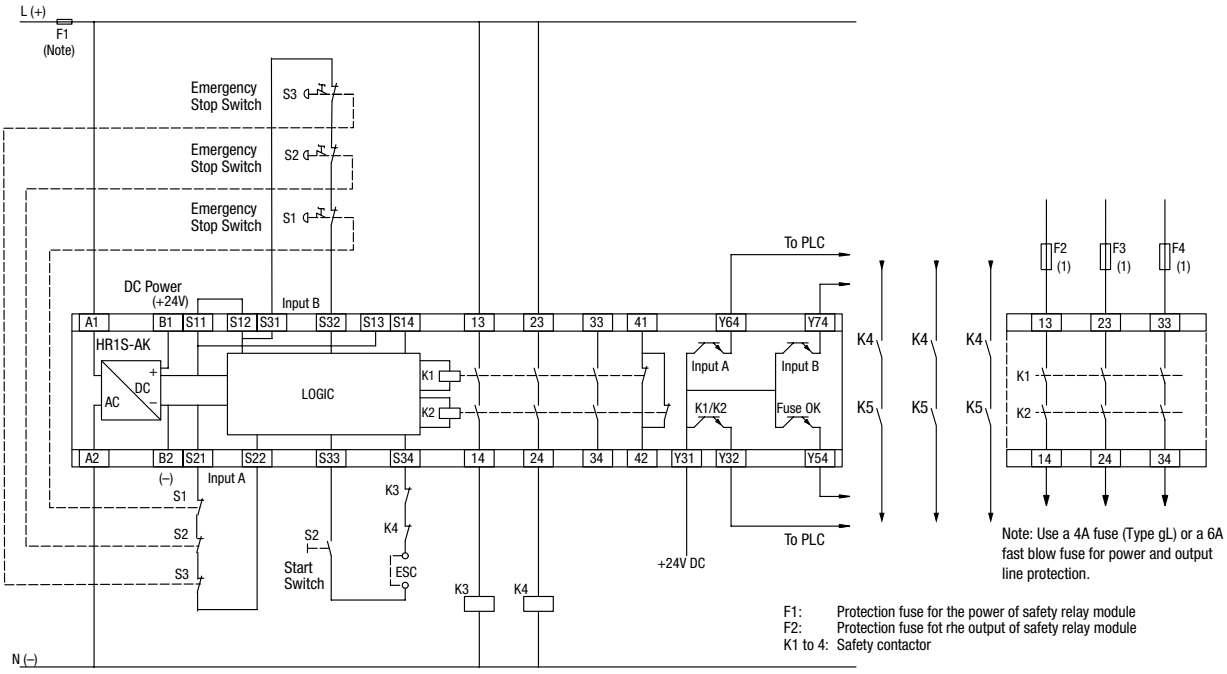
When using an emergency stop switch



Note: Use a 4A fuse (Type gL) or a 6A fast blow fuse for power and output line protection.

F1: Protection fuse for the power of safety relay module
F2: Protection fuse fot rhe output of safety relay module
K1 to 4: Safety contactor

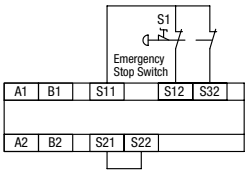
When using multiple emergency stop switches



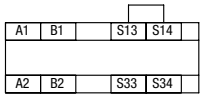
Note: Use a 4A fuse (Type gL) or a 6A fast blow fuse for power and output line protection.

F1: Protection fuse for the power of safety relay module
F2: Protection fuse fot rhe output of safety relay module
K1 to 4: Safety contactor

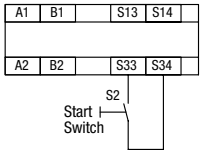
Although two input channels are used, short-circuit cannot be detected in the wiring shown below. Safety category becomes 3.



When not using a start switch (automatic start)



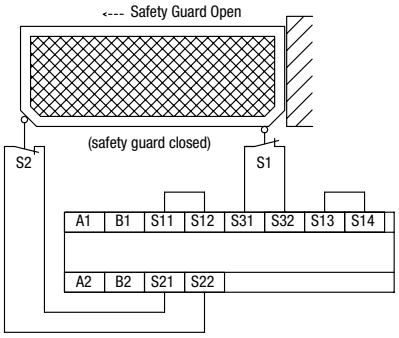
When monitoring the start switch (detecting the OFF status of start switch)



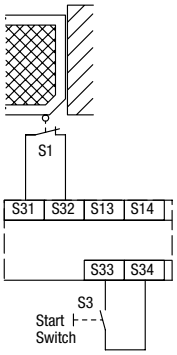
Below are example of an emergency stop switch.

