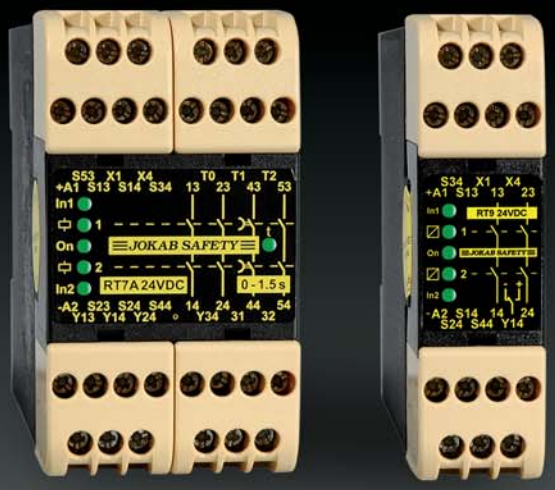
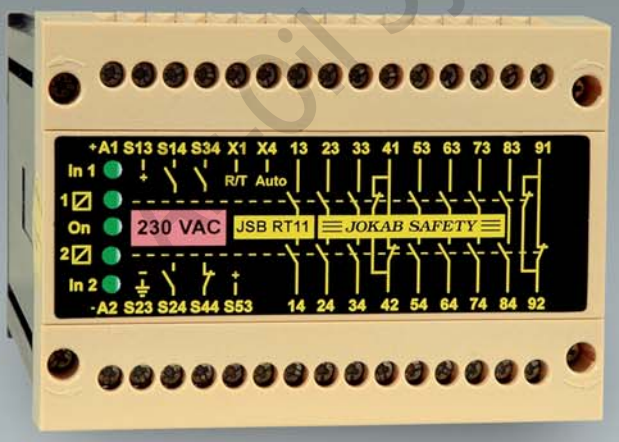


Our universal safety relays offer various input options for use with many different safety devices and risk levels.



Safety Relays

Meet existing safety standards!
Supervise safety devices!
Safe stops and reliable restarts!

Why should I use Safety Relays?

...to meet existing safety standards!

"A fault in the control circuit logic, or failure of or damage to the control circuit must not lead to dangerous situations." This is the declaration of the EU's Machinery Directive and EN 292-2: 1991 under the heading 1.2.7. *"Failure of the control circuit"*. The directive implies that no person should be put at risk if for example, a relay sticks or if a transistor or two electrical conductors short-circuit.

A safety relay will fulfill these requirements. A safety relay has, for example, inputs that are checked for short-circuits and dual redundant circuits that are checked at each operation. This can be compared to the dual brake circuits in a car. If one of the circuits is faulty the other will stop the car. In a safety relay there is an additional function which only allows a machine to start if both circuits are ok.

The safety standard describes various safety categories depending on the level of risk and application. One single universal relay with selectable safety categories solves this.

...to supervise safety devices!

Light Beams

Light Curtains

3-Position Devices

2-Hand Devices

Safety Interlock Switches

Emergency Stop Buttons

Safety Strips and Bumpers

Safety Guard Mats

...for safe stops and reliable restarts!

Dual stop signals when the gate is opened...

Entering or putting a hand or limb into a hazardous area, must cause all machines that can cause a personal injury to stop safely. Many serious accidents occur when machinery is believed to have stopped but is in fact only pausing in its program sequence. The safety relay monitors the gate interlock switch, the cables and gives dual stop signals.

Supervised reset when there can be a person within the risk area...

Make sure that nobody is within the restricted area when activating the reset button. A supervised reset button must be pressed and released before a reset can occur. Many serious accidents have been caused by an unintentional and unsupervised reset.

Timed reset when you cannot see the entire risk area...

Sometimes a double reset function is necessary to make sure that no one is left behind in the risk area. First, after ensuring no other person is inside the hazardous area, the pre-reset button must be activated, followed by the reset button outside the risk area within an acceptable time period e.g 10 seconds. A safety timer and a safety relay can provide this function.

Automatic reset for small hatches...

Where body entry is not possible through a hatch, the safety circuit can be automatically reset.

The safety relays are reset immediately when the hatch interlock switch contacts are closed.

The Smallest and Most Flexible Safety Relays on the Market!

We have the most flexible safety relays on the market. Our first universal relay was developed nearly 20 years ago. Today the flexibility is even greater and the size has been reduced by 85%.

A universal relay is a safety relay with various input options for various safety devices and risk levels. Internally, the safety relay is of the highest safety level (category 4 according to EN 954-1/EN ISO 13849-1)). A machine supplier can therefore, with one single safety relay, select the input configuration that best suits his customer's safety requirements. In addition, our safety relays have detachable connector blocks for ease of replacement and testing.

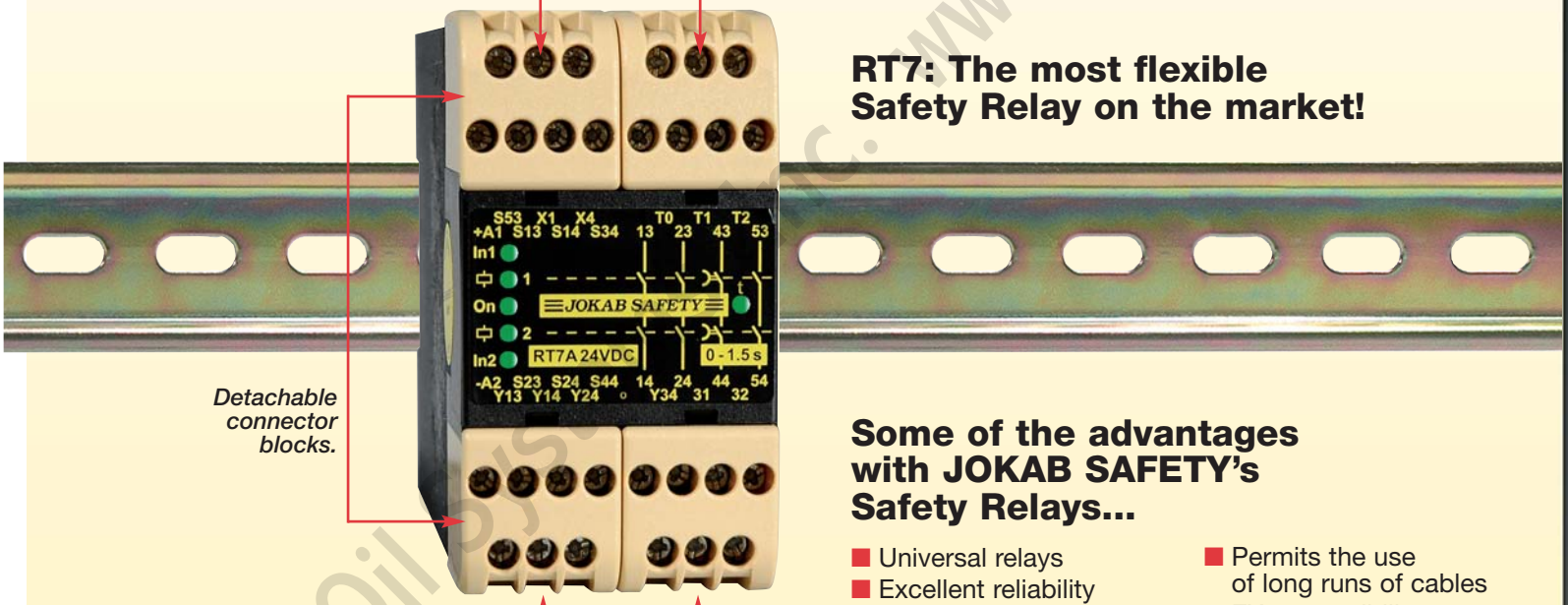
As our universal relay incorporates all input options, it is compatible with all our previous safety relays as well as with other manufacturers products.

Is a universal relay expensive? No, our latest patented construction is extremely simple and the number of major components is less compared to our previous universal relays. This means that our safety relays are even more reliable and economical than before.

We also have gained a great deal of experience from creating safety solutions for our own systems. It would be our pleasure to share these experiences with you! Please do not hesitate to contact us if you should require any other safety solutions.

Inputs for various safety devices

Input for manual or automatic resetting.



Detachable connector blocks.

Outputs for program stop, gate opened or closed and reset indication.

Safety outputs for immediate and delayed stops at optional times.

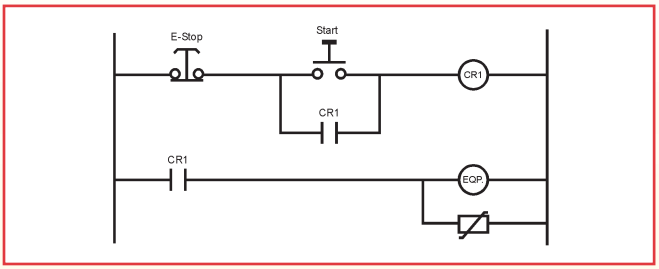
RT7: The most flexible Safety Relay on the market!

Some of the advantages with JOKAB SAFETY's Safety Relays...

- Universal relays
- Excellent reliability
- Approved in Europe, USA, Canada
- Supervised reset
- Time reset
- Small and compact
- Detachable connector blocks
- Low power consumption
- Permits the use of long runs of cables
- EX compatibility
- Functions set by external hardwired links
- LED indication and outputs for indication
- Powerful switching capacity

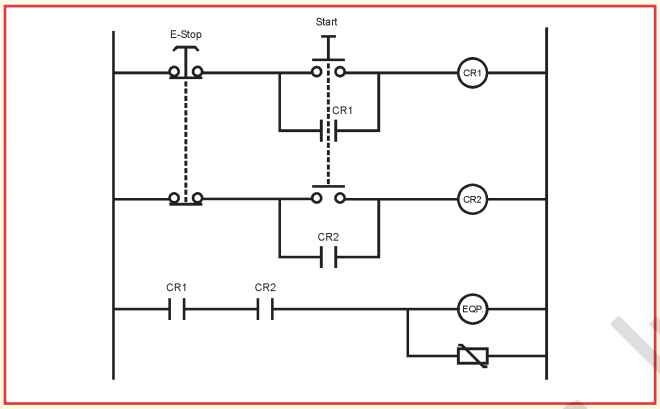
Creating a Control Reliable Safety Systems

Where required by the appropriate ANSI standard (example clause 4.5.4 of RIA 15.06.1999), the importance of using safety relays to achieve control reliable circuits can be explained. Control Reliable Systems must be designed “such that a single component failure within the system does not prevent the stopping action from taking place but will prevent successive system cycle until that failure has been corrected.”



Ladder Diagram of a Common Emergency Stop Circuit

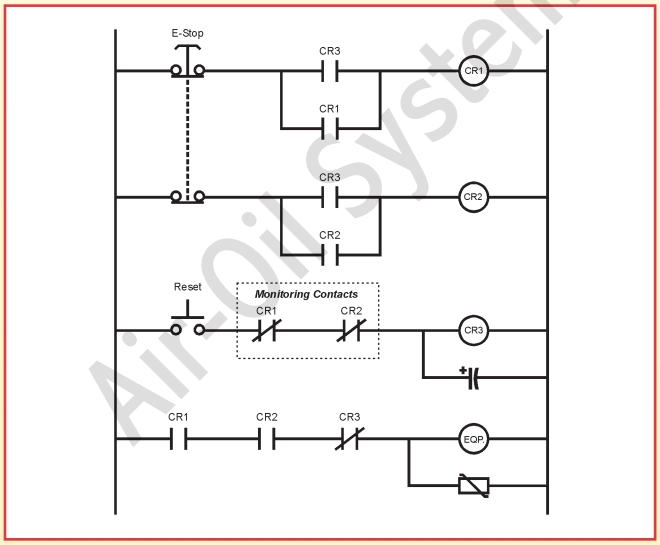
In this typical emergency stop circuit the weakest link is relay CR1. The contacts of CR1 can weld closed or, since this relay is spring applied, it can fail mechanically. If this failure occurred, energy to the load would continue resulting in an UNSAFE CONDITION that would cause machine damage and/or personnel injury. ANSI standards and OSHA regulations demand prevention of such a condition.



Ladder Diagram using two Force-Guided Relays to Achieve Redundancy

According to the definition of control reliability we need to guard against failure of CR1. It is one source for a single component failure. Redundancy is not sufficient. If one of the two relays fail you are back to square one—with redundancy lost, the second relay could fail on a subsequent machine cycle.

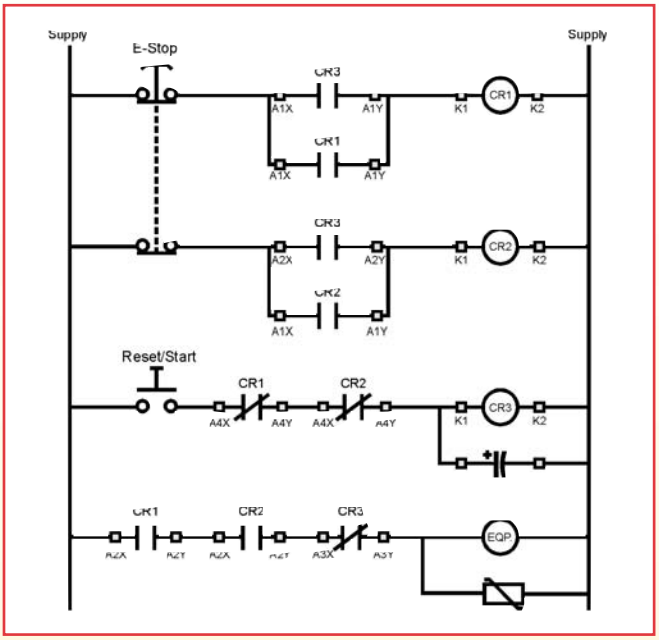
We must monitor the condition of the redundant relays. Force or positive guided relays provide the best solution to accomplish monitoring.



Ladder Diagram of a Circuit using three Force-Guided Relays

This circuit is approaching control reliable. Using positive guided relays offers redundancy and cross-monitoring, but does not monitor for short circuits or reset problems.

Note: Safety Category only refers to the safety relay configuration, input devices, output devices and wiring must be considered for a safety category of the system.



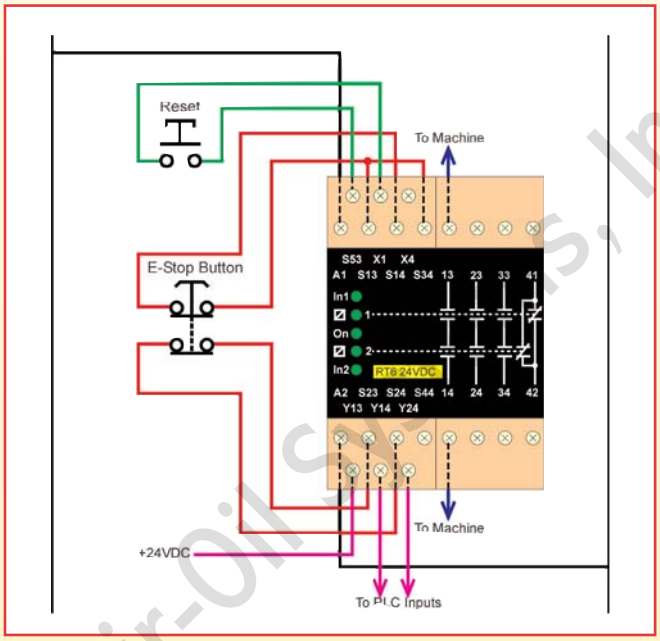
Ladder Diagram using three Force-Guided Relays

Advantages:

- Has redundancy and cross-monitoring

Disadvantages (in comparison to the Jokab Safety Relay):

- No safety approvals
- 38 wiring points
- High chance of wiring errors
- Installation is labor intensive
- More costly
- Larger in overall size (panel space)
- Easy to tamper with and bypass connections
- No short circuit protection on the inputs
- Reset is not monitored
- Difficult to troubleshoot
- The more contacts needed, the more complicated the circuit.



Wiring Diagram using a RT6 Jokab Safety Relay connected in Input Configuration Mode 4 to Achieve Control Reliability Electrically

Advantages (in comparison to the 3 Force-Guided Relays Circuit):

- Control reliable electrically
- Has redundancy and cross-monitoring
- 4 input configuration modes which are hardwire selectable (selectable category of safety)
- 2 reset configuration modes which are hardwire selectable
- Manual supervised reset mode monitors the button and wiring against failure
- Input configuration modes 3 and 4 monitor all input devices and wiring against failure
- Monitors external positive or force-guided contactors/relays
- Universal (multi-purpose)
- Retrofits easily into existing systems
- 5 LED indicators: Power On, Input 1, Input 2, Output K1 and Output K2
- 3 NO safety outputs, 1 NC monitoring output
- 2 transistor outputs for input status and output status
- Available in a variety of source voltages
- Terminal strips are removable for easy change
- 17 wiring points
- Cost effective
- Compact in size (45 mm in width)
- Several safety approvals

Note: Safety Category only refers to the safety relay configuration, input devices, output devices and wiring must be considered for a safety category of the system.

Choice of Safety Category

"A fault in the control circuit logic, or failure of or damage to the control circuit must not lead to dangerous situations." This is the declaration of the EU's Machinery Directive and EN 292-2:1991 under the heading 1.2.7. "Failure of the control circuit", EN terminates on November 1, 2009 to be replaced completely by EN ISO 13849-1. during the transition period, it is possible to choose which of the two standards to apply. A further standard that can be applied to safety-related parts is EN 62061. Information concerning these standards can be found on the previous pages.

The significance of this statement is that a fault such as a jammed relay, a short circuit in a transistor or a short circuit between two conductors should and must not result in the safety function failing with the risk of consequent personal injuries.

Please note, "a fault" means that the system is only expected to handle one fault at a time. Two components failing at the same time is not regarded as likely as long as they cannot be made to fail by an external interference.

This safety requirement has not been recently introduced with the machine directive but has existed in other regulations for many years.

Choice of Category

It is above all a question of the technique available. Gate operation equipment can for example be fitted with a control led interlocking switch (category 1). However, interlocking circuits with relays and transistors, etc. normally require solutions in categories 2–4 in order to achieve a higher safety level than for standard control circuits.

Appendix B to EN954-1 shows an example of how a category is chosen. The example gives some guidance but is quite inadequate. The safety category is chosen based on the safety risk of the machinery. The risk is estimated based on the parameters S, F and P.

A RT9 with an optional safety category facilitates choice.

Methods for Increased Safety

In order to increase the reliability of a safety circuit, the following methods are usually used:

- Well-tried safety components/reliable components
- Redundancy/duplication
- Supervision

The European Standard EN 954-1

EN 954-1 is a standard specifically relating to safe control systems. The standard has a category system based on the above mentioned methods which increases the reliability of a safety function.

Category B

- Basic requirement
- Correctly rated components
- Circuits handling earth faults

Category 1

- All conditions of B apply
- Well-tried safety components and safety principles
- Components with a greater reliability

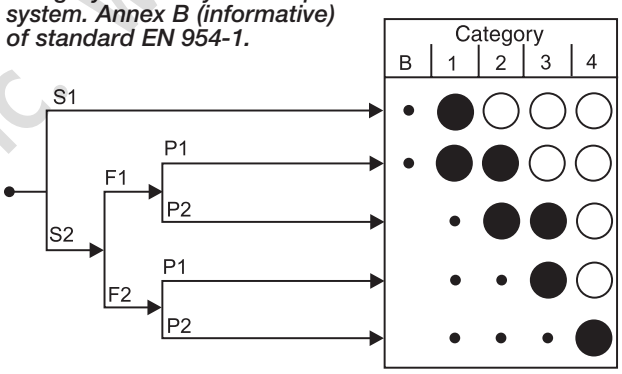
Category 2

- All conditions of B apply
- Individual supervised components
- The safety function may fail
- The loss of the safety function is detected by monitoring

Category 3 and 4

- All conditions of B apply
- The safety function is always retained during a failure
- The difference between category 3 and 4 is that certain types of fault are not detected in category 3.

Fig. 1 - Method for selecting a safety category for safety related parts of control system. Annex B (informative) of standard EN 954-1.



- Possible category which can require additional measures.

