Safety Control Relay HR1S-ATE

- EN ISO 13849-1 Performance Level e, Safety Category 4 compliant, and EN 62061 Safety Integrity Level 3.
- Integrated and removable teminal styles available.
- Compact design: 45 mm in width.
- Time delay outputs: 3NO
- Auxiliary outputs enable monitoring of power, safety inputs, and a time delay output
- Environmentally friendly, RoHs directive compliant.
- UL Listed, CSA certified, TÜV NORD approved.

Part Numbers

Part Numbers	Terminal Style
HR1S-ATE5110	Integrated Terminal Block
HR1S-ATE5110P	Removable Terminal Block

Specifications

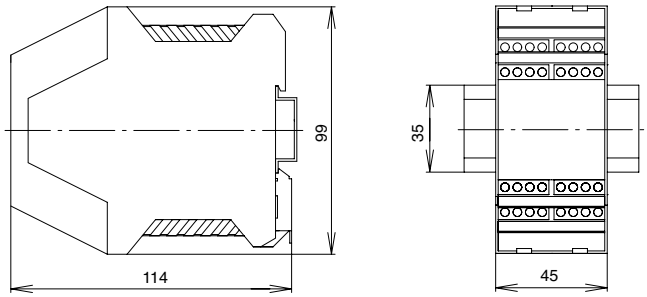
Applicable Standards			EN 60204-1: 2007, EN 60947-1: 2007 EN 60947-5-1:2004, EN 61000-6-2: 2005 EN 61000-6-4: 2007, EN 62061: 2005 EN ISO 13849-1: 2008, EN ISO 13849-2: 2008
Applicable Standards for Use			EN 60204-1: 2006 EN ISO 13850: 2008
Performance Level (PL)			e (EN ISO 13849-1)
Safety Category			4 (EN ISO 13849-1)
Safety Integrity Level (SIL)			3 (EN 62061)
Stop Category			0, 1 (EN 60204-1) (Note)
Operating Temperature			–10 to +55°C (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 to OFF: 20 ms max. (instantaneous output)
Overvoltage Category			III
Pollution Degree			2
Rated Insulation Voltage			300V AC
Safety Outputs	Instantaneous (Stop Cat 0)		2NO
	Time-delay (Stop Cat 1)		3NO
	Monitor Contacts		4NO (PNP)
Output Contact Ratings	Safety Circuit	AC15	C300 (230V AC / Ie=0.75A)
		DC13	24V DC / Ie=1A
	Time-delay Circuit	AC15	C300 (230V AC/ Ie=0.75A)
		DC13	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 Life			See Output Contact Electrical Life graph (last page)
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

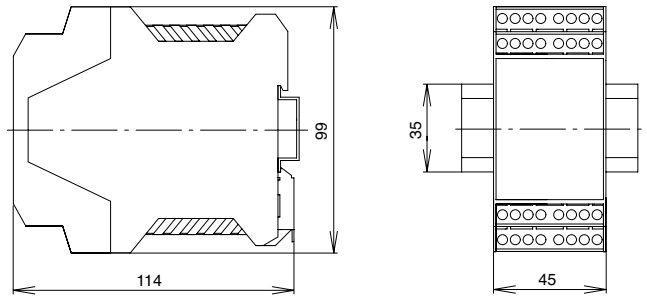
- Use a 4A fuse (Type gG) for power protection. Use a 6A fuse (Type gG) for safety output protection. Use a 4A fuse (Type gG) for time-delay output and auxiliary output protection.

Dimensions (mm)

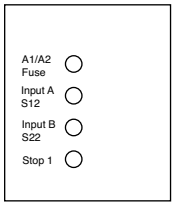
HR1S-ATE5110 Integrated Terminal Type



HR1S-ATE5110P Removable Terminal Type



LED Indicator

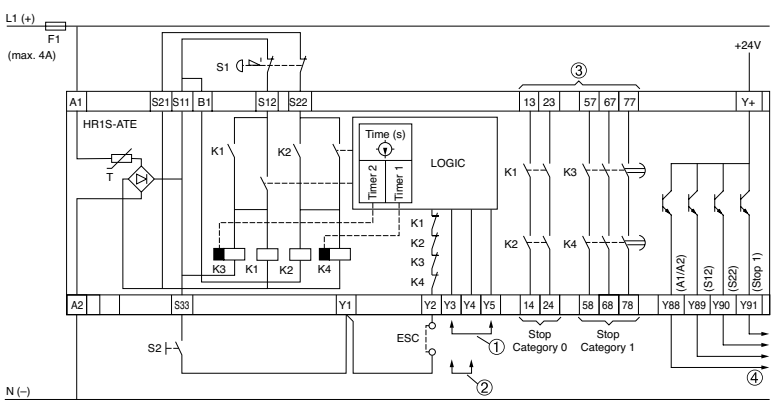


- A1/A2 Fuse: Turns on when power circuit is normal.
- Input A S12: Turns on when S11–S12 is closed.
- Input B S22: Turns on when S21–S22 is closed.
- Stop1: Turns on when the time-delay output circuits 57-58, 67-68, and 77-78 are closed.