Two limit switches/without synchronization monitor

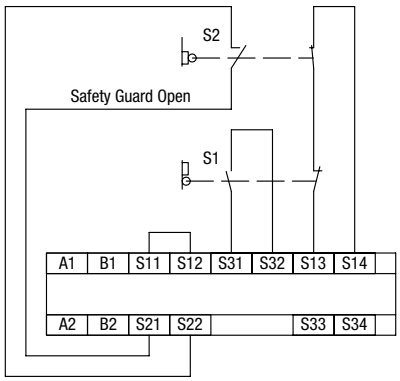
Automatic Start

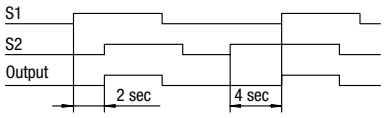


Using a Start Switch



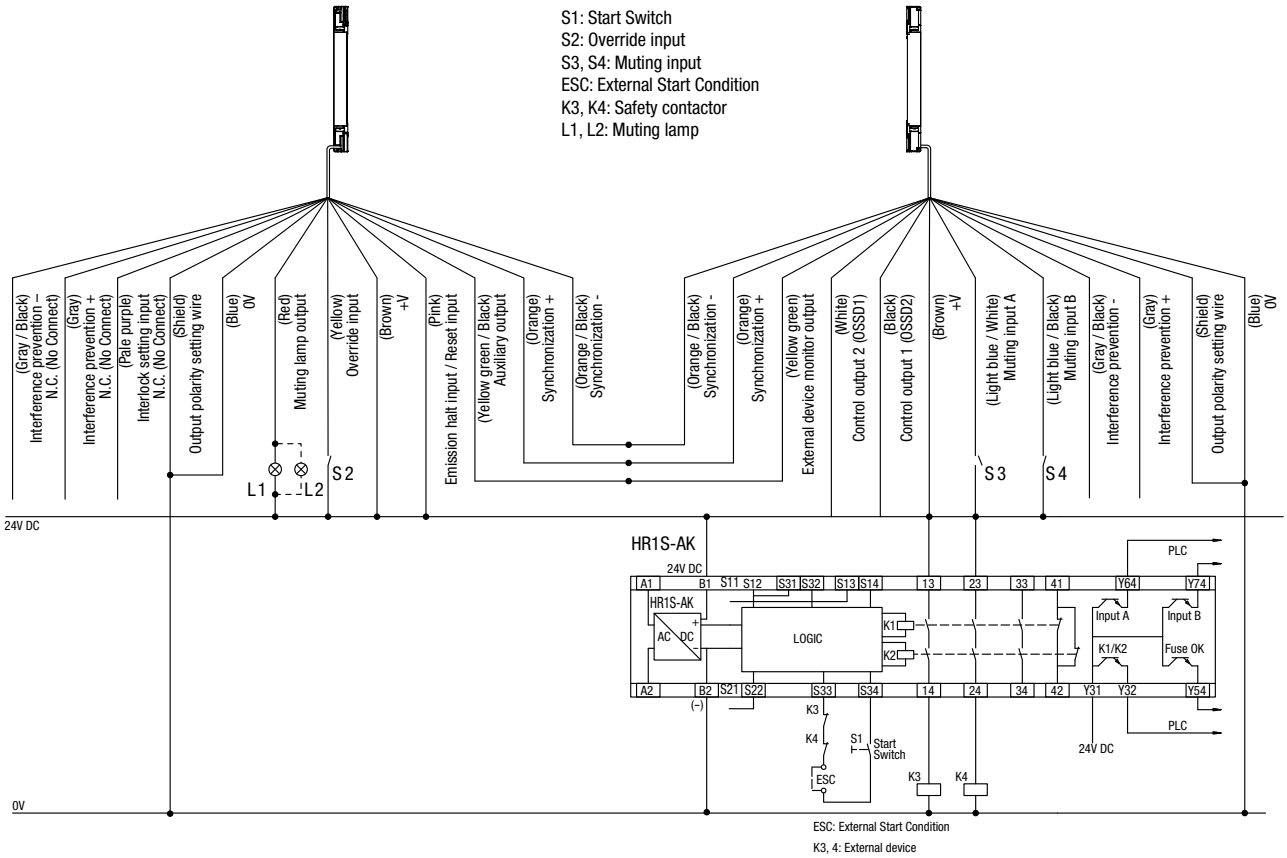
Two limit switches with synchronization monitor (Synchronization monitor is effective for automatic start only.)