● Specified category according to this method.

○ Possible category according to this method.

S Severity of Injury

S1 Slight (normally reversible) injury

S2 Serious (normally irreversible) injury including death

F Frequency and/or Exposure Time to the Hazard

F1 Seldom to quite often and/or the exposure time is short

F2 Frequent to continuous and/or the exposure time is long

P Possibility of Avoiding the Hazard

P1 Possible under specific conditions

P2 Scarcely possible

By taking the three parameters S, F and P into account as shown in the drawing (Fig. 1), a recommended control system category can be obtained according to this method. However, the problem with this table is that it does not give a clear-cut answer but several alternatives. For example, an automatic production plant with estimated risk factors of S2 (serious injuries), F1 (seldom to quite often), P2 (scarcely possible to avoid an accident) comes under the categories 1 - 4 although categories 2 and 3 would be the preferred choice as these are marked with two black filled rings. A higher category can always be chosen and category 1 may also be chosen if the system's intended behavior is maintained. A justification for the deviation should also be given.

The fact that categories 1 and 4 are combined in the same safety circuit is due to the standard not specifying a strict hierarchical safety order. When comparing categories 2 - 4, category 4 is normally the safest. However, when comparing category 1 with categories 2, 3 and 4, this is not always a matter of course.

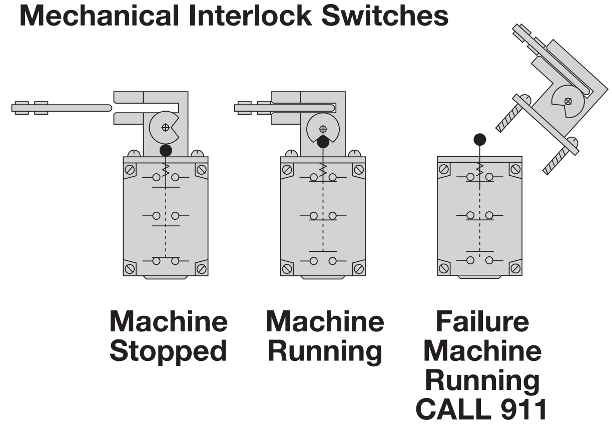
A Mechanical Switch Does Not Give a Safe Function

When it comes to mechanically operated interlocked switches, it has long been accepted a category 1 switch is adequate for many installations, which is also supported by several standards. However, some companies have now re-evaluated this and have instead started to demand two mechanical switches or non-contact switches/sensors, where they previously accepted single mechanical switches. Many reported incidents form the background to this. The requirements for switches to provide safe functioning are that they are mounted correctly and that their positions do not change during their life-cycle, in other words, ideal conditions. In many installations the location of hatches or doors changes over time. This has led to a switch not giving a stopping signal when an interlocked gate has opened. The reasons for this are many, but they can be summarized in mechanical deterioration or physical damage to a door/hatch. In turn this has led to an interlocked switch being affected by higher stress than the switch manufacturer's specifications. To avoid this type of malfunction it is more appropriate to use non-contact switches or sensors because mechanical deterioration does not affect the safety function, i.e. the stop signal is given directly if the position is wrong.

A non-contact switch/sensor does not have a guided function and is designed to fulfill the requirements in another way. The requirements are fulfilled either with dynamic sensors where the safety signal is monitored all the time and a fault directly leads to a stop signal or with a magnetic switch which has two independent contact elements which are monitored every time a gate opens. From the user's perspective the dynamic function is preferable because several sensors can be connected to a single safety module and still achieve category 4. Also the sensor's safety function is monitored without having to open a gate. For a magnetic switch the requirements for category 4 are only fulfilled if one switch per monitoring unit is used and if the gate is opened regularly.

Since the standard EN 954-1 was written, development has progressed and the costs to fulfill category 4 have dropped dramatically. Generally mechanical switches are replaced with non-contact sensors to increase the reliability of production equipment. The same goes for the safety side. With electronic non-contact switches, with a transmitter and a receiver, one avoids the problems of deterioration and excessive stress which harm the sensor. For that kind of sensor, dynamic monitoring is required to enable a safe function. This means that its function is constantly being monitored, hundred of times per second. The reaction time for a safe stop will then be the same during a malfunction as during the activation of a stop (e.g. a gate opening). The monitoring frequency will also be astronomical compared to that of mechanical switches and magnetic switches, which are only monitored every time they are used. In the new EN ISO 13849-1, which will replace 954-1, probability calculations are used together with different category levels to compare different "performance levels". Even when using EN ISO 13849-1 it can be so that one achieves reasonably high theoretical reliability with an electromechanical switch, although this presumes correct installation, proper use and otherwise ideal conditions. A non-contact switch instead provides high levels of both theoretical and practical reliability.

Mechanical Interlock Switches

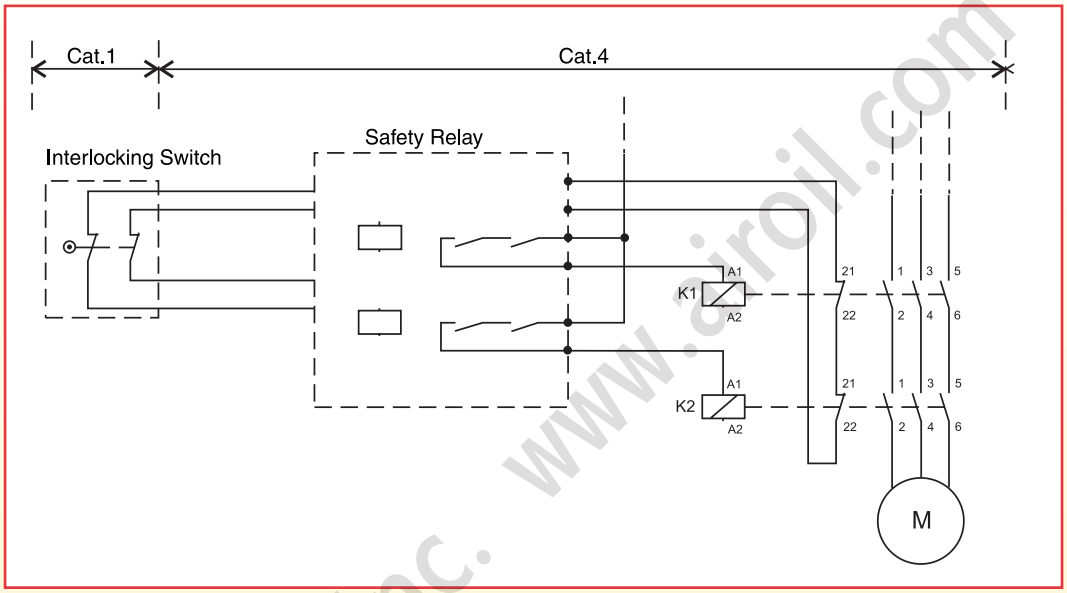


Choice of Safety Category continued

Our Conclusion...Use Dynamic Signals

Our conclusion is that today it is more cost effective, safer and more reliable to work with dynamic signals to achieve category 4 for sensors and monitoring units. In that case it is also possible to fulfill the Machinery Directive 1.2.7. requirement: ***"A fault in the control circuit logic, or failure of or damage to the control circuit, must not lead to dangerous situations."*** Also one does not have to discuss whether the correct safety category has been chosen. For more information reference the Vital Solution Section.

This figure shows a control system for automatic machinery. The system is a combination of categories 1 and 4. The interlocking switch has two contacts and has one actuator. The overall system safety category can therefore only be category 1. If the entire control system is to be category 4, the interlocking switch must be duplicated.



Safety Relays Summary

Which Safety Relay should you choose?

First of all, we would recommend the selection of one of our latest universal relays in the RT-series. These are both practical and cost effective. To facilitate the choice of safety relay or combinations of safety relays, please see:

- the table below dividing the safety relays into application fields
- the table on the opposite page showing possible input and output options
- the relevant data sheet giving comprehensive information about each specific safety relay
- the circuit diagram for various applications are located in 'Connection Examples' starting on page 48

Note: All earlier type of relays that can now be replaced by those in this manual are still kept as stock items and can be supplied upon request.

Application Fields

	Safety Relays								Safety Timers		Expansion Relays			
	RT6	RT7	RT9	JSBRT11	JSBR4	JSBT4	BT50T/BT51T	BT50/BT51	JSHT1A/B	JSHT2A/B/C	E1T	JSR1T	JSR2A	JSR3T
Interlocking Switch/Gate/Hatch	●	●	●	●	●	●	●	●						
Light Curtains	●	●	●	●										
Light Beams	●	●	●	●										
Safety Mats	●	●	●		●	●								
Contact Strips	●	●	●		●	●								
Two-Hand Control Device					●									
Emergency Stop	●	●	●	●	●	●	●	●						
Hold to Run/Enabling Device	●	●	●	●	●	●				●				
Foot Control Device	●	●	●	●	●	●				●				
Area Supervision	●	●	●	●	●	●								
Time Resetting									●					
Time Bypassing									●	●				
Inching										●				
Output Expansion	●	●	●	●		●	●	●			●	●	●	
Delayed Output		●					●				●	●		●

Input Alternatives

Single-Channel, 1 NO from +24V Safety Category 1

The input must be closed before the outputs can be activated. A stop signal is given when the input is opened.

Two-channel, 2 NO from +24V Safety Category 3

Both the inputs must be closed before the outputs can be activated. A stop signal is given if one or both of the inputs are opened. Both the inputs must be opened and reclosed before the outputs can be reactivated. A short-circuit between the inputs is not monitored by the safety relay. Category 4 can only be achieved if a safety device with short circuit monitored outputs is connected.

Two-Channel, 1 NO & 1 NC from +24 V Safety Category 4

One input must be closed and one must be opened before the outputs can be activated. A stop signal is given if one or both of the inputs change position or if the inputs short-circuit. Both inputs must be put into their initial position before the outputs can be reactivated.

Two-Channel, 1 NO from 0 V & 1 NO from +24 V Safety Category 4

Both the inputs must be closed before the outputs can be activated. A stop signal is given if one or both of the inputs are opened. Both the inputs must be opened and reclosed before the outputs can be reactivated. Stop signal is given if there is a short-circuit between the inputs.

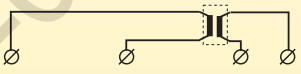
Note: If serial contacts are connected to the input the Safety Category is made lower for two-channel connections. Safety Category only refers to the safety relay configuration, input devices, output devices and wiring must be considered for a safety category of the system.

Technical Data

** indicates the possibility of selecting delayed outputs*
□ indicates one relay contact per output (other relays having two contacts per output)
‡ delayed
o category 4 depending on connection (see Pluto Safety PLC)
† fixed 0.5 s delay

	Safety Relays										Safety Timers		Expansion Relays			
	RT6	RT7	RT9	JSBRT11	JSBR4	JSBT4	BT50T	BT51T	BT50	BT51	JSHT1A/B	JSHT2A/B/C	E1T	JSR1T	JSR2A	JSR3T
Safety Category	1-4	1-4	1-4	1-4	4	4	1-4o	1-4o	1-4o	1-4o	1-4	1-4	1-4	1-4	1-4	1-3
Safety Input																
Single-Channel, 1 NO from +24 V	●	●	●	●			●	●	●	●	●	●	●	●	●	●
Two-Channel, 2 NO from +24 V	●	●	●	●												
Two-Channel, 1 NO & 1 NC from +24 V	●	●	●	●												
Two-Channel, 1 NO from 0 V & 1 NO from + 24 V	●	●	●	●	●	●					●	●	●	●	●	●
Contact Strips/Safety Mats	●	●	●		●	●										
Reset & Test Input																
Monitored Manual	●	●	●	●	●											
Automatic/Unmonitored Manual	●	●	●	●		●	●	●	●	●						
Testing of Contactors, Relays, Valves, etc.	●	●	●	●	●	●	●	●	●	●	●	●				
Output																
NO	3	2	2	7	3	3			3	4			4*	4*	4*	
NO Delayed		2					3	4					4*	4*		2□
NO Impulse Outputs											2□	2□				
NC	1	1		2	1	1			1					1*	1	
NC Delayed							1							1*		
Information Output	2	3	1				1	1								
Switching Capacity (Resistive Load)																
6A/250VAC/1500VA/150W	4	3	2	9	4	4	4‡	4‡	4	4			4	5		
4A/250VAC/1000VA/100W											2□	2□				2□
6A/250VAC/1380VA/138W		2‡														
10A/250VAC/1840VA/192W															5	
Width (mm)	45	45	22.5	100	45	45	22.5	22.5	22.5	22.5	45	45	22.5	45	45	22.5

Contact Strips & Safety Mats Safety Category 1



For an unpressurized mat/strip, both the relay inputs must be closed for the outputs to be activated. In the case of an activated mat/strip and short-circuit input channels, the relay will be de-energized. Current limitation prevents the safety relay from being overloaded when the channels short-circuit.

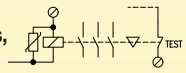
Monitored Manual Reset

A monitored reset means that the safety relay will not be reset if the reset button gets jammed when pressed in or if the input short-circuits. In order for the resetting to be complete, the input must be closed and opened before the outputs can close.

Automatic Reset

Automatic reset means that the outputs are closed immediately when both the input conditions are satisfied and the test input is closed.

Testing of Contactors, Relays & Valves



Can be carried out with both automatic and manual reset.

Note: If serial contacts are connected to the input the Safety Category is made lower for two-channel connections. Safety Category only refers to the safety relay configuration, input devices, output devices and wiring must be considered for a safety category of the system.

RT6 Safety Relay
Would you like a single safety relay for all your safety applications?

Then choose the RT6 universal relay to supervise both your safety devices and the internal safety of your machinery. In addition you can select the safety level required for each installation. All this is possible because the RT6 has the most versatile input option arrangement available on the market. Many other relays can therefore be replaced by the RT6.

The relay also comes with other options such as manual or automatic reset. Manual supervised reset can be used for gates and other safety devices that can be passed through. Automatic reset can be used for small hatches, if deemed acceptable from risk assessment.

The RT6 also has information outputs that follow the inputs and outputs of the relay. These outputs will for example indicate if a gate is open or closed and if the safety relay needs to be reset.

The RT6 is designed with a minimum amount of components thus keeping both production costs and component acquisitions to a minimum.

Choose the RT6 to simplify your safety circuits and reduce your costs.

Connection Examples

For examples of how our safety relays can solve various safety problems, see “Connection Examples” beginning on page 48.

Applications

- Emergency Stops
- Light Curtains
- Three Position Devices
- Interlocked Gates/Hatches
- Magnetic Switches
- Light Beams
- Safety Mats
- Contact Strips
- Foot-Operated Switches

Features

- Five input options
- Single or dual channel input
- Manual supervised or automatic reset
- Test input for supervision of external contactors
- Width 45 mm
- LED indication of supply, inputs, outputs, short-circuit and low voltage level
- 3 NO/1 NC relay outputs
- Two voltage free transistor information outputs
- 24 VDC
- 24, 48, 115 or 230 VAC
- Quick release connector blocks

Approvals

CERTIFIED BY inspecta

RT6 Technical Information

Inputs

The RT6 can be configured to operate in either of the following input options:

1. Single channel, 1 NO contact from +24 V DC, safety category 1.
2. Dual channel, 2 NO contacts from +24 V DC, safety category 3.
3. Dual channel 1 NO, 1 NC contact from +24 V DC, safety category 4.
4. Dual channel, 1 NO contact from 0V and 1 NO contact from +24 V DC, safety category 4.
5. Safety mats/contact strips 1 'contact' from 0V and 1 'contact' from +24 V DC, safety category 1.

Note: Safety category only refers to the safety relay configuration, input devices, output devices and wiring must be considered for a safety category of the system.

When the input/inputs are activated and the test/supervised reset is complete, relays 1 and 2 are energized. These are de-energized when the input/inputs are de-activated in accordance with the input option chosen or in case of a power failure. Relays 1 and 2 must both be de-energized before the RT6 can be reset.

Transistor Output Status Information

The RT6 has two voltage free transistor outputs that can be connected to a PLC, computer or other monitoring device. These outputs give the input and output status of the relay.

Reset and Testing

The RT6 has two reset options; manual and automatic. The manual supervised reset is used when the RT6 is monitoring safety devices that can be passed through, i.e. to ensure that the outputs of the safety relay do not close just because a gate is closed. The automatic reset should only be used if deemed an acceptable risk.

In addition, the RT6 can also test (supervise), if for example, contactors and valves etc. are de-energized/de-activated before a restart is allowed.

Indication of Low Voltage

The 'On' LED will flash if the relay supply voltage falls below an acceptable level. This indication will also be given if a monitored safety mat/contact strip is actuated. See connection option 5.

Safety Level

The RT6 has internal dual and supervised safety functions. Power failure, internal faulty component or external interference will not present a risk to options with the highest safety level. A manual reset requires that the reset input is closed and opened before the safety relay outputs are activated. A short-circuit or a faulty reset button is consequently supervised.

When the RT6 is configured for dual channel input, both the inputs are supervised for correct sequence operation before the unit can be reset.

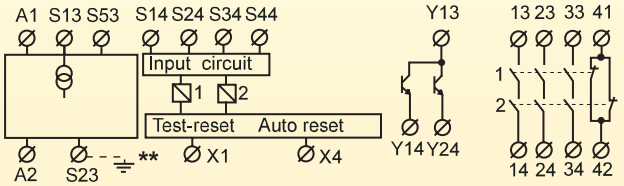
The input options 3 and 4 have the highest safety levels as all short-circuits and power failures are supervised. This in combination with double internal current limitation makes the relay ideal for supervision of safety mats and contact strips.

Regulations and Standards

The RT6 is designed and approved in accordance with appropriate directives and standards. Examples of such are: 98/37/EC, EN ISO 12100-1/-2, EN 60204-1 and EN 954-1/EN ISO 13849-1.

Connection Examples

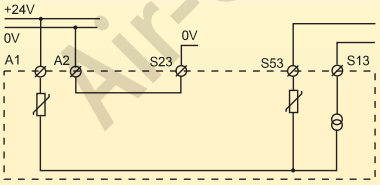
For examples of how our safety relays can solve various safety problems, see "Connection Examples" beginning on page 48.



****Only for AC supply***

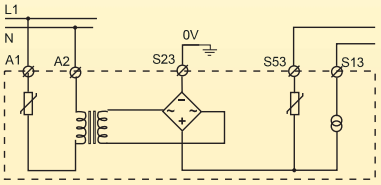
Connection of Supply

DC Supply



The RT6 DC option should be supplied with +24 V on A1 and 0 V on A2.

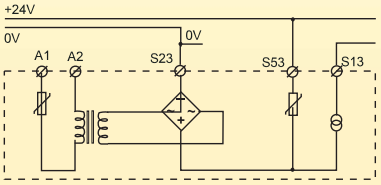
AC Supply



The RT6 AC option should be supplied with the appropriate supply voltage via connections A1 and A2.

The S23/⏚ must be connected to protective earth.

DC Supply of AC Units



All AC-units can also be supplied by +24 VDC to S53 (0VDC to S23).

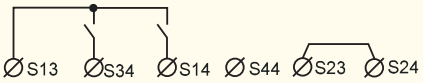
Note: With both DC and AC modules, if cable shielding is used this must be connected to an earth rail or an equivalent earth point.

RT6 Connection of Safety Devices

1. Single Channel, 1 NO from +24V

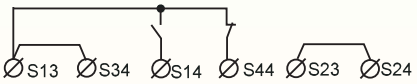
The input (contact to S14) must be closed before the outputs can be activated. When the input contact is opened the relay safety output contacts open.

2. Dual Channel, 2 NO from +24V



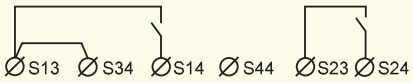
Both input contacts (S14 and S34) must be closed before the relay outputs can be activated. The safety relay contacts will open if one or both of the input contacts are opened. Both the input contacts must be opened and reclosed before the relay can be reset. A short-circuit between inputs S14 and S34 can only be supervised if the device connected to the inputs has short-circuit supervised outputs, e.g. Jokab Focus light curtains.