HR1S-ATE Wiring Diagram

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

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

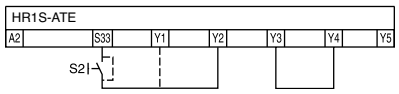


1. When monitoring the start switch, starts when switched off (default setting/recommended)
2. When monitoring the start switch, starts when switched on
3. Outputs must be fused (see the instruction manual for maximum fuse size)
4. To PLC, etc.

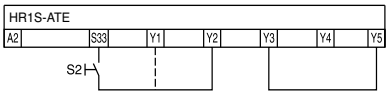
Note: When using off-delay output, safety category becomes 3.

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)

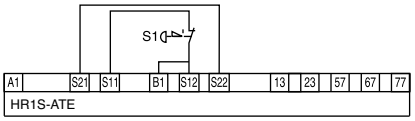


When monitoring the start switch (Y3-Y5 short-circuited)



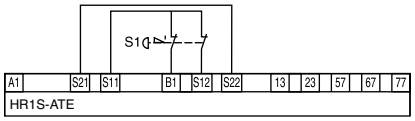
Emergency stop switch - Input 1 channel

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

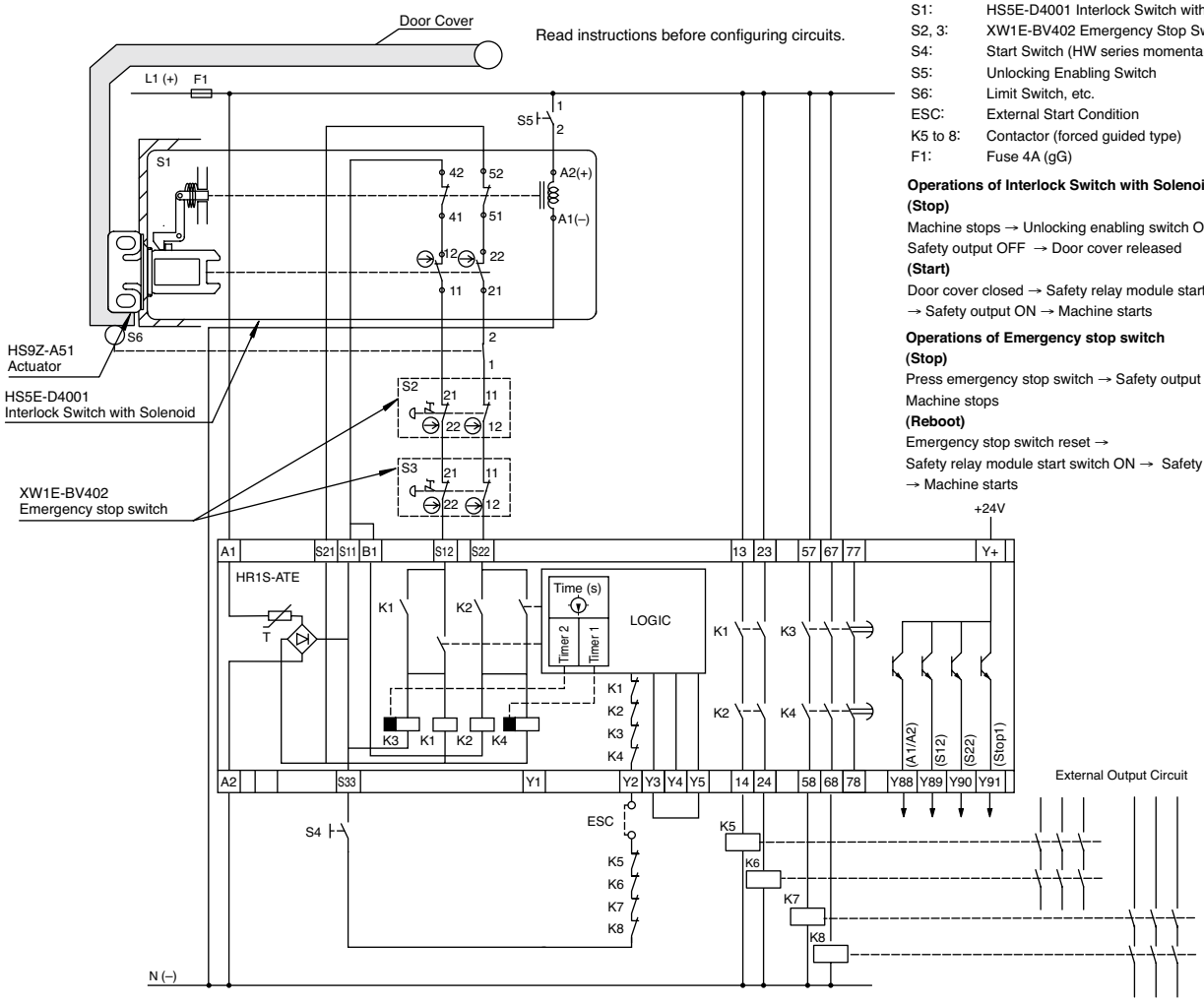


Emergency stop switch - Input 2 channels

When not detecting short-circuit (B1-S12 short-circuit not detected)



Safety Category 3 Example Circuit (using multiple emergency stop switches)

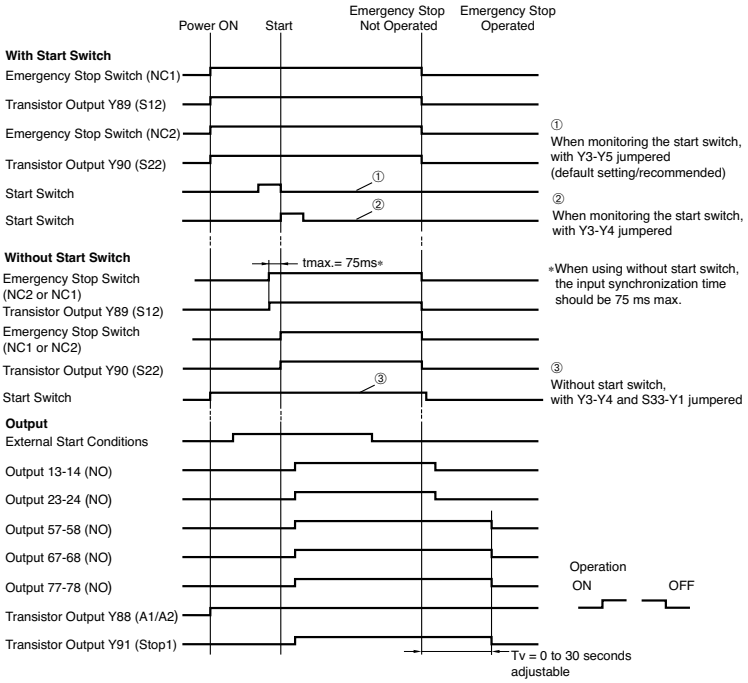


S1: HS5E-D4001 Interlock Switch with Solenoid
S2, 3: XW1E-BV402 Emergency Stop Switch
S4: Start Switch (HW series momentary)
S5: Unlocking Enabling Switch
S6: Limit Switch, etc.
ESC: External Start Condition
K5 to 8: Contactor (forced guided type)