When using a safety light curtain

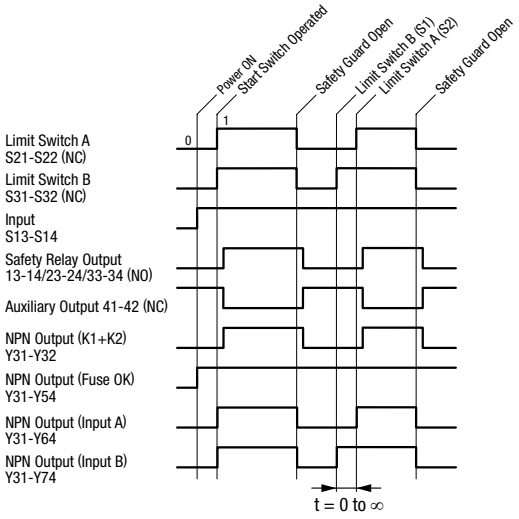
S1: Start Switch
S2: Override input
S3, S4: Muting input
ESC: External Start Condition
K3, K4: Safety contactor
L1, L2: Muting lamp



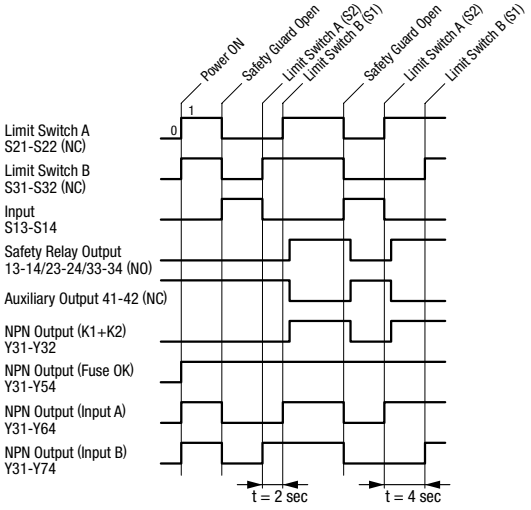
ESC: External Start Condition
K3, 4: External device

Operation Chart

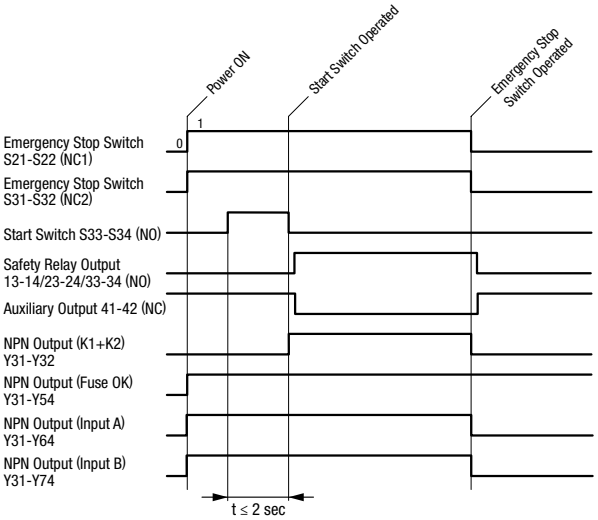
Safety guard application using two limit switches (automatic start mode)



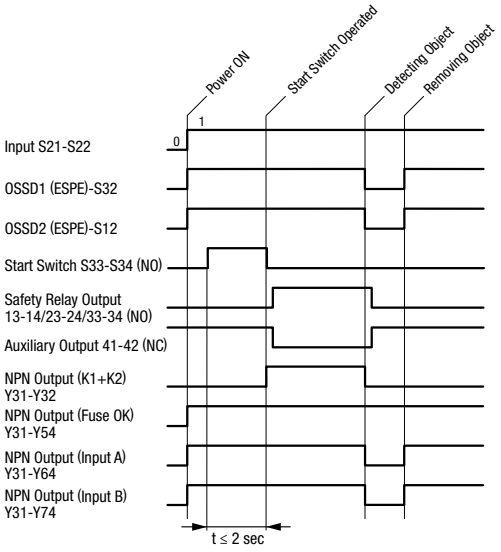
Safety guard application using two limit switches (automatic start mode, synchronization monitor mode)



Using emergency stop switches (start switch monitor mode)



Using OSSD output of safety light curtain (ESPE)



⚠ Residual Risk (EN292-1, 5.5)

The wiring diagrams in this catalog have been tested under actual operating conditions. The HR1S 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 the maintenance schedule strictly).

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

Instructions

- Do not disassemble the safety relay modules. Do not damage the seal.
- Negligence to observe the following instructions may cause accidents that result in death or serious injuries.
  - Connect the wires according to the wiring diagrams shown in this catalog.
  - Connect the wires according to the applicable standards.
  - The contacts of relays and contactors to connect with safety outputs must be forced guided compliant with EN 50205.
  - When maintaining or adjusting the machines, observe the maintenance schedule.
- Turn the power off before installation, removal, wire connection, maintenance, or inspection of the safety relay module in order to avoid electric shock or fire. Otherwise death or serious injury may be caused.
- When installing and wiring, provide sufficient distance from inverter or power line.
- Use 13-14, 23-24, and 33-34 outputs for stop category 0 compliant with EN 60204-1/EN 418.
- Do not use 41-42, Y31-Y32, Y31-Y54, Y31-Y64, or Y31-Y74 outputs for safety-related circuits.