3. Dual Channel, 1 NO, 1 NC from +24V



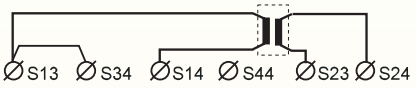
One input contact must be closed (S14) and one opened (S44) before the relay outputs can be activated. The safety relay contacts will open if one or both of the inputs change status or in case of a short-circuit between S14 and S44. Both inputs must return to their initial positions before the relay outputs can be reactivated.

4. Dual Channel, 1 NO from +24V, 1 NO to 0V



Relay functions as option 2, but a short-circuit, in this case between inputs S14 and S24, is supervised (safety outputs are opened).

5. Safety Mat or Contact Strip

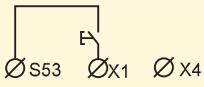


Both 'contact' inputs from a inactivated safety mat/contact strip must be made in order to allow the RT6 relay outputs to be activated. When the safety mat/contact strip is activated or a short-circuit is detected across S14-S23, the relay will de-energize (safety outputs open) and the 'ON' LED will flash. As output S13 has an internal current limit of 80 mA, the RT6 will not be overloaded when the mat/contact strip is activated or a short circuit is detected.

RT6 Reset Connections

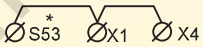
Manual Supervised Reset

The manual supervised reset contact connected to input X1 must be closed and opened in order to activate the relay outputs.



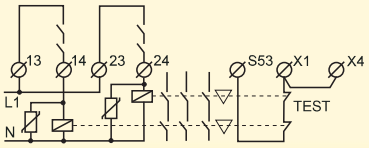
Automatic Reset

Automatic reset is selected when S53, X1 and X4 are linked. The relay outputs are then activated at the same time as the inputs.



connected to S13 for safety mat/contact strip

Testing External Contactor Status

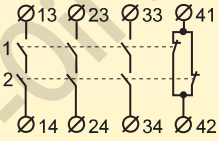


Contactors, relays and valves can be supervised by connecting 'test' contacts between S53 and X1. Both manual supervised and automatic reset can be used.

RT6 Output Connections

Relay Outputs

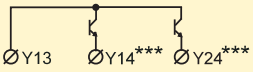
The RT6 has three (3 NO) safety outputs and 1 NC information output.



In order to protect the RT6 output contacts it is recommended that loads (inductive) are suppressed by fitting correctly chosen VDRs, diodes, etc. Diodes are the best arc suppressors, but will increase the switch off time of the load.

Transistor Outputs

The RT6 has two (2) voltage free transistor information outputs.



The transistor outputs are supplied with voltage to Y13, either from S53 (+24V) or an external 5-30 VDC. Y14 and Y24 follow the relay inputs and outputs as follows:

- Y14 becomes conductive when the relay input conditions are fulfilled.
- Y24 becomes conductive when both the output relays are activated.

******Note: These outputs are only for information purposes and must not be connected to the safety circuits of the machinery.***

RT6 Technical Data

Manufacturer.....JOKAB SAFETY
Ordering Data/Article Numbers.....see page 65
Color.....black and beige
Weight.....335 g (24 VDC), 485 g (24-230 VAC)

Supply
Voltage (A1-A2).....24 VDC +15/-20%, 24/48/115/230 VAC, +15/-10%, 50-60 Hz

Power Consumption
DC supply, nominal voltage.....<2.4 W
AC supply, nominal voltage.....5.3 VA

Connections S13.....Short-circuit protected voltage output, 70 mA +/- 10% current limitation. Is used for the inputs S14, S34 and S44

Connections S53.....Short-circuit protected voltage output, internal automatic fuse, max 270 mA. Is used for the reset and autoreset inputs X1 and X4.

Connections S23.....0V connection for input S24

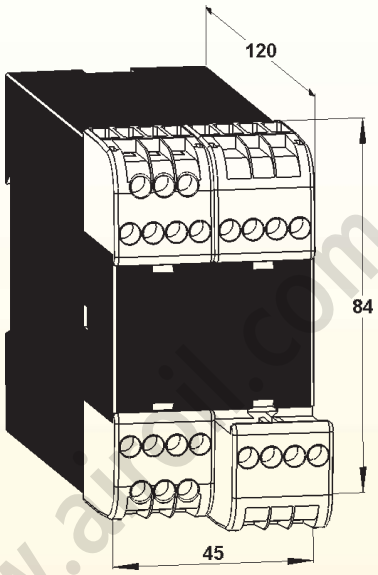
Safety Inputs
S14.....+24 VDC, 20 mA
S24.....0 VDC, 20 mA
S34.....+24 VDC, 20 mA
S44.....+24 VDC, 30 mA

Reset input X1
Supply for reset input.....+24 VDC
Reset current.....300 mA current pulse at contact closure, then 30 mA
Minimum contact closure time for reset.....100 ms

Maximum external connection cable resistance at nominal voltage for
S14, S24, S34.....300 Ohm
S44, X1.....150 Ohm

Response Time
At Power on DC/AC.....<90ms/<220ms
When activating (input-output).....<20 ms
When deactivating (input-output).....<20 ms
At Power Loss.....<150 ms

Relay Outputs
NO.....3
NC.....1
Maximum switching capacity res. load AC.....6A/250 VAC/1500 VA
Maximum switching capacity res. load DC.....6A/24 VDC/150 W
Minimum load.....10mA/10 V
(if load on contact has not exceeded 100 mA)
Contact material.....Ag+Au flash
Mechanical life.....>10^7 operations



Note: Connector blocks are detachable without cables having to be disconnected.

Transistor Outputs.....Short-circuit proof
External supply to Y13.....+5 to +30 VDC
Y14.....Indicates that the input conditions have been fulfilled
Y24.....Indicates that the output relays are activated
Maximum load of Y14, Y24.....15 mA /output
Maximum voltage drop at maximum load.....2.4 V

LED Indication

On ○.....Supply voltage OK, the LED is on
Flashing light in case of under-voltage, overload or short circuit on inputs

In 1 ○ **In 2** ○.....Indicates that the input conditions are fulfilled

▨ ○ **1** ▨ ○ **2**.....Indicates that the output relays are activated

Mounting
Rail.....35 mm DIN rail

Operating Temperature Range.....-10° C to + 55° C

Connection Blocks (detachable)
Maximum screw torque.....1 Nm
Maximum connection area
Solid conductors.....1x4mm²/2x1.5mm²/12AWG
Conductor with socket contact.....1x2.5mm²/2x1mm²
Air and creep distance.....4kV/2 IEC 60664-1

Protection Class
Enclosure.....IP 40 IEC 60529
Connection blocks.....IP 20 IEC 60529

RT7 Safety Relay Universal Relay with Delayed ‘Stop’ Outputs

The RT7 is a universal relay that can be used to supervise both safety devices and the internal safety of your machinery. In addition, you can select the safety level that is required for each installation. All this is possible because the RT7 has the most versatile input options arrangement available on the market. The RT7 can therefore replace many other relays.

The RT7 has four (4 NO) dual safety outputs of which two may be delayed for up to three seconds in order to achieve a safe and ‘soft’ stop. A ‘soft’ stop allows machinery to brake and stop gently before power is removed. A ‘soft’ stop has many benefits: The machinery life will be prolonged, processed products will not be damaged, and restarts from the stopped position are made possible and easier.

Another option with the RT7 is manual or automatic resetting. A manual supervised reset is used for gates and other safety devices that can be passed through, while an automatic reset is used for small safety hatches if deemed appropriate from a risk point of view.

In addition, the RT7 has information outputs that follow the inputs and outputs of the relay. These outputs indicate if for example a gate is opened or closed, if there is a delay or if the relay needs to be reset.

Choose the RT7 to simplify your safety circuits and reduce your costs.

Connection Examples

For examples of how our safety relays can solve various safety problems, see “Connection Examples” beginning on page 48.

Applications

- Emergency Stops
- Light Curtains
- Three Position Devices
- Interlocked Gates/Hatches
- Magnetic Switches
- Light Beams
- Safety Mats
- Contact Strips
- Foot-Operated Switches

Features

- Five input options
- Single or dual channel input
- Manual supervised or automatic reset
- Test input for supervision of external contactors
- Width 45 mm
- LED indication of supply, inputs, outputs, short-circuit and low voltage level
- 4 NO/1 NC relay outputs, 2 NO outputs can be delayed for soft stops
- Delay times: RT7A 0; 0.5; 1.0; 1.5 s RT7B 0; 1.0; 2.0; 3.0 s
- Three voltage free transistor information outputs
- 24 VDC
- 24, 48, 115 or 230 VAC
- Quick release connector blocks

Approvals

CERTIFIED BY inspecta

RT7 A/B Technical Information

Inputs

The RT7 can be configured to operate in either of the following input options:

1. Single channel, 1 NO contact from +24 VDC, safety category 1.
2. Dual channel, 2 NO contacts from +24 VDC, safety category 3.
3. Dual channel 1 NO, 1 NC contact from +24 VDC, safety category 4.
4. Dual channel, 1 NO contact from 0V and 1 NO contact from +24 VDC, safety category 4.
5. Safety mats/contact strips 1 'contact' from 0V and 1 'contact' from +24 VDC, safety category 1.

Note: *Safety category only refers to the safety relay configuration, input devices, output devices and wiring must be considered for a safety category of the system.*

When the input/inputs are activated and the test/supervised reset is complete, relays 1,2,3 and 4 are activated. Relays 1 and 2 are immediately de-energized when the inputs are deactivated in accordance with the input option selected. Relays 3 and 4 are either de-energized imme diately or after the selected time delay. All the relays (1,2,3 and 4) must be de-energized before the RT7 can be reset.

Transistor Output Status Information

The RT7 has three voltage free transistor outputs that can be connected to a PLC, computer or other monitoring device. These outputs give the input and output status of the relay.

Reset and Testing

The RT7 has two reset options; manual and automatic. The manual supervised reset is used when the RT7 is monitoring safety devices that can be passed through, i.e. to ensure that the outputs of the safety relay do not close just because the gate is closed. The automatic reset should only be used if deemed an acceptable risk.

In addition, the RT7 can also test (supervise), if for example, contactors and valves etc. are de-energized/ de-activated before a restart is allowed.

Indication of Low Voltage

The 'On' LED will flash if the relay supply voltage falls below an acceptable level. This indication will also be given if a monitored safety mat/contact strip is actuated. See connection option 5.

Safety Level

The RT7 has internal dual and supervised safety functions. Power failure, internal faulty component or external interference will not present a risk to options with the highest safety level. A manual reset requires that the reset input is closed and opened before the safety relay outputs are activated. A short-circuit or a faulty reset button is consequently supervised.

When the RT7 is configured for dual channel input, both the inputs are supervised for correct sequence operation before the unit can be reset.

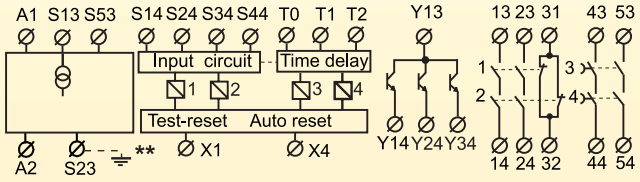
The input options 3 and 4 have the highest safety levels as all short-circuits and power failures are supervised. This in combination with double internal current limitation makes the relay ideal for supervision of safety mats and contact strips.

Regulations and Standards

The RT7 is designed and approved in accordance with appropriate directives and standards. Examples of such are: 98/37/EC, EN ISO 12100-1/-2, EN 60204-1 and EN 954-1/EN ISO 13849-1.

Connection Examples

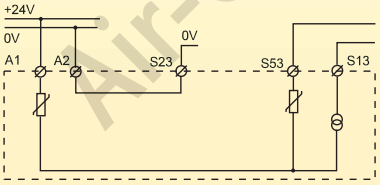
For examples of how our safety relays can solve various safety problems, see "Connection Examples" beginning on page 48.



*****Only for AC supply***

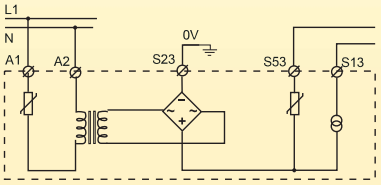
Connection of Supply

DC Supply



The RT7 DC option should be supplied with +24 V on A1 and 0 V on A2.

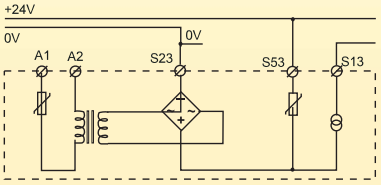
AC Supply



The RT7 AC option should be sup plied with the appropriate supply voltage via connections A1 and A2.

The S23/⏚ must be connected to protective earth.

DC Supply of AC Units



All AC-units can also be supplied by +24 VDC to S53 (0VDC to S23).

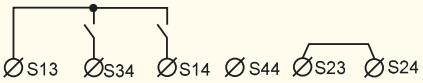
Note: With both DC and AC modules, if cable shielding is used this must be connected to an earth rail or an equivalent earth point.

RT7 A/B Connection of Safety Devices

1. Single Channel, 1 NO from +24V

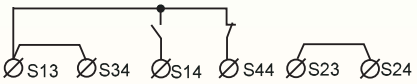
The input (contact to S14) must be closed before the outputs can be activated. When the input contact is opened the relay safety output contacts open.

2. Dual Channel, 2 NO from +24V



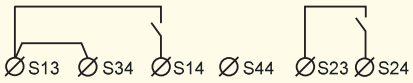
Both input contacts (S14 and S34) must be closed before the relay outputs can be activated. The safety relay contacts will open if one or both of the input contacts are opened. Both the input contacts must be opened and reclosed before the relay can be reset. A short-circuit between inputs S14 and S34 can only be supervised if the device connected to the inputs has short-circuit supervised outputs, e.g. Jokab Focus light curtains.

3. Dual Channel, 1 NO, 1 NC from +24V



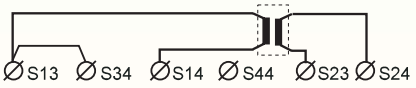
One input contact must be closed (S14) and one opened (S44) before the relay outputs can be activated. The safety relay contacts will open if one or both of the inputs change status or in case of a short-circuit between S14 and S44. Both inputs must return to their initial positions before the relay outputs can be reactivated.

4. Dual Channel, 1 NO from +24V, 1 NO to 0V



Relay functions as option 2, but a short-circuit, in this case between inputs S14 and S24, is supervised (safety outputs are opened).

5. Safety Mat or Contact Strip

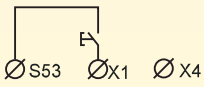


Both 'contact' inputs from a inactivated safety mat/contact strip must be made in order to allow the RT7 relay outputs to be activated. When the safety mat/contact strip is activated or a short-circuit is detected across S14-S23, the relay will de-energize (safety outputs open) and the 'ON' LED will flash. As output S13 has an internal current limit of 60 mA, the RT7 will not be overloaded when the mat/contact strip is activated or a short circuit is detected.

RT7 A/B Reset Connections

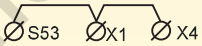
Manual Supervised Reset

The manual supervised reset contact connected to input X1 must be closed and opened in order to activate the relay outputs.



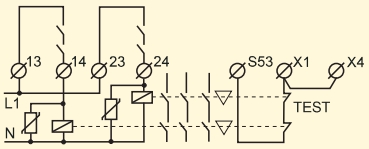
Automatic Reset

Automatic reset is selected when S53, X1 and X4 are linked. The relay outputs are then activated at the same time as the inputs.



connected to S13 for safety mat/contact strip

Testing External Contactor Status

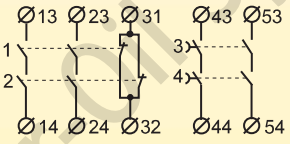


Contactors, relays and valves can be supervised by connecting 'test' contacts between S53 and X1. Both manual supervised and automatic reset can be used.

RT7 A/B Output Connections

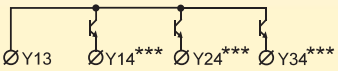
Relay Outputs

The RT7 has four (4 NO) safety outputs, of which two can be delayed, and 1 NC information output.



In order to protect the RT7 output contacts it is recommended that loads (inductive) are suppressed by fitting correctly chosen VDRs, diodes, etc. Diodes are the best arc suppressors, but will increase the switch off time of the load.

Transistor Outputs



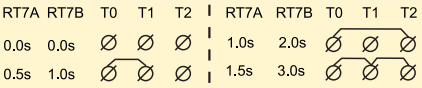
The RT7 has three (3) voltage free transistor information outputs.

The transistor outputs are supplied with voltage to Y13, either from S53 (+24V) or an external 5-30 VDC. Y14, Y24 and Y34 follow the relay inputs and outputs as follows:

- Y14 becomes conductive when the relay input conditions are fulfilled.
- Y24 becomes conductive when both the output relays are activated.
- Y34 becomes conductive when both the delay output relays are activated.

******Note: These outputs are only for information purposes and must not be connected to the safety circuits of the machinery.***

Time Delay Outputs



Time delays are selected by linking the appropriate T0, T1 and T2 connections.

When a stop signal is detected a program stop command is first given to the PLC/servo which brakes the dangerous machine operations in a 'soft' and controlled way.

The delayed relay safety outputs will then turn off the power to the motors, i.e. when the machinery has already stopped. It takes usually around 0.5 to 3 seconds for a dangerous action to be stopped softly.

RT7 A/B Technical Data

Manufacturer.....JOKAB SAFETY
Ordering Data/Article Numbers.....see page 65
Color.....black and beige
Weight.....405 g (24 VDC), 550 g (24-230 VAC)

Supply
Voltage (A1-A2).....24 VDC +15/-20%, 24/48/115/230 VAC, +/-15%, 50-60 Hz

Power Consumption
DC supply, nominal voltage.....4.6 W
AC supply, nominal voltage.....8.7 W

Connections S13.....Short-circuit protected voltage output, 70 mA +/- 10% current limitation. Is used for the inputs S14, S34 and S44

Connections S53.....Short-circuit protected voltage output, internal automatic fuse, max 270 mA. Is used for the reset and autoreset inputs X1 and X4.

Connections S23.....0V connection for input S24

Safety Inputs
S14.....+24 VDC, 20 mA
S24.....0 VDC, 20 mA
S34.....+24 VDC, 20 mA
S44.....+24 VDC, 25 mA

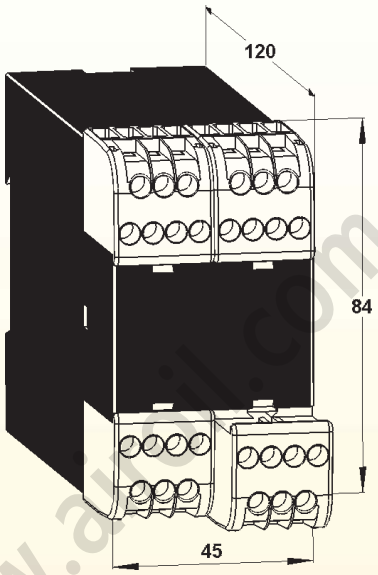
Reset input X1
Supply for reset input.....+24 VDC
Reset current.....600 mA current pulse contact closure, then 30 mA
Minimum contact closure time for reset.....100 ms

Maximum external connection cable resistance at nominal voltage for
S14, S24, S34.....300 Ohm
S44, X1.....150 Ohm

Delay Time Options
RT7A.....0; 0.5; 1.0; 1.5 s
RT7B.....0; 1.0; 2.0; 3.0 s

Response Time
At Power on DC/AC.....<90ms/<140 ms
When activating (input-output).....<20 ms
When deactivating (input-output).....<20 ms
At Power Loss.....<80 ms

Relay Outputs
NO direct (relays 1/2).....2
NO direct or delayed (relays 3/4).....2
NC (relays 1/2).....1
Maximum switching capacity res. load
Relays 1/2 AC.....6A/250 VAC/1500 VA
DC.....6A/24 VDC/150 W
Relays 1/2 total.....9A distributed on all contacts
Relays 3/4 AC.....6A/250 VAC/1380 VA
DC.....6A/24 VDC/138 W
Relays 3/4 total.....6A distributed on all contacts
Minimum load (Relays 1/2/3/4).....10mA/10 V
(if load on contact has not exceeded 100 mA)
Contact material.....$AgSnO_2$+Au flash
Mechanical life.....$>10^7$ operations



Note: Connector blocks are detachable without cables having to be disconnected.