F1: Fuse 4A (gG)

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

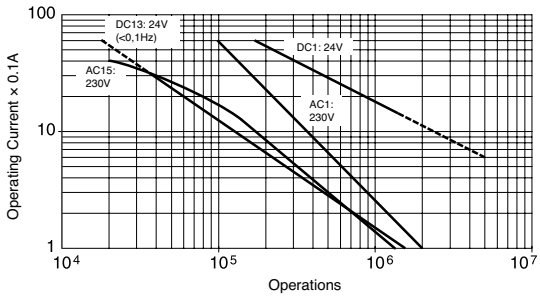
Operations of Emergency stop switch
(Stop)
Press emergency stop switch → Safety output OFF → Machine stops
(Reboot)
Emergency stop switch reset → Safety relay module start switch ON → Safety output ON → Machine starts

HR1S-ATE Operation Chart



Output Contact Electrical Life

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



Residual Risk (EN ISO/ISO12100-1)

The wiring diagrams on previous page 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 applicable 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 the wiring diagrams shown on previous page.
· 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 the wiring diagram on previous page.
· 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 in conditions where irregular voltage, current, temperature, or humidity could occur.
- 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 diagram on previous page.
  5. Use guards or barriers to protect against components operating adjacent to the safety relay module.
  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 / Teminals: IP40 / IP20
  Finger-safe protection according to EN 50274
- Connect external fuse according to the wiring diagram on page 3.

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