HR1S-ATE Safety Relay Modules

Compact safety relay modules. Size is reduced by 50% from conventional models. Plug-in terminal structure enables simple wiring.

- EN ISO 13849-1 performance level e, safety category 4 compliant, and EN 62061 safety integrity level 3.
- Integrated and removable terminal styles available.
- Compact design: 45 mm in width.
- Time delay outputs: 3NO
- Auxiliary output enables power supply monitoring, inputs (2 channels), and a time delay output.
- UL Listed, CSA certified, TÜV NORD approved.

- See website for details on approvals and standards.

Package Quantity: 1

Part No.	Voltage	Terminal Style
HR1S-ATE5110	24V AC, -20% +10% 24V DC, -20% +20%	Integrated Terminal Block
HR1S-ATE5110P		Removable Terminal Block

Specifications

Applicable Standards			EN 60204-1: 2006 EN 60947-1: 2007 EN 60947-5-1:2004 EN 61000-6-2: 2005 EN 61000-6-4: 2007 EN 62061: 2005 EN ISO 13849-1: 2008 EN ISO 13849-2: 2008
Applicable Standards for Use			EN 60204-1: 2006 EN ISO 13850: 2008
Performance level (PL)			e (EN ISO 13849-1)
Safety Category			4 (EN ISO 13849-1)
Safety Integrity Level (SIL)			3 (EN 62061)
Stop Category			0, 1 (EN 60204-1) (Note)
Operating Temperature			–10 to +55ºC (no freezing)
Relative Humidity			30 to 85% RH (no condensation)
Impulse Withstand Voltage			4 kV (IEC 60947-5-1)
Shock Resistance			150 m/s², 11m sec, 3 shocks in each 3 axes
Vibration Resistance			10 to 60 Hz, amplitude 0.35 mm 60 to 150 Hz, acceleration 50 m/s²
Degree of Protection			Terminal: IP20 Enclosure: IP40
Rated Voltage			24V AC –20% +10% 24V DC –20% +20%
Power Consumption			24V AC: 8 VA max. 24V DC: 4W max.
Overcurrent Protection			Built-in, electronic
Minimal Applicable Load			17V DC / 10 mA (initial value)
Response Time			ON→OFF: 20 ms max. (Instantaneous output)
Overvoltage Category			III
Pollution Degree			2
Rated Insulation Voltage			300V AC
No. of Outputs	Safety Circuit		2NO
	Time-delay Circuit		3NO
	Auxiliary Circuit	Contact	—
		Transistor	4
Output Contact Ratings	Safety Circuit	AC15	C300 (Ue = 230V AC / Ie = 0.75A)
		DC13	24V DC / Ie=1A
	Time-delay Circuit	AC15	C300 (Ue = 230V AC / Ie=0.75A)
		DC13	Ue = 24V DC / Ie=1A
		Preset Time	0, 0.5, 1, 2, 4, 6, 8, 10, 15, 20, 25, 30 sec.
	Auxiliary Circuit		24V DC / 20 mA (PNP)

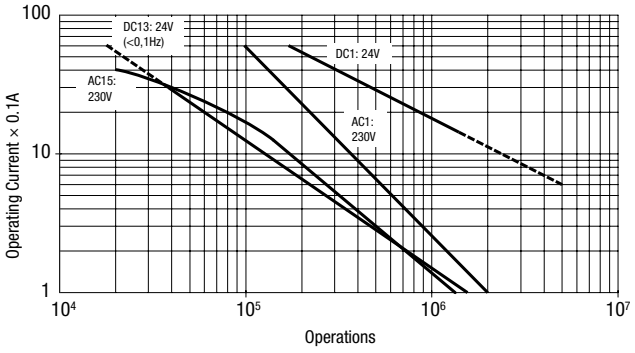
Mechanical Durability		10,000,000 operations
Electrical Durability		See below “Output Contact Electrical Life”.
Rated Current		Total output: 8A max. 1 output 4A max.
Wire Size	HR1S-ATE5110	Single wire: 0.2 to 2.5 mm² max. (24~14 AWG) Multiple wires: 0.14 to 0.75 mm² max.
	HR1S-ATE5110P	Single wire: 0.2 to 2.5 mm² max. (24~14 AWG) Multiple wires: 0.2 to 1.5 mm² max.
Weight (approx.)		280g

Note: Safety output contact Stop category 0
Time-delay output contact Stop category 1

- Use a 4A fuse (Type gG) for power protection.Use a 6A fuse (Type gG) for safety output protection. Use a 4A fuse (Type gG) for time-delay output and auxiliary output protection.