Transistor Outputs
External supply to Y13.....+5 to +30 VDC
Y14.....Indicates that the input conditions have been fulfilled
Y24.....Indicates that the output relays 1/2 are activated
Y34.....Indicates that the delay output relays 3/4 are activated
Maximum load of Y14, Y24, Y34.....15 mA /output
Maximum voltage drop at maximum load.....2.4 V

LED Indication
On ○ .....Supply voltage OK , the LED is on
Flashing light in case of under-voltage, overload or short circuit on inputs
In 1 ○ **In 2** ○ .....Indicates that the input conditions are fulfilled
⧅ ○ **1** ⧅ ○ **2** .....Indicates that the output relays 1/2 are activated
t ○ .....Indicates that the delay output relays 3/4 are activated

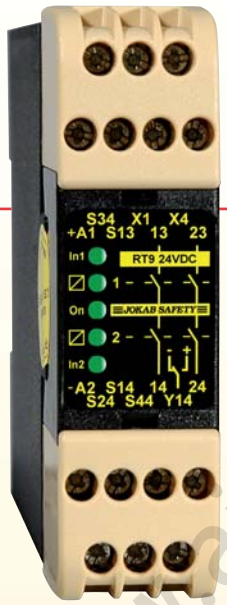
Mounting
Rail.....35 mm DIN rail

Operating Temperature Range
24 VDC.....-10° C to + 55° C
24-230 VAC.....-10° C to + 45° C

Connection Blocks (detachable)
Maximum screw torque.....1 Nm
Maximum connection area
Solid conductors.....1x4mm²/2x1.5mm²/12AWG
Conductor with socket contact.....1x2.5mm²/2x1mm²
Air and creep distance.....4kV/2 IEC 60664-1

Protection Class
Enclosure.....IP 40 IEC 60529
Connection blocks.....IP 20 IEC 60529

RT9 Safety Relay
Would you like a small safety relay for all your safety applications?



If so, then choose the compact RT9 universal relay to supervise both your safety devices and the internal safety of your machinery. In addition, you can select the safety level that is required for each installation. All this is possible due to the RT9 offering the most versatile input option arrangement available on the market. The RT9 can therefore replace many other relays.

Other RT9 options include selection of either manual supervised or automatic resetting. The manual supervised reset can be used for gates and other safety devices that can be passed through. Automatic reset can be used for small safety hatches, if deemed acceptable from risk assessment.

In addition, the RT9 has a dual function information output that will indicate, e.g. if a gate is open or if the relay needs resetting.

The RT9 uses the latest component technology and modern assembly techniques to ensure a highly cost effective solution.

Choose the RT9 to simplify your safety circuits and reduce your costs.

Connection Examples

For examples of how our safety relays can solve various safety problems, see “Connection Examples” beginning on page 48.

Applications

- Emergency Stops
- Light Curtains
- Three Position Devices
- Interlocked Gates/Hatches
- Magnetic Switches
- Light Beams
- Safety Mats
- Contact Strips
- Foot-Operated Switches

Features

- Five input options
- Single or dual channel input
- Manual supervised or automatic reset
- Test input for supervision of external contactors
- Width 22.5 mm
- LED indication of supply, inputs, outputs, short-circuit and low voltage level
- 2 NO relay outputs
- 1 changeover relay with a dual information output
- 24 VDC
- Detachable connection blocks

Approvals

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RT9 Technical Information

Inputs

The RT9 can be configured to operate in either of the following input options:

1. Single channel, 1 NO contact from +24 VDC, safety category 1.
2. Dual channel, 2 NO contacts from +24 VDC, safety category 3.
3. Dual channel, 1 NO, 1 NC contact from +24 VDC, safety category 4.
4. Dual channel, 1 NO contact from 0V and 1 NO contact from +24 VDC, safety category 4.
5. Safety mats/contact strips 1 'contact' from 0V and 1 'contact' from +24 VDC, safety category 1.

Note: *Safety category only refers to the safety relay configuration, input devices, output devices and wiring must be considered for a safety category of the system.*

When the input/inputs are activated and the test/supervised reset is complete, relays 1 and 2 are energized. These are de-energized when the input/ inputs are de-activated in accordance with the input option chosen or in case of a power failure. Relays 1 and 2 must both be de-energized before the RT9 can be reset.

Transistor Output Status Information

The RT9 has a changeover contact relay output that can be connected to a PLC, control lamp, computer or similar. The output gives information about the status of the relay.

Reset and Testing

The RT9 has two reset options; manual and automatic. The manual supervised reset is used when the RT9 is monitoring safety devices that can be passed through, i.e. to ensure that the outputs of the safety relay do not close just because a gate is closed. The automatic reset should only be used if deemed an acceptable risk.

Due to special internal circuits the RT9 can be automatically reset regardless of the operational voltage rise time, this being an important factor when large loads are started up on the same power supplies at the same time.

In addition, the RT9 can also test (supervise), if for example, contactors and valves, etc. are de-energized/ de-activated before a restart is made.

Indication of Low Voltage

The 'On' LED will flash if the relay supply voltage falls below an acceptable level. This indication will also be given if a monitored safety mat/contact strip is actuated. See connection option 5.

Safety Level

The RT9 has internal dual and supervised safety functions. Power failure, internal faulty component or external interference will not present a risk to options with the highest safety level. A manual reset requires that the reset input is closed and opened before the safety relay outputs are activated. A short-circuit or a faulty reset button is consequently supervised.

When the RT9 is configured for dual channel input, both the inputs are supervised for correct operation before the unit can be reset.

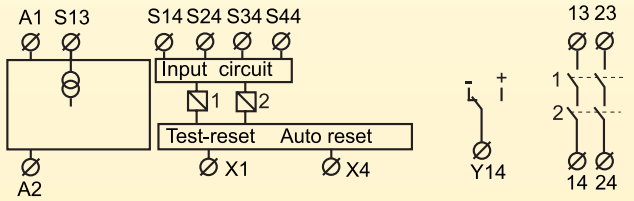
The input options 3 and 4 have the highest safety levels as all short-circuits and power failures are supervised. This in combination with double internal current limitation makes the relay ideal for supervision of safety mats and contact strips.

Regulations and Standards

The RT9 is designed and approved in accordance with appropriate directives and standards. Examples of such are: 98/37/EC, EN ISO 12100-1/-2, EN 60204-1 and EN 954-1/EN ISO 13849-1.

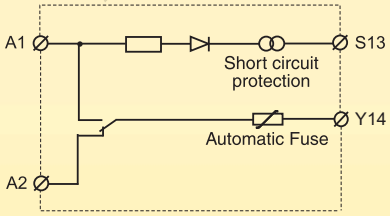
Connection Examples

For examples of how our safety relays can solve various safety problems, see "Connection Examples" beginning on page 48.



Connection of Supply

DC Supply

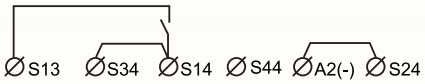


The RT9 should be supplied with +24 V on A1 and 0 V on A2.

Note: If cable shielding is used this must be connected to an earth rail or an equivalent earth point.

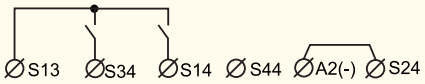
RT9 Connection of Safety Devices

1. Single Channel, 1 NO from +24V



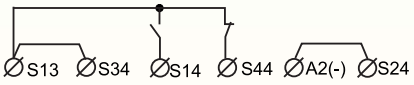
The input (contact to S14) must be closed before the outputs can be activated. When the input contact is opened the relay safety output contacts open.

2. Dual Channel, 2 NO from +24V



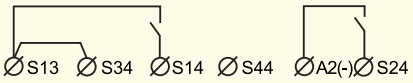
Both input contacts (S14 and S34) must be closed before the relay outputs can be activated. The safety relay contacts will open if one or both of the input contacts are opened. Both the input contacts must be opened and reclosed before the relay can be reset. A short-circuit between inputs S14 and S34 can only be supervised if the device connected to the inputs has short-circuit supervised outputs, e.g. Jokab Focus light curtains.

3. Dual Channel, 1 NO, 1 NC from +24V



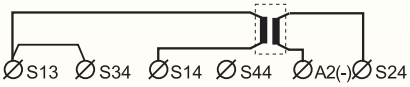
One input contact must be closed (S14) and one opened (S44) before the relay outputs can be activated. The safety relay contacts will open if one or both of the inputs change status or in case of a short-circuit between S14 and S44. Both inputs must return to their initial positions before the relay outputs can be reactivated.

4. Dual Channel, 1 NO from +24V, 1 NO to 0V



Relay functions as option 2, but a short-circuit, in this case between inputs S14 and S24, is supervised (safety outputs are opened).

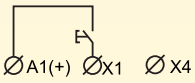
5. Safety Mat or Contact Strip



Both 'contact' inputs from a inactivated safety mat/contact strip must be made in order to allow the RT9 relay outputs to be activated. When the safety mat/contact strip is activated or a short-circuit is detected across S14-S23, the relay will de-energize (safety outputs open) and the 'ON' LED will flash. As output S13 has an internal current limit of 85 mA, the RT9 will not be overloaded when the mat/contact strip is activated or a short circuit is detected.

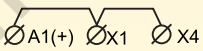
RT9 Reset Connections

Manual Supervised Reset



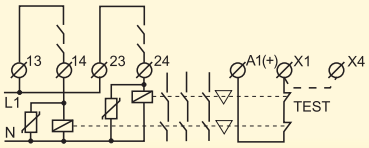
The manual supervised reset contact connected to input X1 must be closed and opened in order to activate the relay outputs.

Automatic Reset



Automatic reset is selected when A1(+), X1 and X4 are linked. The relay outputs are then activated at the same time as the inputs.

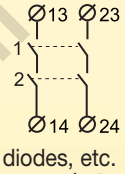
Testing External Contactor Status



Contactors, relays and valves can be supervised by connecting 'test' contacts between A1(+) and X1. Both manual supervised and automatic reset can be used.

RT9 Output Connections

Relay Outputs



The RT9 has two (2 NO) safety outputs.

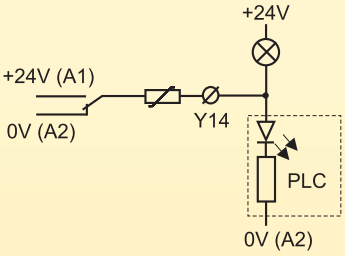
In order to protect the RT9 output contacts it is recommended that loads (inductive) are suppressed by fitting correctly chosen VDRs, diodes, etc. Diodes are the best arc suppressors, but will increase the switch off time of the load.

Transistor Outputs

The RT9 has a changeover contact information output.

The relay output Y14 is connected internally to 0V and 24V in the following way:

- Y14 is internally closed to 0V when the RT9 is not reset.
- Y14 is internally closed to +24V when the RT9 is reset.



RT9 Technical Data

Manufacturer..... JOKAB SAFETY
Ordering Data/Article Numbers.....see page 65
Color..... black and beige
Weight..... 210 g

Power Supply
Voltage (A1-A2)..... 24 VDC +/- 20%

Power Consumption
DC supply, nominal voltage..... 2.5 W

Connections S13..... Short-circuit protected voltage output, 70 mA +/- 10% current limitation. Is used for the inputs S14, S34 and S44

Input currents (at nominal supply voltage)
S14.....+24 VDC, 30 mA
S24.....0 VDC, 20 mA
S34.....+24 VDC, 20 mA
S44.....+24 VDC, 25 mA

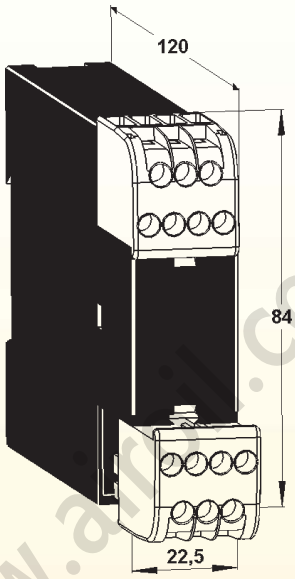
Reset input X1
Supply for reset input.....+24 VDC
Reset current.....300 mA current pulse at closure, then 30 mA
Minimum contact closure time for reset..... 80 ms
Minimum contact closure time *(at low limit voltage -20%)*..... 100 ms

Maximum external connection cable resistance at nominal voltage for
S14, S24, S34.....300 Ohm
S44, X1..... 150 Ohm

Response Time
At Power on..... <100 ms
When activating (input-output)..... <20 ms
When deactivating (input-output)..... <20 ms
At Power Loss..... <80 ms

Relay Outputs
NO..... 2
Maximum switching capacity res. load AC..... 6A/250/1500 VA
Maximum switching capacity res. load DC.....6A/24 V DC/150 W
Maximum total switching capacity..... 8A distributed on all contacts
Minimum load..... 10mA/10 V
(if load on contact has not exceeded 100 mA)
Contact material.....Ag+Au flash
Mechanical life..... >10^7 operations

Transistor Outputs
Y14 - (0V)..... Indicates that RT9 is not reset
+ (24V)..... Indicates that RT9 is reset
Maximum load of Y14.....250 mA
Short-circuit protection for information output..... Internal automatic fuse



Note: Connector blocks are detachable without cables having to be disconnected.

LED Indication
On ..... Supply voltage OK, the LED is on
Flashing light in case of under-voltage, overload or short circuit on inputs
In 1 **In 2** .....Indicates that the input conditions are fulfilled
1 **2** .....Indicates that the output relays are activated

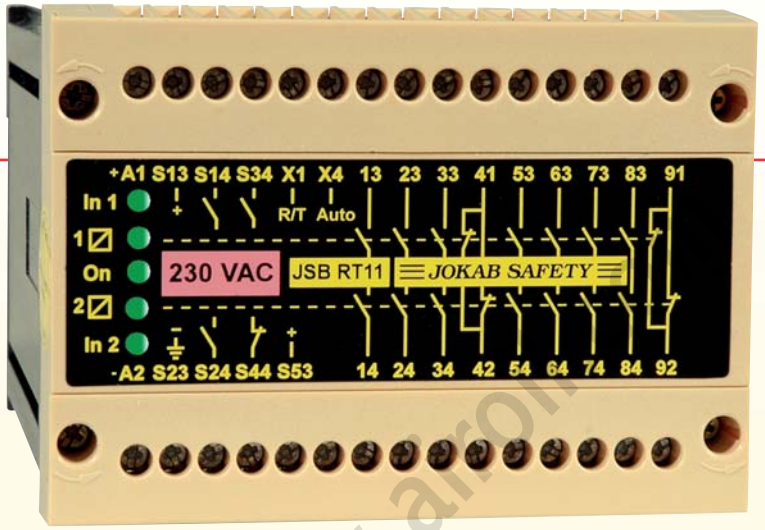
Mounting
Rail.....35 mm DIN rail

Operating Temperature Range..... -10° C to + 55° C

Connection Blocks (detachable)
Maximum screw torque..... 1 Nm
Maximum connection area
Solid conductors..... 1x4mm^2/2x1.5mm^2/12AWG
Conductor with socket contact..... 1x2.5mm^2/2x1mm^2
Air and creep distance..... 4kV/2 IEC 60664-1

Protection Class
Enclosure..... IP 40 IEC 60529
Connection blocks..... IP 20 IEC 60529

JSBRT11 Safety Relay
Flexible Safety Relay with Various Outputs



The JSBRT11 has been designed to provide the safety system circuit designer with the ability to select from both a range of input connection configurations and either automatic or supervised reset.

The unit can be hardwire configured to operate in either of the following input configurations:

- Mode 1: Single Channel (1 NO contact from +24 VDC), safety category 1
- Mode 2: Dual Channel (2 NO contacts from +24 VDC), safety category 3
- Mode 3: Dual Channel (1NO, 1 NC contacts from +24 VDC), safety category 4
- Mode 4: Dual Channel (1 NO) contact from 0 V and 1 NO contact from +24 VDC), safety category 4

In addition, the unit can also be used to test that contactors and valves have fallen/returned to their 'reset' state before a new 'start' signal is given.

Safety Level

The JSBRT11 has dual and monitored internal safety functions. Power failure, internal component failures or external interference (with the exception of short circuiting of input contact when used in a single channel input mode) do not result in a dangerous function.

When wired for supervised reset, should a short circuit appear across the reset input the relay will not automatically reset when the input/inputs are made. Only when the supervised reset input is made and broken will the relay reset.

The JSBRT11 provides detection of contact failure in the inputs when wired in dual channel mode. Both inputs have to be opened and closed in order to enable the reactivation of the relay. The highest safety level of the JSBRT11 is in configuration mode 3 or 4 because all short circuits are supervised, i.e. a short circuit between the inputs leads to a safe state as the outputs drop out.

Connection Examples

For examples of how our safety relays can solve various safety problems, see "Connection Examples" beginning on page 48.

Applications

- Emergency Stops
- Light Curtains
- Three Position Devices
- Interlocked Gates/Hatches
- Magnetic Switches
- Light Beams
- Foot-Operated Switches

Features

- Selectable inputs and safety category
- Manual supervised or automatic reset
- Width 100 mm
- LED indication of supply, inputs and outputs
- 7 NO + 2 NC relay outputs
- Supply 24 VDC 24, 48, 115 or 230 VAC
- Quick release connector blocks

Regulations and Standards

The JSBRT11 is designed and approved in accordance with appropriate directives and standards. Examples of such are: 98/37/EC, EN ISO 12100-1/-2, EN 60204-1, EN 954-1/EN ISO 13849-1.

Approvals

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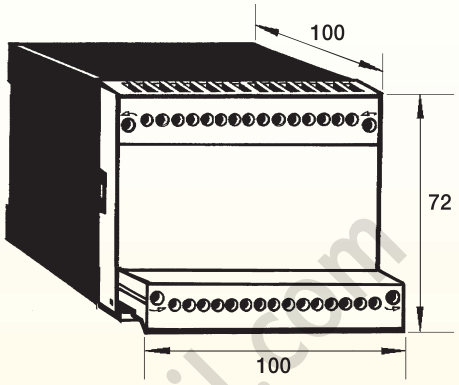
JSBRT11 Technical Data

Manufacturer.....JOKAB SAFETY
Ordering Data/Article Numbers.....see page 65-66
Color.....black and beige
Weight..... 610 g (24 VDC), 790 g (24-230 VAC)
Power Supply A1 - A2.....24 VDC+/-15%
24/48/115/230 VAC, +/-15%, 50-60 Hz
Power Consumption.....<3 VA
Relay Outputs.....7 NO + 2 NC
Maximum switching capacity res. load AC.....6A/250 VAC/1500 VA
Maximum switching capacity res. load DC..... 6A/24 VDC/150 W
Maximum total switching capacity..... 21A distributed on all contacts
Minimum load.....10mA/10 V
(if load on contact has not exceeded 100 mA)
Contact Material.....$AgSnO_2$ + Au flash
Maximum input wire res. at nom. voltage.....200 Ohm (S14, S24, S34, X1, X4)
100 Ohm (S44)

Response Time
At deactivation (input-output)..... <20 ms
At activation (input-output)..... <30 ms
Mounting..... 35 mm DIN rail
Operating Temperature Range.....-10ºC to +55ºC

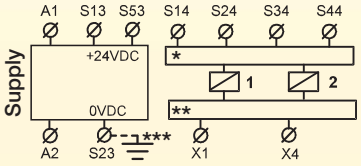


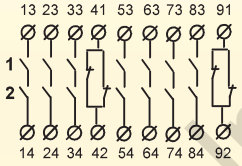
Note: Connector blocks are detachable without cables having to be disconnected.

Terminals
Maximum screw torque.....1 Nm
Single strand..... 1x4mm²/2x1.5mm²
Conductor with socket contact..... 1x2.5mm²/2x1mm²
Air and creep distance.....4kV/2 IEC 60664-1
Function Indication.....Electrical supply, Input 1 and 2, Output relays 1 and 2

Protection Class
Enclosure.....IP 40 IEC 60529
Connection blocks.....IP 20 IEC 60529

JSBRT11 Technical Description





The supply voltage is connected across A1 and A2. The input connection configuration and type of reset required is set by connecting the unit as shown in the diagrams below. When the input/inputs and the test/supervised reset are made K1 and K2 energize. K1 and K2 will de-energize if the power is disconnected or a stop signal is given in accordance to the configuration mode wired. Both K1 and K2 have to be deactivated before the outputs of the JSBRT11 can be closed again.

Configuration Mode 1

When the single input opens both K1 and K2 relays are deactivated.

Configuration Mode 2

Both inputs have to be closed in order to enable the unit to be activated. A stop signal is given if both or one input is opened. Both inputs have to be opened and reclosed in order to enable the reactivation of the unit. If the possibility of short circuits between the inputs cannot be excluded, configuration mode 3 or 4 should be used in order to reach the high safety level.

Configuration Mode 3

One input has to be closed and the other input has to be opened in order to enable the unit to be activated. A stop signal is given if both or one input change state. Both inputs have to change state in order to give a dual stop function and to allow a new start after stop.

Configuration Mode 4

Operation as mode 2 but short circuits between the inputs leads to a safe state, i.e. the relays inside the JSBRT11 will drop out.

Supervised reset connection

The input to X1 (see diagram below) has to be closed and opened in order to activate the unit, after input/inputs are made accord- ing to the configuration mode selected. This mode is selected when X1 - X4 is open circuit.

Automatic reset connection

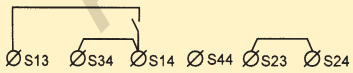
The input has to be closed in order to activate the unit after input/inputs are made according to the configuration mode selected. This mode is selected when a connection between X1 and X4 is made.

Test

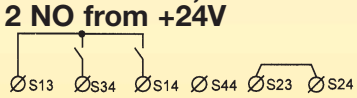
Test contacts of contactors can be connected between S53 and X1 for supervision.

JSBRT11 Electrical Connections

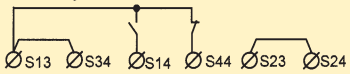
Single Channel,* 1 NO from +24V



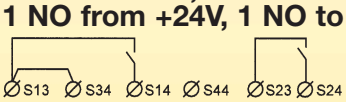
Dual Channel,* 2 NO from +24V



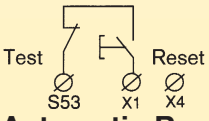
Dual Channel,* 1 NO, 1 NC from +24V



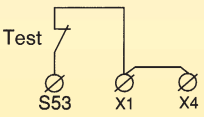
Dual Channel,* 1 NO from +24V, 1 NO to 0V



Supervised Manual Reset



Automatic Reset



Note: With the input conditions shown, the JSBRT11 is in its de-energized state, i.e.output contacts are open.

JSBR4 Safety Relay
Universal Relay for Two-Handed Devices

The JSBR4 has two inputs, which both have to be closed to keep the safety output contacts closed. A short circuit across the inputs will cause the output contacts to open. The inputs can however be subjected to a continuous short circuit without damaging the safety relay.

In order to make the safety outputs close the reset input must be closed and opened. In this way an unintentional reset is prevented in the case of a short circuit in the reset button cable or if the button gets jammed in the actuated position. The reset input can also be used for test/supervision to ensure that contactors or valves have returned to their initial off "stop" position before a new start can be allowed by the safety relay.

When the JSBR4 is used as a Two Hand relay both buttons have to be pressed within 0.5 seconds of each other in order to close the outputs.

When the JSBR4 is used for Safety Mats and Safety Strips the ”stop” condition is given following detection of a short circuit between input channels A and B. Neither the safety mat, safety strip or the relay will be damaged by a continuous short circuit. This also gives the advantage that if there is a failure between the inputs in the installation, the safety relay will not be damaged.

Safety Level

The JSBR4 has a twin supervised safety function. Neither component failure, short circuit or external disturbances (power loss, etc.) will prevent the safe function of the relay. This is valid both for the inputs A and B as well as for the reset input. The JSBR4 operates at the highest safety level for safety relays (category 4).

Connection Examples

For examples of how our safety relays can solve various safety problems, see “Connection Examples” beginning on page 48.

Applications

- Two-Handed Devices of Type IIIc
- Emergency Stops
- Three Position Devices
- Interlocked Gates/Hatches
- Safety Mats
- Contact Strips
- Foot-Operated Switches

Features

- Dual input channels synchronism 0.5s
- Supervised reset
- Test input
- Width 45 mm
- LED indication of supply, inputs and outputs
- 3 NO/1 NC relay outputs
- 24 VDC
- 24, 48, 115 or 230 VAC
- Quick release connector blocks

Regulations and Standards

The JSBR4 is designed and approved in accordance with appropriate directives and standards. Examples of such are: 98/37/EC, EN ISO 12100-1/-2, EN 60204-1 and EN 954-1/EN ISO 13849-1.

The JSBR4 complies with the highest safety level for connection of a two-hand control device of type IIIc in accordance with EN574.

Approvals

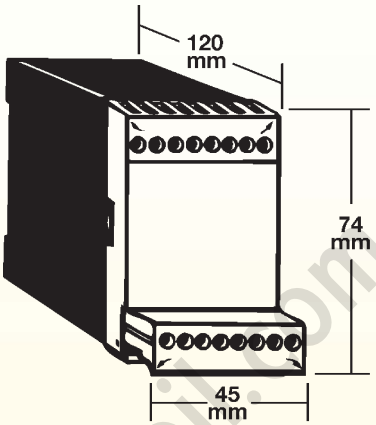
CERTIFIED BY inspecta

JSBR4 Technical Data

Manufacturer.....JOKAB SAFETY
Ordering Data/Article Numbers.....see page 66
Color.....black and beige
Weight.....350 g (24 VDC), 460 g (24-230 VAC)
Power Supply.....24 VDC+/-15%, 24/48/115/230 VAC, +/-15%, 50-60 Hz
Power Consumption.....<2 VA
Relay Outputs.....3 NO + 1 NC
Maximum switching capacity res. load AC.....6A/250 VAC/1500 VA
Maximum switching capacity res. load DC.....6A/24 VDC/150 W
Maximum total switching capacity.....12A distributed on all contacts
Minimum load.....10mA/10 V
(if load on contact has not exceeded 100 mA)
Contact Material.....Ag + Au flash
Maximum input wire res. at nom. voltage.....300 Ohm (S13-S14 and S23-S24)

Response Time
At deactivation.....<20 ms (145 ms at power loss)

Mounting.....35 mm DIN rail
Operating Temperature Range.....-10°C to +55°C



Note: Connector blocks are detachable without cables having to be disconnected.

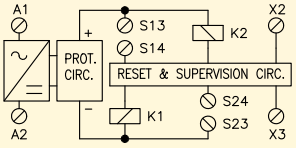
Terminals
Maximum screw torque.....1 Nm
Single strand.....1x4mm²/2x1.5mm²
Conductor with socket contact.....1x2.5mm²/2x1mm²
Air and creep distance.....4kV/2 IEC 60664-1

Function Indication.....Electrical supply, inputs, outputs

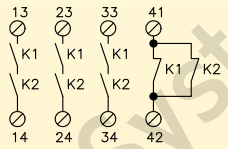
Protection Class
Enclosure.....IP 40 IEC 60529
Connection blocks.....IP 20 IEC 60529

JSBR4 Technical Description

The electrical supply is connected across A1 and A2. After Voltage reduction and Rectification (AC-versions) or reverse polarization protection (DC-version) there is an overload protection-circuit.



When the inputs S13-S14 and S23-S24 have closed and the reset is made, the relays K1 and K2 are activated.



A dual stop signal is given when K1 and K2 drop, due to short circuiting between the inputs, opening of the inputs or power failure. If one input is opened the other input must also be opened for K1 and K2 to be activated again.

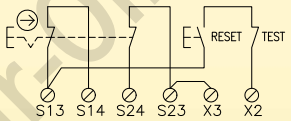
The monitoring circuit checks K1 and K2 and that the reset circuit to X2 is both closed and opened before K1 and K2 are energized. Both the stop and reset function therefore comply with the requirement that a component fault, short circuit or external interference do not result in a dangerous function.

The safety outputs consist of contacts from K1 and K2 connected internally in series across terminals 13 - 14, 23 -24 and 33 - 34. These contacts are used to cut the power to components which stop or prevent hazardous movements/functions. It is recommended that all switched loads are adequately suppressed and/or fused in order to provide additional protection for the safety contacts.

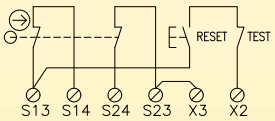
Note: Output 41-42 is intended for the indication purposes only, e.g. gate opened. No load between S14 and S24 allowed.

JSBR4 Electrical Connections

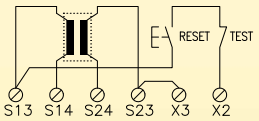
Emergency stop with manual resetting.



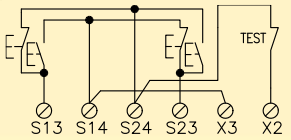
Interlocked gate with manual reset.



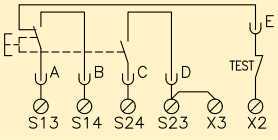
Contact mat or strip with manual reset.



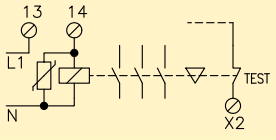
Two-hand device with buttons in separate or same enclosure. Buttons to be pressed in within 0.5 s of each other. Foot-pedal switches can be connected in the same configuration.



Enabling device JSHD4. Stop condition is given in both top and bottom PB positions.



Control and supervision of external contactors, relay, valve or Jokab Safety's expansion relays.



JSBT4 Safety Relay
Safety Relay with Synchronized Dual Input Channels (within 0.5s)

The JSBT4 has two inputs, both of which have to be closed in order to keep the safety output contacts closed. A short circuit between inputs A and B will cause the output contacts to open. The inputs can be continuously short circuit without damaging the safety relay.

For the outputs to close, the test input must be closed. The test input is intended to monitor that contactors or valves have dropped/returned before a new start is permitted.

This test input must not be confused with the reset function required for gates that a person can walk through and where there is a high safety requirement (see JSBR4).

If the JSBT4 is used for safety Mats and Safety Strips, the "stop" condition is given following detection of a short circuit. Neither the Safety Mat, Safety Strip or the relay will be damaged by a continuous short circuit. This also provides the advantage that if there is a failure between inputs A and B in the installation, the safety relay will not be damaged.

Safety Level

The JSBT4 has a twin supervised safety function. Neither component failure, short circuit or external disturbances (power loss, etc.) will prevent the safe function of the relay. Category 3 or 4 depending on use.

The true two channel safety function has the advantage that the cabling installation demands for safety can be reduced due to the fact that a short circuit between the inputs will directly open the relays safety outputs.

Connection Examples

For examples of how our safety relays can solve various safety problems, see “Connection Examples” beginning on page 48.

Applications

- Emergency Stops
- Three Position Devices
- Interlocked Gates/Hatches
- Safety Mats
- Contact Strips
- Foot-Operated Switches

Features

- Dual channel input synchronism 0.5 s
- Test input
- Width 45 mm
- LED indication of power on, inputs and outputs
- 3 NO/1 NC relay outputs
- 24 VDC
- 24, 48, 115 or 230 VAC
- Quick release connector blocks

Regulations and Standards

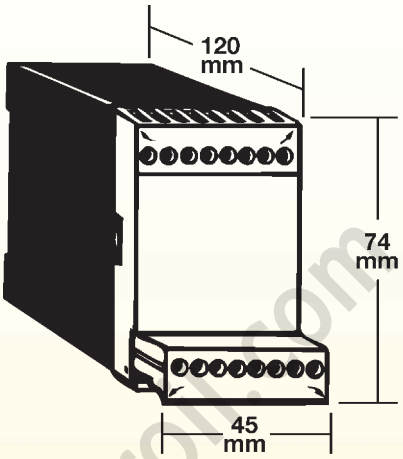
The JSBT4 is designed and approved in accordance with appropriate directives and standards. Examples of such are: 98/37/EC, EN ISO 12100-1/-2, EN 60204-1 and EN 954-1/EN ISO 13849-1.

Approvals

CERTIFIED BY inspecta

JSBT4 Technical Data

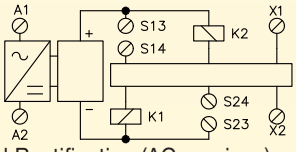
Manufacturer.....JOKAB SAFETY
Ordering Data/Article Numbers.....see page 66
Color.....black and beige
Weight.....350 g (24 VDC), 460 g (24-230 VAC)
Power Supply.....24 VDC+/-15%, 24/48/115/230 VAC, +/-15%, 50-60 Hz
Power Consumption.....<2 VA
Relay Outputs.....3 NO + 1 NC
Maximum switching capacity res. load AC.....6A/250 VAC/1500 VA
Maximum switching capacity res. load DC.....6A/24 VDC/150 W
Maximum total switching capacity.....12A distributed on all contacts
Minimum load.....10mA/10 V
(if load on contact has not exceeded 100 mA)
Contact Material.....Ag + Au flash
Maximum input wire res. at nom. voltage.....300 Ohm (S13-S14 and S23-S24)
Response Time
At deactivation.....<20 ms (145 ms with switched supply/power loss)
Mounting.....35 mm DIN rail
Operating Temperature Range.....-10ºC to +55ºC
Function Indication.....Electrical supply, inputs, outputs



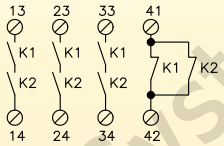
Note: Connector blocks are detachable without cables having to be disconnected.

Terminals
Maximum screw torque.....1 Nm
Single strand.....1x4mm²/2x1.5mm²
Conductor with socket contact.....1x2.5mm²/2x1mm²
Air and creep distance.....4kV/2 IEC 60664-1
Protection Class
Enclosure.....IP 40 IEC 60529
Connection blocks.....IP 20 IEC 60529

JSBT4 Technical Description



The electrical supply is connected across A1 and A2. After Voltage reduction and Rectification (AC-versions) or reverse polarization protection (DC-version) there is an overload protection-circuit.



When the inputs S13-S14 and S23-S24 are closed within 0.5 seconds the relays K1 and K2 are energized . A dual stop signal is given, K1 and K2 de-energize, when there is a short circuit between or an opening of the inputs and at power loss. If one input is opened the other one also has be opened in order to activate K1 and K2 again. The test circuit, X1- X2, has to be closed in order to activate the outputs, thereafter the test circuit can be opened or closed continuously. If the test circuit is closed after the inputs there is no requirement to close them within 0.5 seconds.

The internal supervision circuit monitors the two Inputs and relays K1, K2. The stop function then fulfills the requirement that one failure (short circuit, component, external disturbance) shall not prevent the safe function of the JSBT4.

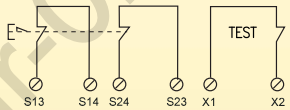
The safety outputs consist of contacts from K1 and K2 connected internally in series across terminals 13-14, 23-24 and 33-34. These contacts are used to cut the power to components which stop or prevent hazardous movements/functions. It is recommended that all switched loads are adequately suppressed and/or fused in order to provide additional protection for the safety contacts.

The NC output 41-42 should only be used for monitoring purpose e.g. Indication lamp or PLC input, etc. The output contacts are closed until the module is reset.

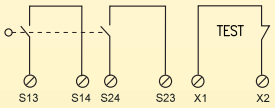
Note: Output 41-42 is intended for the indication purposes only, e.g. gate opened. No load between S14 and S24 allowed.

JSBT4 Electrical Connections

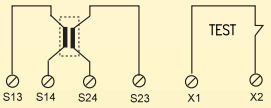
Emergency stop with automatic resetting.



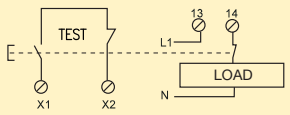
Interlocked hatch with automatic resetting.



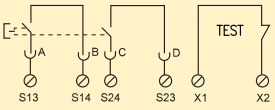
Contact mat or strip with automatic reset.



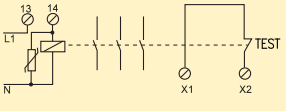
Monitoring to ensure that the Start button cannot stick in pressed position. Short circuiting over the closing contact is not monitored. The RT-series and JSBR4 have built-in short circuiting monitored resetting.



Enabling device JSHD4. Stop condition is given in both top and bottom PB positions.



Control and supervision of external contactors, relay, valve or Jokab Safety's expansion relays.



BT50 Safety Relay
BT50T Expansion Relay

Single Channel Safety Relay

The BT50 is designed to connect safety devices, such as emergency stops, directly in the voltage supply circuit to the relay. Despite a maximum built-in width of only 22.5 mm, the relay is very powerful.

With 3 NO safety outputs, 1 NC output (for monitoring purposes), a test input and complete internal supervision, the BT50 is quite unique. In addition, delayed outputs (BT50T) can be ordered.

In order for the safety outputs to close, the supply voltage, by means of an emergency stop button, must be connected to A1 and A2 and the test input closed. After actuation of the relay the test input can be opened again.

The test input is intended to supervise that contactors or valves have dropped/returned before a new start can be permitted. The test input can also be used for starting and the start button can be supervised (see Connection Example on next page).

More Outputs

By connecting BT50 to a safety relay/PLC it is easy to increase the number of safe outputs. This means that an unlimited number of dangerous machine operations and functions can be stopped from one safety relay/PLC.

Safety Level

The BT50 has a twin and supervised internal safety function. Power failure, internal component faults or external interference cannot result in dangerous functions.

Input via A1 only is not protected from short circuiting and therefore installation is critical for the safety level to be achieved. To achieve a higher safety level, a screened cable can be used and/or connection made to both A1 and A2 (see Technical Description on next page).

Connection Examples

For examples of how our safety relays can solve various safety problems, see “Connection Examples” beginning on page 48.

Applications

- Emergency Stops
- Interlocked Hatches
- Expansion of Pluto Outputs

Features

- Width 22.5 mm
- LED indication
- 3 NO/1 NC relay outputs
- Test/reset input
- 24 VDC
- Single or dual channel
- BT50 - Additional power terminals
- Quick release connector blocks
- BT50T - 1 changeover relay with a double information output (Y14)
- BT50T - Delay times selectable from 0 to 1.5 s

Regulations and Standards

The BT50 is designed and approved in accordance with appropriate directives and standards. Examples of such are: 98/37/EC, EN ISO 12100-1/-2, EN 60204-1 and EN 954-1/EN ISO 13849-1.

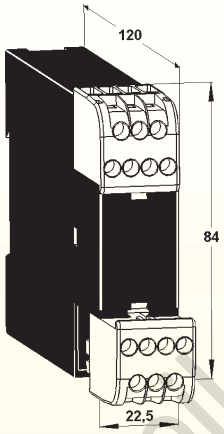
Approvals

CERTIFIED BY inspecta

BT50(T) Technical Data

Manufacturer.....JOKAB SAFETY
Ordering Data/Article Numbers.....see page 66
Color.....black and beige
Weight.....200 g
Power Supply.....24 VDC+15%/-25%
Power Consumption.....<2 VA
Relay Outputs.....3 NO + 1 NC
Maximum switching capacity res. load AC.....6A/250 VAC/1500 VA
Maximum switching capacity res. load DC.....6A/24 VDC/150 W
Maximum total switching capacity.....12A distributed on all contacts
Minimum switching load.....10mA/10 V
(if load on contact has not exceeded 100 mA)
Contact Material.....Ag + Au flash
Maximum input wire res. at nom. voltage.....200 Ohm
Response Time
At deactivation (input/output).....Version B <20 ms or delayed max 1500 ms (old version of BT50 <60 ms)
Mounting.....35 mm DIN rail
Operating Temperature Range.....-10°C to +55°C
Function Indication.....Electrical supply, relay and X4

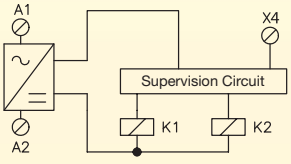
Note: Connector blocks are detachable without cables having to be disconnected.