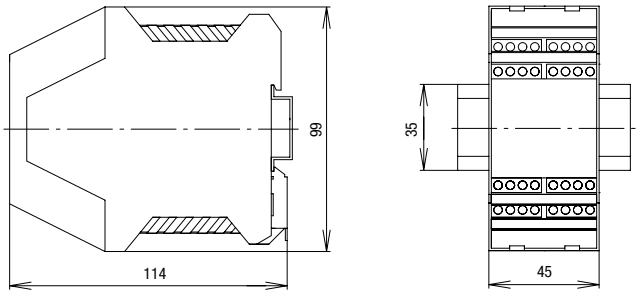
Output Contact Electrical Life

(Safety Circuit, Time-delay Circuit, Auxiliary Circuit)

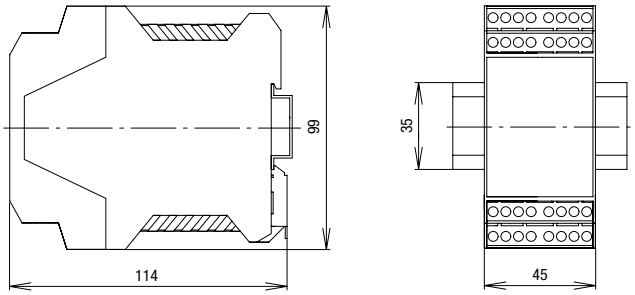


Dimensions

HR1S-ATE5110 Integrated Terminal

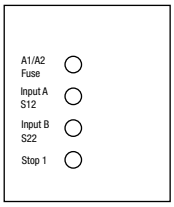


HR1S-ATE5110P Removable Terminal



All dimensions in mm.

LED Indicator

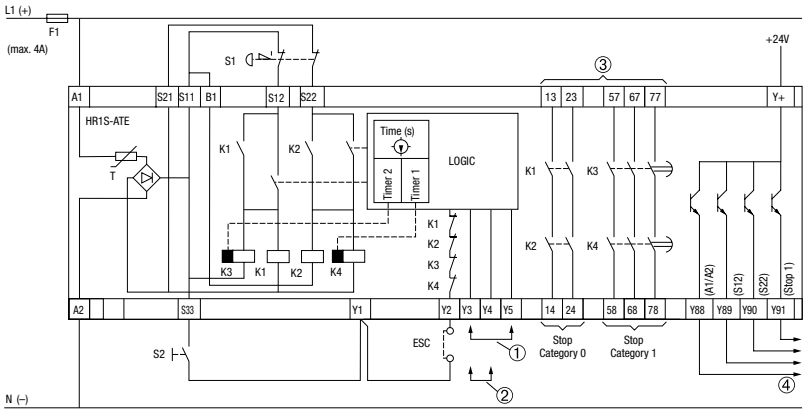


- A1/A2 Fuse: Turns on when power circuit is normal.
- Input A S12: Turns on when S11–S12 is closed.
- Input B S22: Turns on when S21–S22 is closed.
- Stop1: Turns on when the time-delay output circuits 57-58, 67-68, and 77-78 are closed.

Wiring Diagram

Below are examples of wiring diagrams.

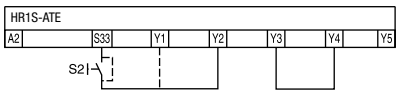
When using an emergency stop switch



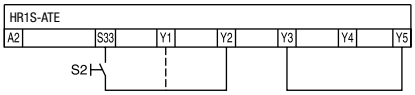
① When monitoring the start switch, starts when switched off (default setting/recommended)
② When monitoring the start switch, starts when switched on
③ Outputs must be fused (see the instruction manual for maximum fuse size)
④ To PLC, etc.
Note: When using off-delay output, safety category becomes 3.