Terminals
Maximum screw torque.....1 Nm
Single strand.....2x1.5mm²
Conductor with socket contact.....2x1mm²
Air and creep distance.....4kV/2 IEC 60664-1
Protection Class
Enclosure.....IP 40 IEC 60529
Connection blocks.....IP 20 IEC 60529

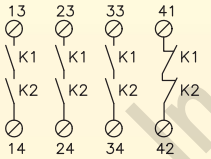
BT50(T) Technical Description

When supply voltage is connected to A1 and A2, relays K1 and K2 are activated.



K1 and K2 drop if the supply voltage is disconnected. both relays K1 and K2 must drop for them to be activated again. The test circuit, A1 - X4 can either be open or constantly closed.

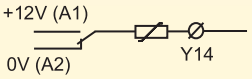
The supervising circuit ensures that both K1 and K2 have dropped before they can be reactivated. The stop function complies with the requirement that a component fault or external interference cannot lead to a dangerous function.



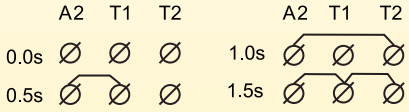
The safety outputs consist of contacts from K1 and K2 connected internally in series across terminals 13-14, 23-24, and 33-34. These contacts are used to cut the power to components which stop or prevent hazardous movements/functions. It is recommended that all switched loads are adequately suppressed and/or fused in order to provide additional protection for the safety contacts.

The NC output 41-42 should only be used for monitoring purposes e.g. indication lamp for emergency stop pressed.

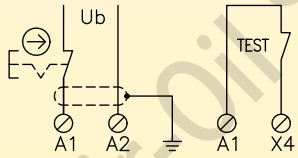
JSB50T Information Output



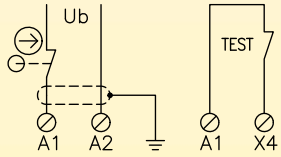
JSBT50T Delay Times



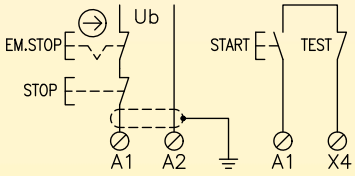
BT50(T) Electrical Connections



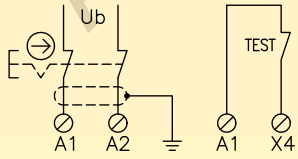
Emergency stop with reset when emergency button returns.



Hatch with automatic reset.

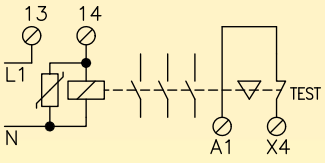


JSBT50 as emergency stop and control relay with Start and Stop function.

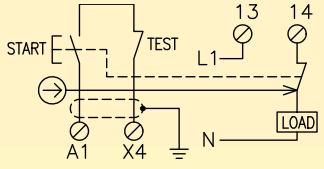


Emergency stop with dual connection direct to the supply voltage.

***Note: BT50 has additional power terminals A1 and A2.**



Controlled monitoring of external contactor, relay, valve or Jokab Safety's expansion relays.



Monitoring to ensure that the On button is not stuck in pressed position. A short circuit over the closing contact is not monitored.

BT51 Safety Relay
BT51T Expansion Relay

Single Channel Safety Relay

The BT51 is designed to connect safety devices, such as emergency stops, directly in the voltage supply circuit to the relay. Despite a maximum built-in width of only 22.5 mm, the relay is very powerful.

With 4 NO safety outputs, test input and complete internal supervising, the BT51 is quite unique. In addition you can order delayed outputs (BT51T).

In order for the safety outputs to close, the supply voltage, by means of an emergency stop button, must be connected to A1 and A2 and the test input closed. After actuation of the relay the test input can be opened again.

The test input is intended to supervise that contactors or valves have dropped/returned before a new start can be permitted. The test input can also be used for starting and the start button can be supervised (see Connection Example on next page).

More Outputs

By connecting BT51 to a safety relay/PLC it is easy to increase the number of safe outputs. This means that an unlimited number of dangerous machine operations and functions can be stopped from one safety relay/PLC.

Safety Level

The BT51 has a twin and supervised internal safety function. Power failure, internal component faults or external interference cannot result in dangerous functions.

Input via A1 only is not protected from short circuiting and therefore installation is critical for the safety level to be achieved. To achieve a higher safety level, a screened cable can be used and/or connection made to both A1 and A2 (see Technical Description on next page).

Connection Examples

For examples of how our safety relays can solve various safety problems, see “Connection Examples” beginning on page 48.

Applications

- Emergency Stops
- Interlocked Hatches
- Expansion of Pluto Outputs

Features

- Width 22.5 mm
- LED indication
- 4 NO relay outputs
- Test/reset input
- 24 VDC
- Single or dual channel
- BT51 - Additional power terminals
- Quick release connector blocks
- BT51T - 1 changeover relay with a double information output (Y14)
- BT51T - Delay times selectable from 0 to 1.5 s

Regulations and Standards

The BT51 is designed and approved in accordance with appropriate directives and standards. Examples of such are: 98/37/EC, EN ISO 12100-1/-2, EN 60204-1 and EN 954-1/EN ISO 13849-1.

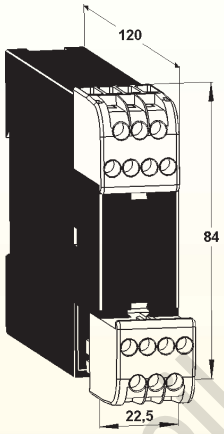
Approvals

CERTIFIED BY inspecta

BT51(T) Technical Data

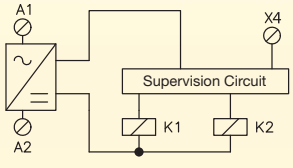
Manufacturer.....JOKAB SAFETY
Ordering Data/Article Numbers.....see page 66
Color.....black and beige
Weight.....200 g
Power Supply.....24 VDC+15%/-25%
Power Consumption.....<2 VA
Relay Outputs.....4 NO
Maximum switching capacity res. load AC.....6A/250 VAC/1500 VA
Maximum switching capacity res. load DC.....6A/24 VDC/150 W
Maximum total switching capacity.....12A distributed on all contacts
Minimum switching load.....10mA/10 V
(if load on contact has not exceeded 100 mA)
Contact Material.....Ag + Au flash
Maximum input wire res. at nom. voltage.....200 Ohm
Response Time
At deactivation.....<20 ms or delayed max 1500 ms (BT51T)
Mounting.....35 mm DIN rail
Operating Temperature Range.....-10°C to +55°C
Function Indication.....Electrical supply, relay and X4

Note: Connector blocks are detachable without cables having to be disconnected.



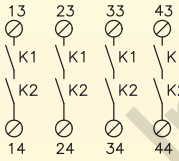
Terminals
Maximum screw torque.....1 Nm
Single strand.....2x1.5mm²
Conductor with socket contact.....2x1mm²
Air and creep distance.....4kV/2 IEC 60664-1
Protection Class
Enclosure.....IP 40 IEC 60529
Connection blocks.....IP 20 IEC 60529

BT51(T) Technical Description



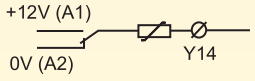
When supply voltage is connected to A1 and A2, relays K1 and K2 are activated. K1 and K2 drop if the supply voltage is disconnected. both relays K1 and K2 must drop for them to be activated again. The test circuit, A1 - X4 can either be open or constantly closed.

The supervising circuit ensures that both K1 and K2 have dropped before they can be reactivated. The stop function complies with the requirement that a component fault or external interference cannot lead to a dangerous function.

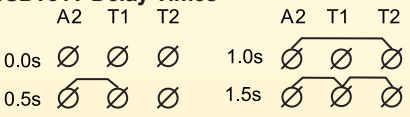


The safety outputs consist of contacts from K1 and K2 connected internally in series across terminals 13-14, 23-24, 33-34 and 43-44. These contacts are used to cut the power to components which stop or prevent hazardous movements/functions. It is recommended that all switched loads are adequately suppressed and/or fused in order to provide additional protection for the safety contacts.

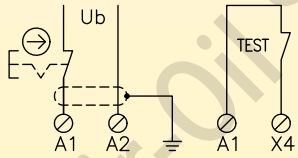
JSB51T Information Output



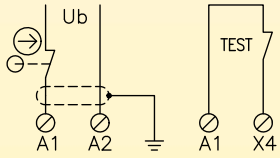
JSBT51T Delay Times



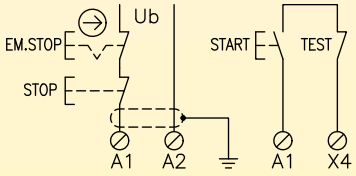
BT51(T) Electrical Connections



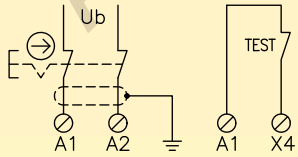
Emergency stop with reset when emergency button returns.



Hatch with automatic reset.

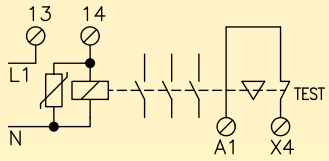


JSBT51 as emergency stop and control relay with Start and Stop function.

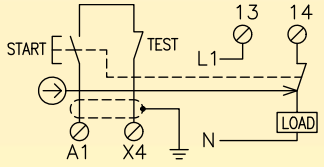


Emergency stop with dual connection direct to the supply voltage.

***Note: BT51 has additional power terminals A1 and A2.**



Controlled monitoring of external contactor, relay, valve or Jokab Safety's expansion relays.



Monitoring to ensure that the On button is not stuck in pressed position. A short circuit over the closing contact is not monitored.

JSHT1 A/B Safety Timer closes 2 independent relay outputs during a guaranteed maximum time when the inputs are opened.

Time Reset

Time reset can prevent unintentional reset of safety system when someone is still in the dangerous area of the machine. During a guaranteed maximum time, one or several PB´s for reset must be activated. The reset buttons should be sited in such a way that operatives have a clear overview of the whole area which is guarded. Time reset is made by the combination of a safety relay and the timer relay JSHT1A/B.

Time Bypassing

The JSHT1 can also be used for time bypass of light beams, for example a forklift into a dangerous area.

Operation

When the inputs open the output contacts close. The output contacts open when the inputs close or when the time period has expired. The time period is hardwire selectable on terminals T1, T2 and T3. The time given is the maximum time. One or two channel operation is also hardwire selectable.

Connection Examples

For examples of how our safety relays can solve various safety problems, see “Connection Examples” beginning on page 48.

Applications

- Time Reset
- Time Bypassing

Features

- Hardwire time selection 5 - 40 s
- Selectable single or dual channel input
- Test input
- Width 45 mm
- LED indication for supply, inputs and outputs
- 1+1 NO relay outputs
- 24 VDC
- 24/48/115/230 VAC
- Quick release connector blocks

Regulations and Standards

The JSHT1 A/B is designed and approved in accordance with appropriate directives and standards. Examples of such are: 98/37/EC, EN ISO 12100-1/-2, EN 60204-1 and EN 954-1/EN ISO 13849-1.

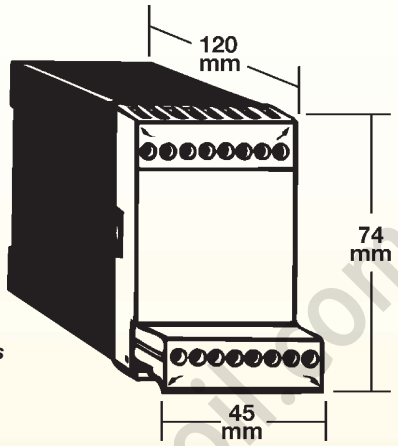
Approvals

CERTIFIED BY inspecta

JSHT1 A/B Technical Data

Manufacturer.....JOKAB SAFETY
Ordering Data/Article Numbers.....see pages 66-67
Color.....black and beige
Weight.....330 g (24 VDC), 430 g (24/48/115/230 VAC)
Power Supply.....24 VDC+/-15%, 24/48/115/230 VAC +/- 15%, 50-60 Hz
(AC versions JSHT1A only)
Power Consumption.....<3 VA
Relay Outputs.....2 x 1 NO
Maximum switching capacity res. load AC.....4A/250 VAC/1000 VA
Maximum switching capacity res. load DC.....4A/24 VDC/100 W
Maximum total switching capacity.....8A distributed on all contacts
Minimum load.....10mA/10 V
(if load on contact has not exceeded 100 mA)
Maximum input wire res. at nom. voltage/channel.....100/200 Ohm
(1 Channel/2 Channel)

Response Time
At activation.....<30 ms
At deactivation.....<15 ms
Selectable Time (+/-15% at nom. voltage)
JSHT1A.....5-10-15-20 s
JSHT1B.....5-15-30-40 s
Mounting.....35 mm DIN rail
Operating Temperature Range.....-10°C to +55°C



Note: Connector blocks are detachable without cables having to be disconnected.

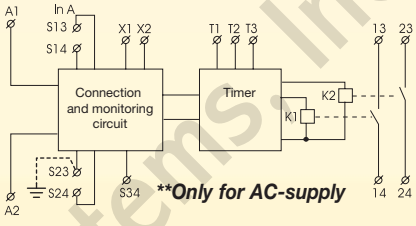
Function Indication.....Electrical supply, inputs, outputs
Contact Material.....AgCuNi
Terminals
Maximum screw torque.....1 Nm
Single strand.....1x4mm²/2x1.5mm²
Conductor with socket contact.....1x2.5mm²/2x1mm²
Air and creep distance.....4kV/2 IEC 60664-1
Protection Class
Enclosure.....IP 40 IEC 60529
Connection blocks.....IP 20 IEC 60529

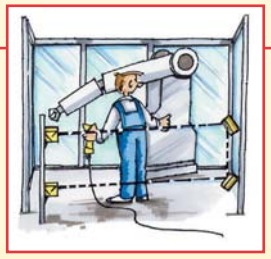
JSHT1 A/B Technical Description

The electrical supply is connected across A1 and A2. The internal supervising circuit is activated directly when the supply is on. The inputs A and B must both be closed and then opened.

Thereafter K1 and K2 are activated and the outputs close. K1 and K2 are activated for the hardwired selected time (set by connections on the terminals T1, T2 and T3) If there is a short circuit between the inputs or the inputs are closed again before the set time period has expired the outputs will open. In order to close the outputs again both the inputs have to be closed and both internal relays K1 and K2 deactivated (controlled by the supervising circuit) and the inputs again opened.

By external hardwire connections the JSHT1 can be made single or dual channel input. See figure below.



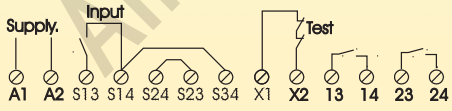


Light beam being bypassed for a maximum pre-set time e.g. 5 sec. by the JSHT1 during entrance and exit with the JSHD4 Three Position Enabling device.

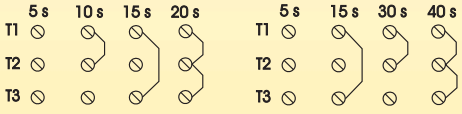
Time reset procedure. First push PB1, then exit dangerous area and close the door, then push PB2 (PB1 and PB2 must be pressed within the predetermined time period selected). After this procedure the machine can be safely restarted.

JSHT1 A/B Electrical Connections

Connection for single channel input.

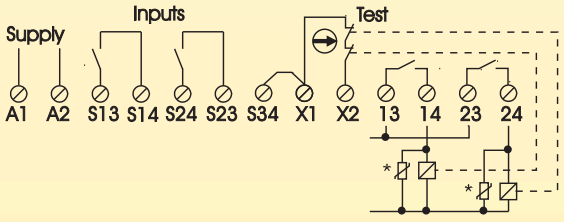


Selection of time by hardwire links.



JSHT1A JSHT1B

Connection for dual channel input.



**** It is recommended that all switched loads are adequately suppressed and/or fused in order to provide additional protection for the safety contacts.***

In the figure the monitoring of two contactors in the test input is shown.

JSHT2 A/B/C Safety Timer closes 2 independent relay outputs during a guaranteed maximum time when the inputs are closed.

Time Bypassing

Sensors detect the autocarrier and are connected to the JSHT2 which supervises the sensors and bypasses the light beam for a maximum predetermined time.

Inching

Inching applications require safety outputs to be closed for a predetermined maximum period of time, allowing the machine to move only a short distance each time the inching control is activated. For each new motion the inching control, e.g. PB or pedal must be released and activated again.

Operation

When the inputs close the output contacts close. The output contacts open when the input opens or when the time period has expired. The time is hardwire selectable on the terminals T1, T2 and T3. The time given is the maximum time. Single or dual channel operation is also hardwire selectable.

Connection Examples

For examples of how our safety relays can solve various safety problems, see “Connection Examples” beginning on page 48.

Applications

- Time Bypassing
- Inching

Features

- Hardwire time selection 0.2 - 40 s
- Selectable single or dual channel input
- Test input
- Width 45 mm
- LED indication for supply, inputs and outputs
- 1+1 NO relay outputs
- 24 VDC
- 24/48/115/230 VAC
- Quick release connector blocks

Regulations and Standards

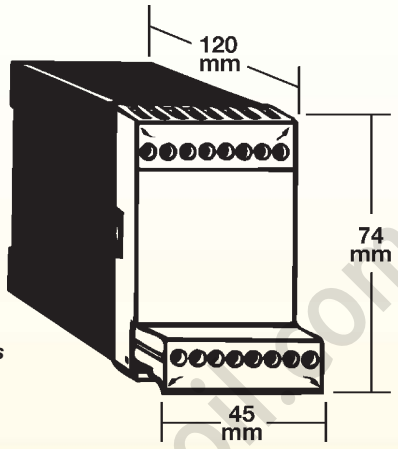
The JSHT2 A/B/C is designed and approved in accordance with appropriate directives and standards. Examples of such are: 98/37/EC, EN ISO 12100-1/-2, EN 60204-1 and EN 954-1/EN ISO 13849-1.

Approvals

CERTIFIED BY inspecta

JSHT2 A/B/C Technical Data

Manufacturer.....JOKAB SAFETY
Ordering Data/Article Numbers.....see page 67
Color.....black and beige
Weight.....310 g (24 VDC), 410 g (24-230 VAC)
Power Supply.....24 VDC+/-15%, 24/48/115/230 VAC +/-15%, 50-60 Hz (AC versions JSHT2A/B only)
Power Consumption.....<3 VA
Relay Outputs.....2 x 1 NO
Maximum switching capacity res. load AC.....4A/250 VAC/1000 VA
Maximum switching capacity res. load DC.....4A/24 VDC/100 W
Maximum total switching capacity.....8A distributed on all contacts
Minimum load.....10mA/10 V
(if load on contact has not exceeded 100 mA)
Maximum input wire res. at nom. voltage.....100/200 Ohm (1 Channel/2 Channel)
Response Time
At activation.....<30 ms
At deactivation.....<15 ms
Selectable Time (+/-15% at nom. voltage)
JSHT2A.....0.2-0.5-0.7-1.0 s
JSHT2B.....5-10-15-20 s
JSHT2C.....5-15-30-40 s
Mounting.....35 mm DIN rail
Operating Temperature Range.....-10°C to +55°C



Note: Connector blocks are detachable without cables having to be disconnected.

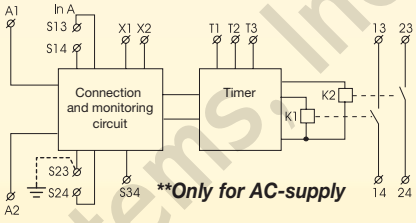
Function Indication.....Electrical supply, inputs, outputs
Contact Material.....AgCuNi
Terminals
Maximum screw torque.....1 Nm
Single strand.....1x4mm²/2x1.5mm²
Conductor with socket contact.....1x2.5mm²/2x1mm²
Air and creep distance.....4kV/2 IEC 60664-1
Protection Class
Enclosure.....IP 40 IEC 60529
Connection blocks.....IP 20 IEC 60529

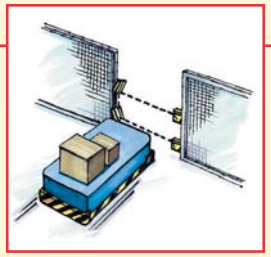
JSHT2 A/B/C Technical Description

The electrical supply is connected across A1 and A2. The internal supervising circuit is activated directly when the supply is on. The inputs A and B must both be opened and then closed.