S1 = Emergency stop switch with 2 NC contacts (recommended)
S2 = Start switch
ESC = External start conditions
Y1 (S33) – Y2 = Feedback loop

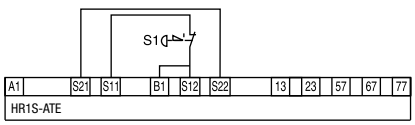
When not monitoring the start switch (Y3-Y4 short-circuited) (automatic start when S33-Y2 is short-circuited)



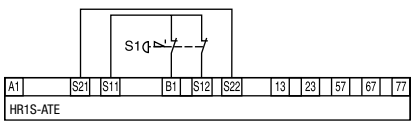
When monitoring the start switch (Y3-Y5 short-circuited)



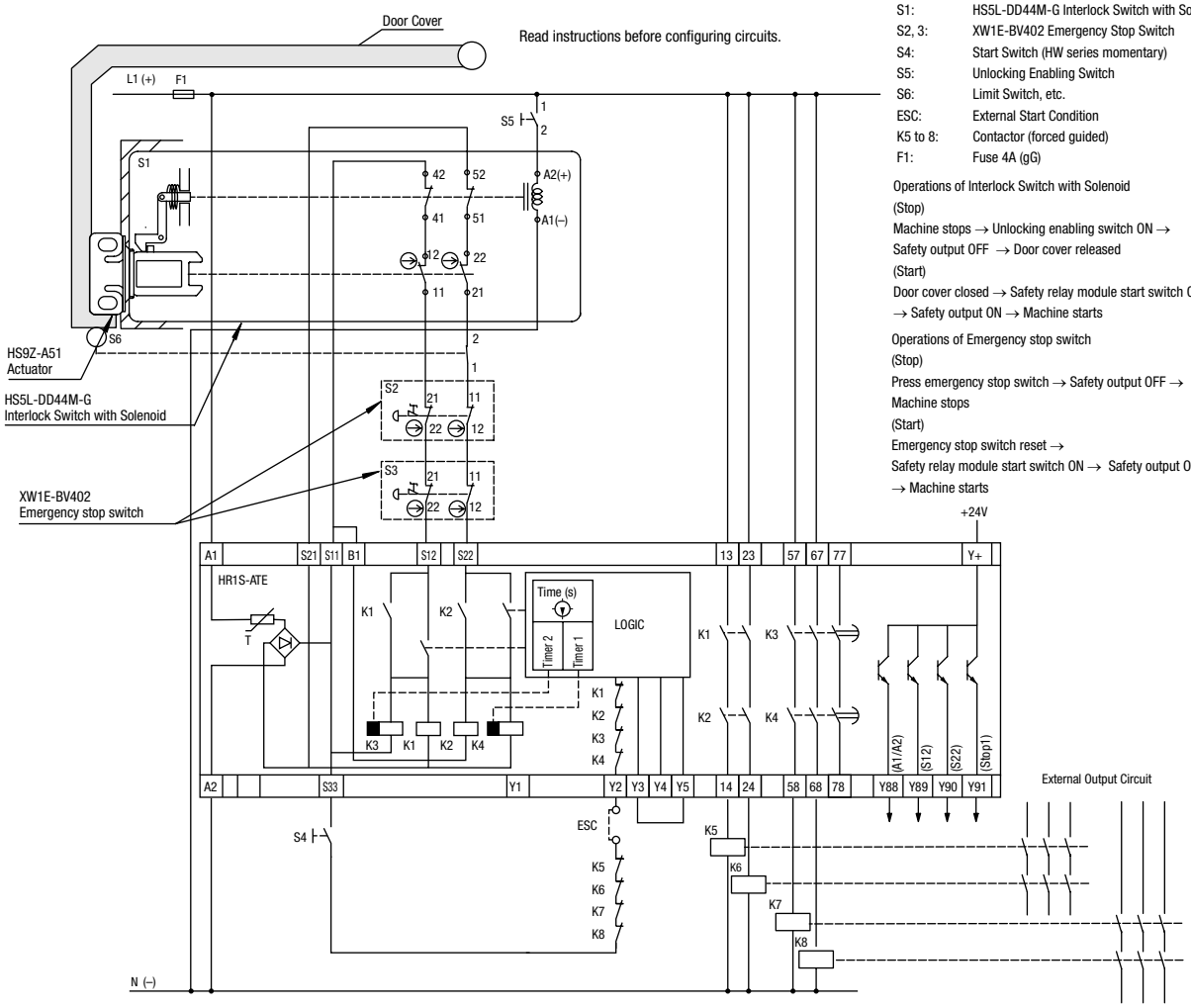
Emergency stop switch - Input 1 channel When not detecting short-circuit (All failures such as short-circuit of emergency stop switch wiring not detected)



Emergency stop switch - Input 2 channels When not detecting short-circuit (B1-S12 short-circuit not detected)



When using multiple emergency stop switches

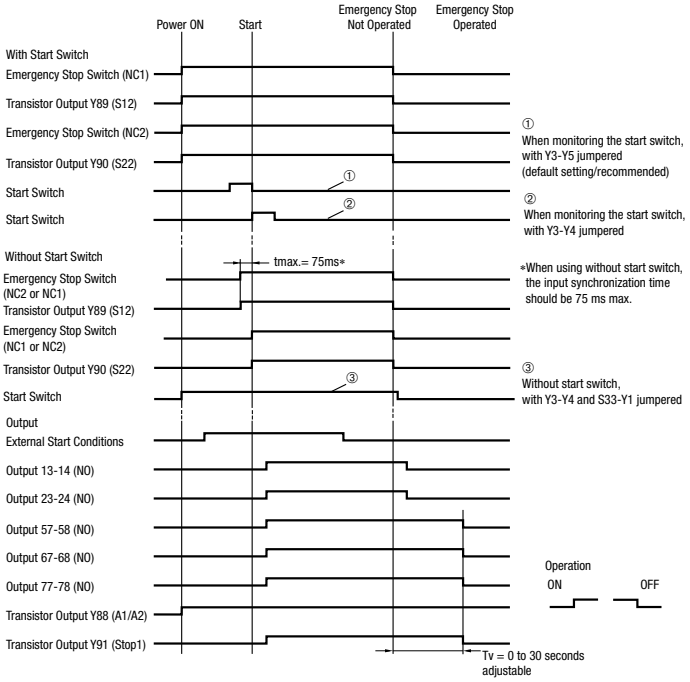


S1: HS5L-DD44M-G Interlock Switch with Solenoid
S2, 3: XW1E-BV402 Emergency Stop Switch
S4: Start Switch (HW series momentary)
S5: Unlocking Enabling Switch
S6: Limit Switch, etc.
ESC: External Start Condition
K5 to 8: Contactor (forced guided)
F1: Fuse 4A (gG)

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



⚠ Residual Risk (EN ISO/ISO12100-1)

The wiring diagrams on page 21 have been tested under actual operating conditions. The HR1S-ATE safety relay module can be used in a safety circuit by connecting to safety equipment compliant to applsicable standards. Consider residual risk in the following circumstances:

a) When it is necessary to modify the recommended circuit and if added/modified components are not properly integrated into the control circuit.

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

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

Instructions

- Only persons with technical expertise may install, startup, modify, or retrofit the HR1S-ATE safety relay module.
- Turn the power off before installation, removal, wiring, maintenance, or inspection of the safety relay module. If an error occurs, line voltage may be present at the control circuit in devices without DC isolation.
- Observe all electrical safety regulations issued by appropriate technical authorities or trade association. The safety function can be lost if the device is not used for its intended purpose.
- Do not open the housing or perform invalid operation, otherwise the warranty will become voided.
- Negligence to observe the following instructions may cause accidents that may result in death or serious injuries.
  - Connect the wires according to wiring diagrams.
  - Connect the wires according to applicable standards.
  - The contacts of relays and contactors to connected with safety outputs must be forced guided (compliant with EN 50205).
  - For external fusing, use an appropriate fuse size and connect according to wiring diagrams.
  - When maintaining or adjusting machines, observe the maintenance schedule.
  - If the recommended circuit is modified or if components are added/modified, make sure that they are properly integrated into the control circuit.
  - Relays must have mechanically-linked contacts.
  - Follow required standards applicable to the operation of the machine. When maintaining or adjusting machines, observe a proper maintenance schedule.
- Do not use the module if it has been subjected to improper or incorrect use. In this case, the warranty will be voided.
- Do not use the HR1S-ATE under stressful conditions such as irregular voltage, current, temperature, or humidity.
- Before starting up your equipment for the first time, be sure to check all safety functions according to regulations and observe the specified test cycles for safety equipment.
- Perform the following precautionary steps prior to installation, assembly, or disassembly of the system.

1. Disconnect the supply voltage to the equipment / system prior to starting work.
2. To prevent accidental activation of the module or system, perform lock-out or tag-out.
3. Make sure that no voltage is applied.
4. Ground N (–) as shown in the wiring diagrams.
5. Protect against adjacent operating components using guards or barriers.
6. The devices must be installed in a cabinet with a protection class of at least IP54.

- Contact Protection
  Type of protection according to EN/IEC 60529
  Housing / Terminals: IP40 / IP20
  Finger-safe protection according to EN 50274
- Connect external fuse according to wiring diagrams.

Ordering Terms and Conditions

Thank you for using IDEC Products.

By purchasing products listed in our catalogs, datasheets, and the like (hereinafter referred to as "Catalogs") you agree to be bound by these terms and conditions. Please read and agree to the terms and conditions before placing your order.

1. Notes on contents of Catalogs

(1) Rated values, performance values, and specification values of IDEC products listed in this Catalog are values acquired under respective conditions in independent testing, and do not guarantee values gained in combined conditions.
Also, durability varies depending on the usage environment and usage conditions.

(2) Reference data and reference values listed in Catalogs are for reference purposes only, and do not guarantee that the product will always operate appropriately in that range.