Thereafter K1 and K2 are activated and the outputs close. K1 and K2 are activated for the hardwired selected time (set by connections on the terminals T1, T2 and T3) If there is a short circuit between the inputs or the inputs are opened again before the set time period has expired the outputs will open. In order to close the outputs again both the inputs have to be opened and both internal relays K1 and K2 deactivated (controlled by the supervising circuit) and the inputs again closed.

By external hardwire connections the JSHT2 can be made single or dual channel input. See figure below.



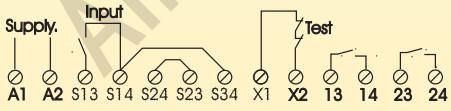


Light beam being only bypassed during the time it takes for the autocarrier to pass.

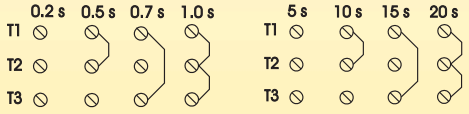
Shaft only turns a small amount each time the PB is pressed.

JSHT2 A/B/C Electrical Connections

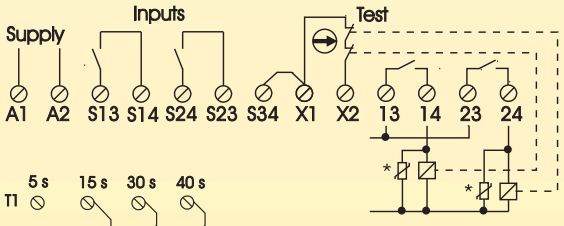
Connection for single channel input.



Selection of time by hardwire links.



Connection for dual channel input.



**** It is recommended that all switched loads are adequately suppressed and/or fused in order to provide additional protection for the safety contacts.***

In the figure the monitoring of two contactors in the test input is shown.

E1T Expansion Relay

More Outputs

By connecting expansion relays to a safety relay it is easy to increase the number of safe outputs. This means that an unlimited number of dangerous machine operations and functions can be stopped from one safety relay/PLC.

Safe Soft Stop

When a gate is opened a program stop is first given to the machine's PLC/servo which brakes the dangerous operations in a soft and controlled way. The safety outputs then break the power to the motors, that is, when the machine has already stopped. Normally between 0.5 and 1 second is needed to brake a dangerous machine operation softly. Soft stop ensures many advantages:

- The machine lasts longer.
- Parts being processed are not damaged.
- Restart from stopped position is enabled and simplified.

A safe soft stop is achieved by means of a safety relay which gives the program stop, and an expansion relay, E1T, which gives safe delayed stop signals. See chapter "Connection Examples". The drop time delay on a E1T can as standard be selected from 0 to 3 seconds. By connecting several E1Ts in series even longer times can be achieved.

Safety Level

The E1T has twin stop functions, that is, two relays with mechanically operated contacts. A monitored stop function is achieved by connecting the test output (terminals X1 and X2) to the test or reset input on the safety relay which is being expanded.

One condition for a safe delayed stop is that the delay time cannot increase in the event of a fault. The E1T complies with this requirement.

When are delayed safe stops used?

Delayed safety stop signals can be used for emergency stops according to EN418 § 4.1.5. Stop category 1 and NFPA 79, i.e. a controlled stop with power to the actuator(s) available to achieve the stop and then removal of power when stop is achieved.

Stop category 1 may also be permitted when it is not possible to gain physical access to the machine before the safe stop is affected e.g:

- Gates, access time is normally over 1 sec.
- Covers and gates which are locked until dangerous operations and functions have been stopped.
- Long distances between a safety device and a dangerous machine function.

Connection Examples

For examples of how our safety relays can solve various safety problems, see "Connection Examples" beginning on page 48.

Applications

- More Safety Outputs
- Delayed Safety Outputs
- Output Contact Indication

Features

- Width 22.5 mm
- LED indication of output
- 4 NO relay outputs
- 24 VDC
- Single or dual channel operation option
- Quick release connector blocks

Regulations and Standards

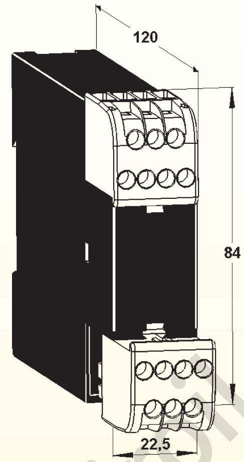
The E1T is designed and approved in accordance with appropriate directives and standards. Examples of such are: 98/37/EC, EN ISO 12100-1/-2, EN 60204-1 and EN 954-1/EN ISO 13849-1.

Approvals

E1T Technical Data

Manufacturer..JOKAB SAFETY
Ordering Data/Article Numbers.................see page 67-68
Color.. black and beige
Weight... 220 g
Power Supply..24 VDC+/-15%
Power Consumption... ....2W
Relay Outputs.. .... 4 NO
Maximum switching
capacity res. load AC...........................6A/250 VAC/1500 VA
Maximum switching
capacity res. load DC...............................6A/24 VDC/150 W
Maximum total
switching capacity................. 12A distributed on all contacts
Total unit switching cap.........12A distributed on all contacts
Minimum switching load.....................................10mA/10 V
(if load on contact has not exceeded 100 mA)
Contact material..Ag + Au flash
Maximum external
res. at nom. voltage...............................150 Ohm (S14, S24)
Response Time
At deactivation (input - output)...............<0.020 s, 0.5 s, 1 s,
1.5 s, 2 s, 3 s, +/-20%
Mounting..35 mm DIN rail
Operating Temperature Range...................-10ºC to +55ºC
Function Indication..Output status

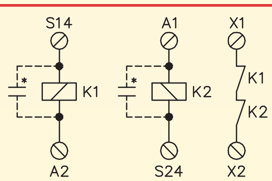
Note: Connector blocks are detachable without cables having to be disconnected.



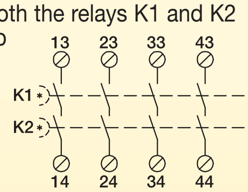
Terminals
Maximum screw torque..1 Nm
Single strand...$1x4mm^2/2x1.5mm^2$
Conductor with socket contact.............$1x2.5mm^2/2x1mm^2$
Air and creep distance.............................4kV/2 IEC 60664-1
Protection Class
Enclosure.. IP 40 IEC 60529
Connection blocks.......................................IP 20 IEC 60529

E1T Technical Description

The E1T has to be connected to a safety relay in order to fulfill the necessary safety requirements (see connection examples below). The safety relay controls and monitors the E1T. (The E1T can be connected for single or dual channel operation - see below.) When the inputs S14 and S24 close, relays K1 and K2 are activated. A stop signal is given, K1 and K2 drop, if the inputs are opened or during power failure. K1 and K2 drop either directly or after a delay* (if incorporated). Delay time of module is fixed and shown on front panel of device. The delay circuit is so arranged that the design time cannot be exceeded.



To check that both the relays K1 and K2 drop during a stop signal they must be monitored. This is achieved by connecting X1 and X2 to the test or reset input on the safety relay which is expanded (see below). K1 and K2 are mechanically operated relays, therefore, if one of the output contacts should stick closed then the relay's contact in X1-X2 cannot be closed thus preventing a new ready signal being given to the safety relay.

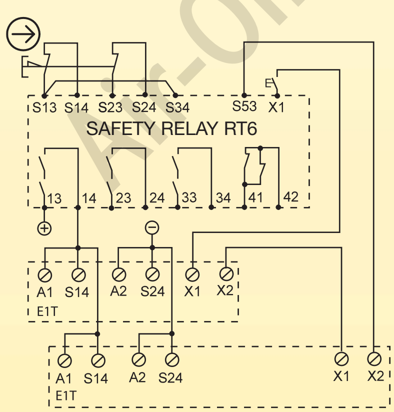


Inductive loads should be equipped with an arc suppressor to protect the output contacts.

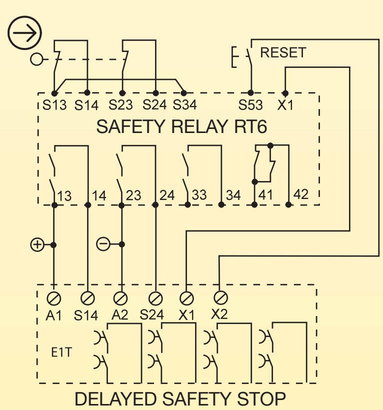
Diodes are the best arc suppressors but will increase the switch off time of the load.

E1T Electrical Connections

Single channel expansion of outputs for a safety relay connected to an emergency stop.



Dual channel expansion with delayed safety outputs for a safety relay monitoring a gate.



JSR1T Expansion Relay

More Outputs

By connecting expansion relays to a safety relay it is easy to increase the number of safe outputs. This means that an unlimited number of dangerous machine operations and functions can be stopped from one safety relay/PLC.

Safe Soft Stop

When a gate is opened a program stop is first given to the machine's PLC/servo which brakes the dangerous operations in a soft and controlled way. The safety outputs then break the power to the motors, that is, when the machine has already stopped. Normally between 0.5 and 1 second is needed to brake a dangerous machine operation softly. Soft stop ensures many advantages:

- The machine lasts longer.
- Parts being processed are not damaged.
- Restart from stopped position is enabled and simplified.

A safe soft stop is achieved by means of a safety relay which gives the program stop, and an expansion relay, JSR1T, which gives safe delayed stop signals. See chapter "Connection Examples". The drop time delay on a JSR1T can as standard be selected, from 0 to 10 seconds. By connecting several JSR1Ts in series even longer times can be achieved.

Safety Level

The JSR1T has twin stop functions, that is, two relays with mechanically operated contacts. A monitored stop function is achieved by connecting the test output (terminals X1 and X2) to the test or reset input on the safety relay which is being expanded.

One condition for a safe delayed stop is that the delay time cannot increase in the event of a fault. The JSR1T complies with this requirement.

When are delayed safe stops used?

Delayed safety stop signals can be used for emergency stops according to EN418 § 4.1.5. Stop category 1 and NFPA 79, i.e. a controlled stop with power to the actuator(s) available to achieve the stop and then removal of power when stop is achieved.

Stop category 1 may also be permitted when it is not possible to gain physical access to the machine before the safe stop is affected e.g:

- Gates, access time is normally over 1 sec.
- Covers and gates which are locked until dangerous operations and functions have been stopped.
- Long distances between a safety device and a dangerous machine function.

Connection Examples

For examples of how our safety relays can solve various safety problems, see "Connection Examples" beginning on page 48.

Expansion Relay with

- More Safety Outputs
- Delayed Safety Outputs
- Information Output

Features

- Width 45 mm
- LED indication of output
- 4 NO/1 NC relay outputs
- 24 VDC
- Single and dual channel
- Quick release connector blocks

Regulations and Standards

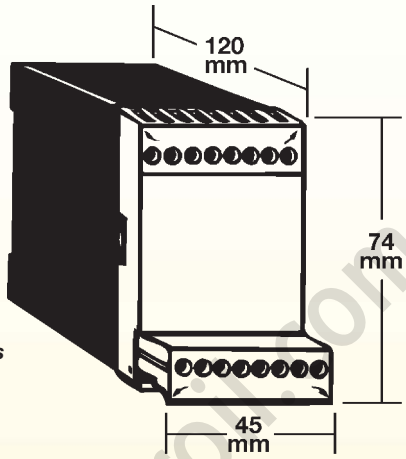
The JSR1T is designed and approved in accordance with appropriate directives and standards. Examples of such are: 98/37/EC, EN ISO 12100-1/-2, EN 60204-1 and EN 954-1/EN ISO 13849-1.

Approvals

CERTIFIED BY inspecta

JSR1T Technical Data

Manufacturer.....JOKAB SAFETY
Ordering Data/Article Numbers.....see page 68-69
Color.....black and beige
Weight.....280 g
Power Supply.....24 VDC+/-15%
Power Consumption.....<2W
Relay Outputs.....4 NO + 1 NC
Maximum switching capacity res. load AC.....6A/250 VAC/1500 VA
Maximum switching capacity res. load DC.....6A/24 VDC/150 W
Maximum total switching capacity..... 16A distributed on all contacts
Minimum load.....10mA/10 V
(if load on contact has not exceeded 100 mA)
Contact material.....Ag + Au flash
Maximum input wire res. at nom. voltage.....150 Ohm (S14, S24)
Response Time
At deactivation (input - output).....<0.020 s, 0.5 s, 1 s, 1.5 s, 2 s, 3 s, 5 s, 8 s, 10 s +/-20%
Mounting.....35 mm DIN rail
Operating Temperature Range.....-10°C to +55°C
Function Indication.....Output relay supplies

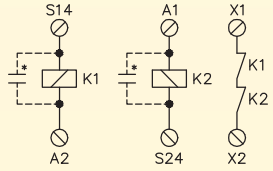


Note: Connector blocks are detachable without cables having to be disconnected.

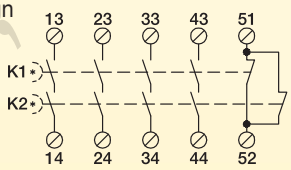
Terminals
Maximum screw torque.....1 Nm
Single strand.....1x4mm²/2x1.5mm²
Conductor with socket contact.....1x2.5mm²/2x1mm²
Air and creep distance.....4kV/2 IEC 60664-1
Protection Class
Enclosure.....IP 40 IEC 60529
Connection blocks.....IP 20 IEC 60529

JSR1T Technical Description

The JSR1T has to be connected to a safety relay in order to fulfill the necessary safety requirements (see connection examples below). The safety relay controls and monitors the JSR1T. (The JSR1T can be connected for single or dual channel operation - see below.) When the inputs S14 and S24 close, relays K1 and K2 are activated. A stop signal is given, K1 and K2 drop, if the inputs are opened or during power failure. K1 and K2 drop either directly or after a delay* (if incorporated). Delay time of module is fixed and shown on front panel of device. The delay circuit is so arranged that the design time cannot be exceeded.



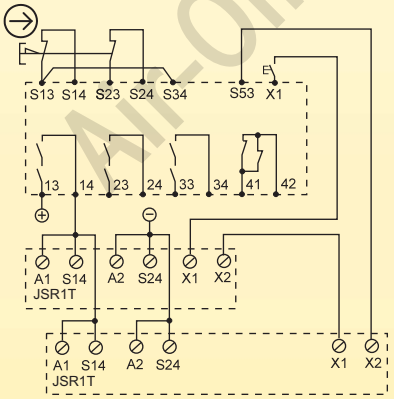
To check that both the relays K1 and K2 drop during a stop signal they must be monitored.



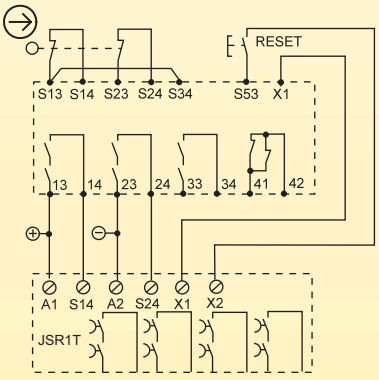
This is achieved by connecting X1 and X2 to the test or reset input on the safety relay which is expanded (see below). K1 and K2 are mechanically operated relays, therefore, if one of the output contacts should stick closed then the relay's contact in X1-X2 cannot be closed thus preventing a new ready signal being given to the safety relay.

JSR1T Electrical Connections

Expansion of outputs for safety relay connected to emergency stop with automatic reset.



Dual channel expansion with delayed safety outputs for a safety relay monitoring a gate.



JSR2A Expansion Relay

More Outputs

The JSR2A expansion relay is used to provide increased switching capacity and number of safety outputs to a safety relay. This means that an unlimited number of dangerous machine operations and functions can be stopped from one safety relay/PLC.

Greater Current Switching Capacity

The JSR2A expansion relay enables switching of up to 10 amps (AC/DC) per output contact.

Safety Level

The JSR2A has twin stop functions, that is, two relays with mechanically positively guided contacts. A monitored stop function is achieved by connecting the test output (terminals X1 and X2) to the test or reset input on the safety relay which is to be expanded.

Connection Examples

For examples of how our safety relays can solve various safety problems, see “Connection Examples” beginning on page 48.

Expansion Relay with

- More Safety Outputs
- Greater Current Switching Capacity
- Output Contact Indication

Features

- Switching up to 10A/250V/output
- Width 45 mm
- LED function indication
- 4 NO/1 NC relay outputs
- 5 supply versions
- 24 VDC/VAC
- 48, 115, 230 VAC
- Quick release connector blocks

Regulations and Standards

The JSR2A is designed and approved in accordance with appropriate directives and standards. Examples of such are: 98/37/EC, EN ISO 12100-1/-2, EN 60204-1 and EN 954-1/EN ISO 13849-1.

Approvals

CERTIFIED BY inspecta

JSR2A Technical Data

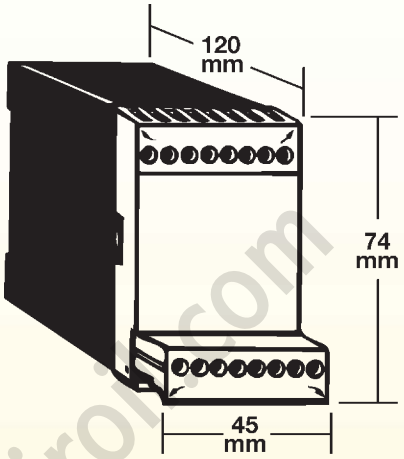
Manufacturer.....JOKAB SAFETY
Ordering Data/Article Numbers.....see page 69
Color.....black and beige
Weight.....313 g
Supply A1 - A2.....24 VDC/AC
48/115/230 VAC +/-15%, 50-60Hz
Power Consumption.....< 2.5VA
Contact Material.....$AgSnO_2$ + Au flash
Relay Outputs.....4 NO + 1 NC
Maximum switching
capacity res. load AC.....10A/250 VAC/1840 VA
Maximum switching
capacity res. load DC.....10A/24 VDC/192 W
Maximum total
switching capacity.....26A distributed on all contacts
Minimum load.....10mA/10 V/100mW
(if load on contact has not exceeded 100 mA)
Maximum input wire res. at nom. voltage
24 VDC/VAC.....100 Ohm
48/115/230 VAC.....200 Ohm
Mechanical Operational Life.....$>10^7$ operations
Response Time
At deactivation (input - output).....<25 ms
At activation (input - output).....<15 ms
Mounting.....35 mm DIN rail
LED Indication
On.....Supply voltage
1 2.....Output relays 1 and 2

Note: The total switching capacity of the JSR2A is 26A.

The load on each single contact must not exceed 10 A.

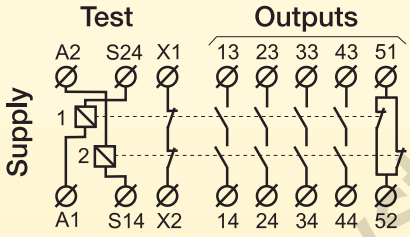
Minimum switching requirement of 10mA is not valid after the contact has been subjected to load currents exceeding 100 mA.

Connector blocks are detachable without cables having to be disconnected.



Terminals (removable)
Maximum screw torque.....1 Nm
Single strand.....1x4mm²/2x1.5mm²/12AWG
Conductor with socket contact.....1x2.5mm²/2x1mm²
Air and creep distance.....4kV/2 IEC 60664-1
Operating Temperature Range.....-10°C to +55°C
Protection Class
Enclosure.....IP 40 IEC 60529
Connection blocks.....IP 20 IEC 60529

JSR2A Technical Description

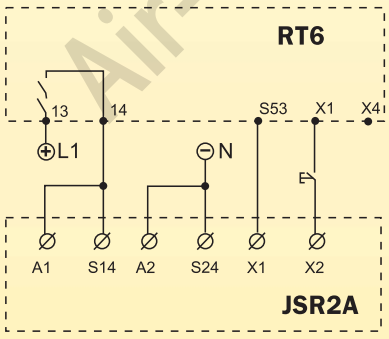


The JSR2A has to be connected to a suitable safety relay in order to fulfill the necessary safety requirements (see Connection Examples). The safety relay controls and monitors the JSR2A unit. (The JSR2A can be connected for single or dual channel operation—see electrical connection diagrams below.) When the inputs to S14 and S24 close, internal relays K1 and K2 are activated. A stop signal is given, K1 and K2 drop, if the inputs are opened or during power failure.