(3) The specifications / appearance and accessories of IDEC products listed in Catalogs are subject to change or termination of sales without notice, for improvement or other reasons.

(4) The content of Catalogs is subject to change without notice.

2. Note on applications

(1) If using IDEC products in combination with other products, confirm the applicable laws / regulations and standards.
Also, confirm that IDEC products are compatible with your systems, machines, devices, and the like by using under the actual conditions. IDEC shall bear no liability whatsoever regarding the compatibility with IDEC products.

(2) The usage examples and application examples listed in Catalogs are for reference purposes only. Therefore, when introducing a product, confirm the performance and safety of the instruments, devices, and the like before use. Furthermore, regarding these examples, IDEC does not grant license to use IDEC products to you, and IDEC offers no warranties regarding the ownership of intellectual property rights or non-infringement upon the intellectual property rights of third parties.

(3) When using IDEC products, be cautious when implementing the following.

i. Use of IDEC products with sufficient allowance for rating and performance

ii. Safety design, including redundant design and malfunction prevention design that prevents other danger and damage even in the event that an IDEC product fails

iii. Wiring and installation that ensures the IDEC product used in your system, machine, device, or the like can perform and function according to its specifications

(4) Continuing to use an IDEC product even after the performance has deteriorated can result in abnormal heat, smoke, fires, and the like due to insulation deterioration or the like. Perform periodic maintenance for IDEC products and the systems, machines, devices, and the like in which they are used.

(5) IDEC products are developed and manufactured as general-purpose products for general industrial products. They are not intended for use in the following applications, and in the event that you use an IDEC product for these applications, unless otherwise agreed upon between you and IDEC, IDEC shall provide no guarantees whatsoever regarding IDEC products.

i. Use in applications that require a high degree of safety, including nuclear power control equipment, transportation equipment (railroads / airplanes / ships / vehicles / vehicle instruments, etc.), equipment for use in outer space, elevating equipment, medical instruments, safety devices, or any other equipment, instruments, or the like that could endanger life or human health

ii. Use in applications that require a high degree of reliability, such as provision systems for gas / waterworks / electricity, etc., systems that operate continuously for 24 hours, and settlement systems

iii. Use in applications where the product may be handled or used deviating from the specifications or conditions / environment listed in the Catalogs, such as equipment used outdoors or applications in environments subject to chemical pollution or electromagnetic interference
If you would like to use IDEC products in the above applications, be sure to consult with an IDEC sales representative.

3. Inspections

We ask that you implement inspections for IDEC products you purchase without delay, as well as thoroughly keep in mind management/maintenance regarding handling of the product before and during the inspection.

4. Warranty

(1) Warranty period

The warranty period for IDEC products shall be one (1) year after purchase or delivery to the specified location. However, this shall not apply in cases where there is a different specification in the Catalogs or there is another agreement in place between you and IDEC.

(2) Warranty scope

Should a failure occur in an IDEC product during the above warranty period for reasons attributable to IDEC, then IDEC shall replace or repair that product, free of charge, at the purchase location / delivery location of the product, or an IDEC service base. However, failures caused by the following reasons shall be deemed outside the scope of this warranty.

i. The product was handled or used deviating from the conditions / environment listed in the Catalogs

ii. The failure was caused by reasons other than an IDEC product

iii. Modification or repair was performed by a party other than IDEC

iv. The failure was caused by a software program of a party other than IDEC

v. The product was used outside of its original purpose

vi. Replacement of maintenance parts, installation of accessories, or the like was not performed properly in accordance with the user's manual and Catalogs

vii. The failure could not have been predicted with the scientific and technical standards at the time when the product was shipped from IDEC

viii. The failure was due to other causes not attributable to IDEC (including cases of force majeure such as natural disasters and other disasters)

Furthermore, the warranty described here refers to a warranty on the IDEC product as a unit, and damages induced by the failure of an IDEC product are excluded from this warranty.

5. Limitation of liability

The warranty listed in this Agreement is the full and complete warranty for IDEC products, and IDEC shall bear no liability whatsoever regarding special damages, indirect damages, incidental damages, or passive damages that occurred due to an IDEC product.

6. Service scope

The prices of IDEC products do not include the cost of services, such as dispatching technicians. Therefore, separate fees are required in the following cases.

(1) Instructions for installation / adjustment and accompaniment at test operation (including creating application software and testing operation, etc.)

(2) Maintenance inspections, adjustments, and repairs

(3) Technical instructions and technical training

(4) Product tests or inspections specified by you

The above content assumes transactions and usage within your region. Please consult with an IDEC sales representative regarding transactions and usage outside of your region. Also, IDEC provides no guarantees whatsoever regarding IDEC products sold outside your region.

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