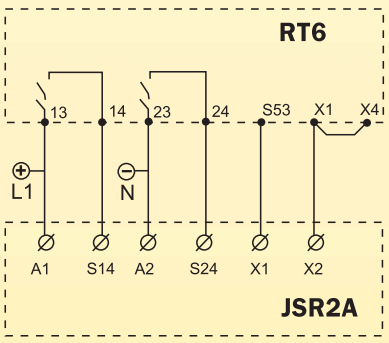
To check that both the K1 and K2 relays drop during a stop signal they must be monitored. This is achieved by connecting X1 and X2 to the test or reset input on the safety relay which is expanded. K1 and K2 have mechanically positively guided contacts, therefore if one of the output contacts should stick closed then the relay's contact in X1-X2 cannot be closed thus preventing a new ready signal being given to the safety relay.

JSR2A Electrical Connections

One channel expansion of RT6 with JSR2A connected for manual reset.



Dual channel expansion of RT6 with JSR2A connected for automatic reset.



JSR3T Expansion Relay

Delayed Outputs

By connecting the JSR3T expansion relay to a compatible safety relay/PLC it is easy to obtain safe “delayed” outputs.

The JSR3T provides the system designer with the facility to hardwire selected time delays in steps between 0.5 and 10 seconds.

Use of Delayed Outputs

There are many applications where delayed outputs are necessary and permissible. For example delayed stop signals can be used for emergency stops according to EN418 § 4.1.5 Stop Category 1 and NFPA 79 (a controlled stop with power to the machine actuator(s) available to achieve the stop and then removal of power when stop is achieved). Stop Category 1 may also be permitted when it is not possible to gain physical access to the machine before the safe stop is effected, e.g. by:

- Covers and Gates which are locked until dangerous operations and functions have been stopped.
- Long distances between a safety device and dangerous machine functions.

Using this technique of stopping a machine provides many advantages i.e.:

- Machines last longer as they are not subjected to excessive loading, etc. when requested to stop.
- Parts being processed are not damaged.
- Restarting machines from stopped position is simplified.

A safe “soft” stop is achieved by means of a safety relay giving a programmed stop to the machine control system, e.g. when a gate is opened or emergency stop is activated. The output of the safety relay is used to provide both a stop signal to the machine control system, i.e. via a PLC which applies the necessary braking/stopping of the machine in a controlled way, and to switch a delayed expansion relay, e.g. JSR3T. The delayed safety outputs of the JSR3T expansion relay are then used to control the safe disconnection of the power to the actuators/motors, etc. of the machine.

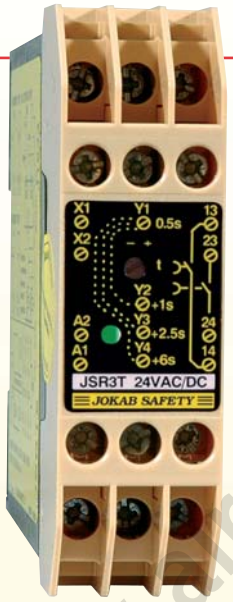
Safety Level

The JSR3T has twin stop functions, using two positively guided contact relays. In order to achieve the level of monitoring required the JSR3T must be used with a suitable safety relay, e.g. JSBR4, RT6, RT9, etc. The JSR3T test output (terminals X1 and X2) must be connected to the test input of the safety relay being expanded. (See connection examples.)

The JSR3T provides delay times that even in the event of an internal fault condition complies with the requirement that the set delay cannot increase in time.

Connection Examples

For examples of how our safety relays can solve various safety problems, see “Connection Examples” beginning on page 48.



Expansion Relay with Delay for

- Hardwire Selection of Delay Time
- Delayed Safety Outputs

Features

- Hardwire selectable delay 0.5 - 10.0 seconds by hardwire links and time trim potentiometer
- Width 22.5 mm
- Output indication
- 2 x 1 NO relay outputs
- 24 VDC/VAC

Regulations and Standards

The JSR3T is designed and approved in accordance with appropriate directives and standards. Examples of such are: 98/37/EC, EN ISO 12100-1/-2, EN 60204-1 and EN 954-1/EN ISO 13849-1.

Approvals

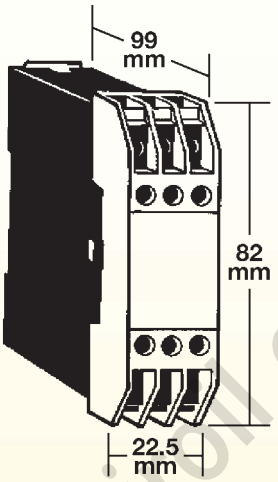
CERTIFIED BY inspecta

JSR3T Technical Data

Manufacturer.....JOKAB SAFETY
Ordering Data/Article Numbers.....see page 69
Color.....black and beige
Weight.....158 g
Power Supply.....24 VAC/DC, 50-60Hz
Power Consumption.....<2 VA
Relay Outputs.....2 x 1 NO
(see connection examples)

Maximum switching capacity res. load AC.....4A/250 VAC/1000 VA
Maximum switching capacity res. load DC.....4A/24 VDC/100 W
Maximum total switching capacity.....6A distributed on all contacts
Minimum load.....10mA/10 V
(if load on contact has not exceeded 100 mA)
Contact material.....AgNi
Maximum input wire res. at nom. voltage.....100 Ohm

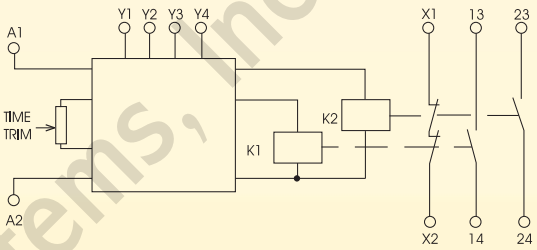
Response Time
At activation.....<20 ms
At deactivation.....<.05 - 10.0 s at nom. voltage
(Selected delay can be lowered by up to approximately 30% by means of preset potentiometer on front panel.
Mounting.....35 mm DIN rail
LED Indication.....Outputs
Operating Temperature Range.....-10°C to +55°C



Terminals (removable)
Maximum screw torque.....1 Nm
Single strand.....2x1.5mm²
Conductor with socket contact.....2x1mm²
Air and creep distance.....4kV/2 IEC 60664-1
Protection Class
Enclosure.....IP 40 IEC 60529
Terminals.....IP 20 IEC 60529

JSR3T Technical Description

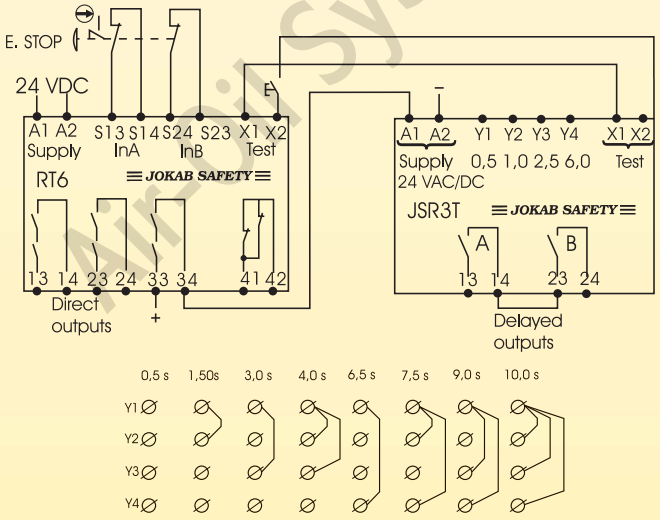
When supply voltage is connected to A1 and A2, relays K1 and K2 are activated. When the supply voltage is removed, relays K1 and K2 remain energized for a time period determined by the hardwire link configuration chosen (set by connecting links on the terminals Y1, Y2, Y3 and Y4) and the setting of the Time Trim potentiometer.

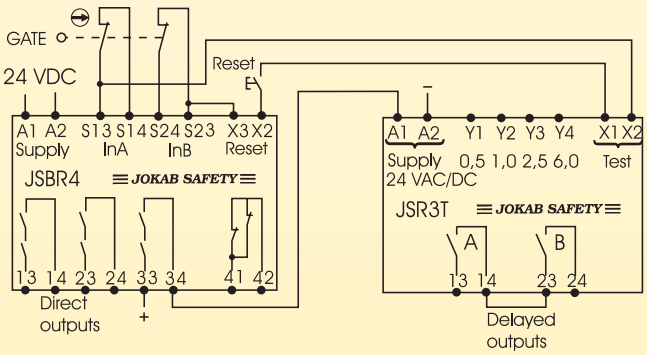


Note 1: Max. time set by hardwire links can only be reduced (up to approx. 40% reduction) by Time Trim potentiometer.

Note 2: Both the output contacts of K1 and K2 (13-14 and 23-24) must be used. Output contacts must be either connected in series (forming one safety output) or used in parallel circuits in order to obtain necessary redundancy.

JSR3T Electrical Connections





It is recommended that all switched loads are adequately suppressed and/or fused in order to provide additional protection for the safety contacts.

Selection of time delay by hardwire links (Y1, Y2, Y3 and Y4.) Selected delay can be lowered by up to approximately 30% by means of preset potentiometer on front panel.

Explanations of Safety Terminology

Supervised Reset
The input must both be closed and opened before the outputs of the safety relay are activated. Using this method both the reset device and the interconnecting cable are supervised.

Bypass Connection
This is sometimes permissible where it is required to, e.g. allow material transport into a dangerous area. The Bypass Connection must be of the same safety level as the safety device being bypassed.

Test
The input is used to supervise contactors and valves, and must be closed before the safety relay can be reset. It can also be used as a simple form of reset only requiring a contact closure. In this case however, the risk of short circuit must be prevented and the reset device supervised separately.

Time Bypass Connection
This is the provision of a guaranteed maximum time for the transportation of material or passing with an enabling device.

Time Reset
This is used to prevent unintentional reset when somebody is in the risk area. Within a guaranteed maximum time two or more reset push buttons must be activated. The PB's must be placed in such physical positions so that the users can overview the total danger area. The Time Reset function can be achieved using a JSHT1 in combination with a safety relay incorporating a supervised reset.

Inching
Inching requires safety outputs to be closed for a maximum period of time allowing the machine to move only a short distance each time the inching control is activated. The time must be designed so that the specified time will not increase in the case of component failure.

Delayed Safety Stop
Where it is permissible to allow a machine to stop before disconnection of power, it is necessary to achieve a Delayed Safety Stop. The delay period being the time between the initiation of the stop signal and the opening of the safety contacts. The time delay must be designed in such a way that it will not increase in time in the case of a component failure. This type of delay is permitted, dependent upon risk assessment, for both emergency stops and other safety devices.

Three-Position Enabling/Hold to Run Device
These devices are used during troubleshooting or testing of machines. If the device push button is pressed into its bottom position or released completely a safe duplicated stop signal is given. Jokab Safety's Three-Position Devices have duplicated switches and are supervised by a true two input channel safety relay.

Contact Strip/Mat
Contact Strips/Mats can be supervised by a true two input channel safety relay. A stop signal being generated when both inputs are connected (short circuited) to each other.

Foot Pedal
Safety relays can be used to supervise Foot Pedals to ensure correct operation and to ensure short circuits in connecting cables do not cause unintentional start signals.

Brake Strip
When a Brake Strip is squeezed the contacts within the strip are forced open and provides a stop signal via a suitable safety relay.

Emergency Stop
When an Emergency Stop push button is activated a stop signal is given via a safety relay. Reset of the Emergency Stop device should not by itself lead to a start signal being given.

Two-Hand Control
This requires the use of a safety relay to supervise that the two start push buttons are pressed within 0.5 seconds of each other before a start signal is allowed. The highest safety level requires two contacts in each PB, a duplicated stop function being given even if only one PB is released (see JSBR4). Short circuits between connecting wires are detected automatically. In the lower safety level other safety relays can be used.

Machine I/O
All types of machines have a need to interface to emergency stops, contactors and other types of safety devices. Approved safety relays make this easy to perform.

Interlocked Hatch
When an Interlocked Hatch is opened an interlock device gives a stop signal via a safety relay. If the hatch cannot be entered by a human body automatic reset can be allowed.

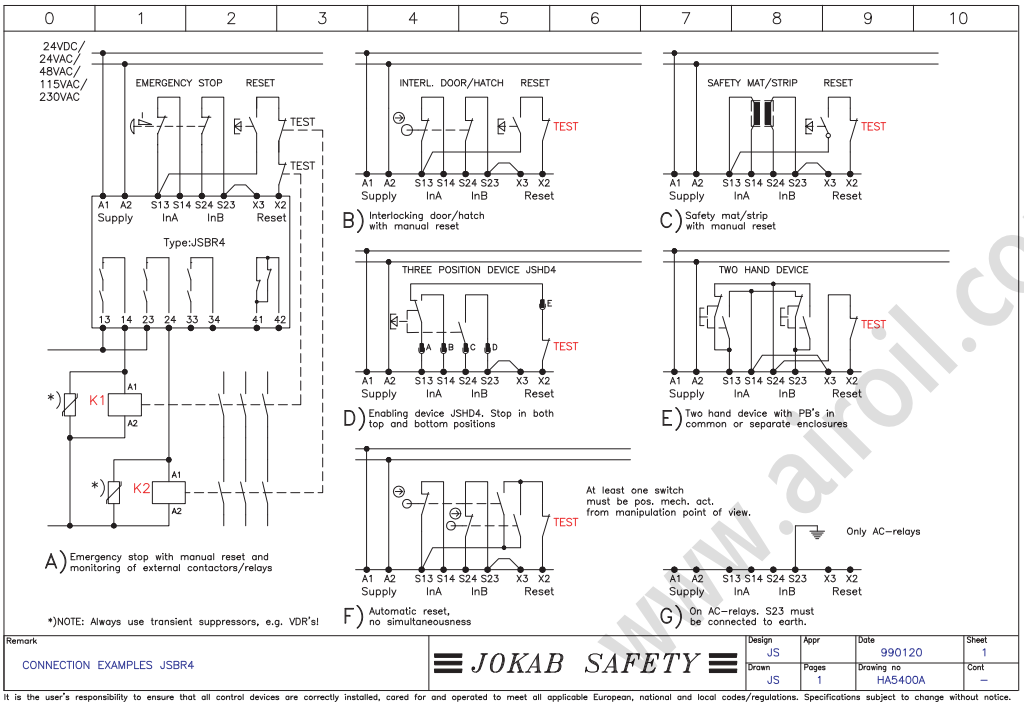
True Two Channel
True Two Channel requires two inputs with different voltages to be closed before the safety relay can be activated. A stop signal is given even if only one input is opened or a short circuit is detected across the inputs.

Interlocked Gate
When an Interlocked Gate is opened an interlock device gives a stop signal via a safety relay. If the gate can be passed by a human body a safety relay with a supervised reset should be used.

Connection Examples Contents

General Drawing

HA5400A Connection Example JSBR4



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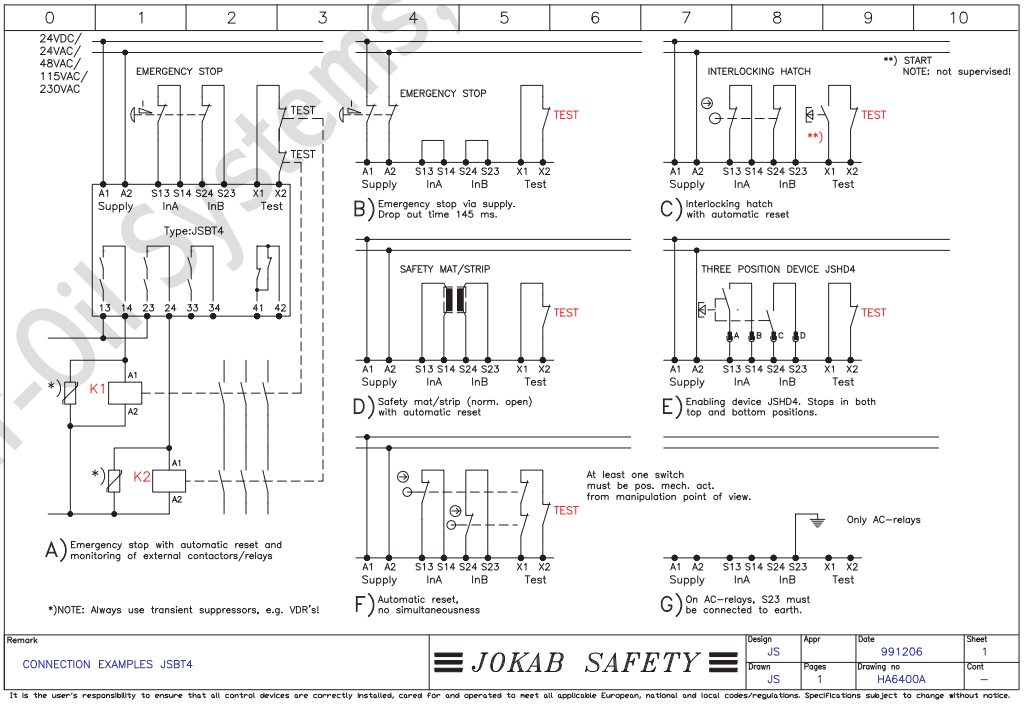
General Drawing

HA6400A Connection Example JSBT4



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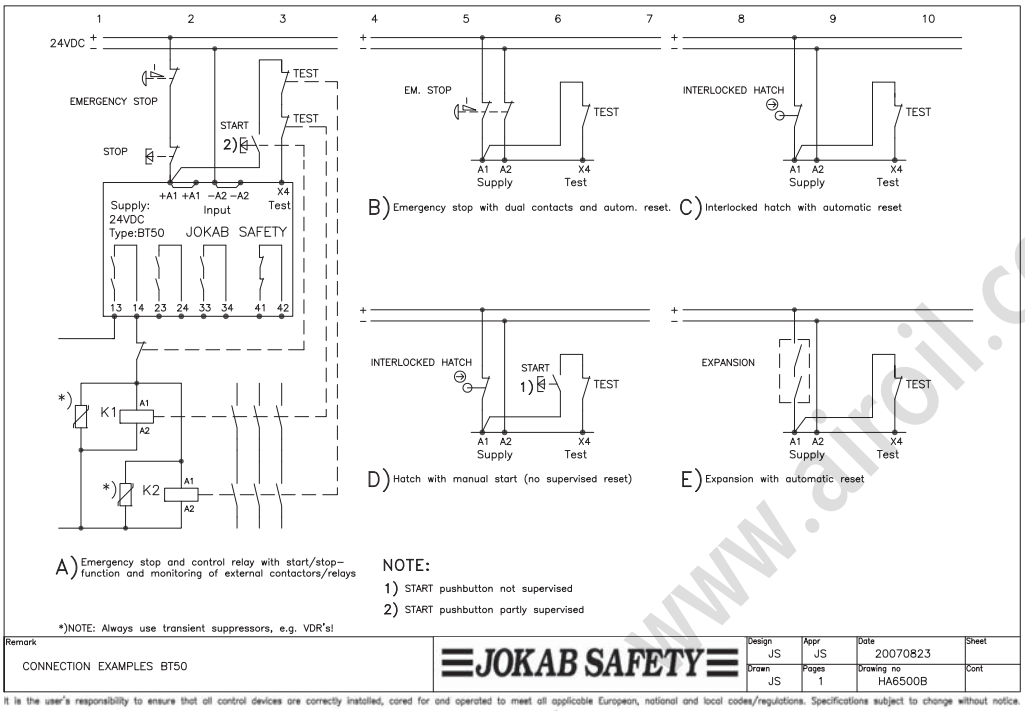
General Drawing

HA6500B Connection Example BT50



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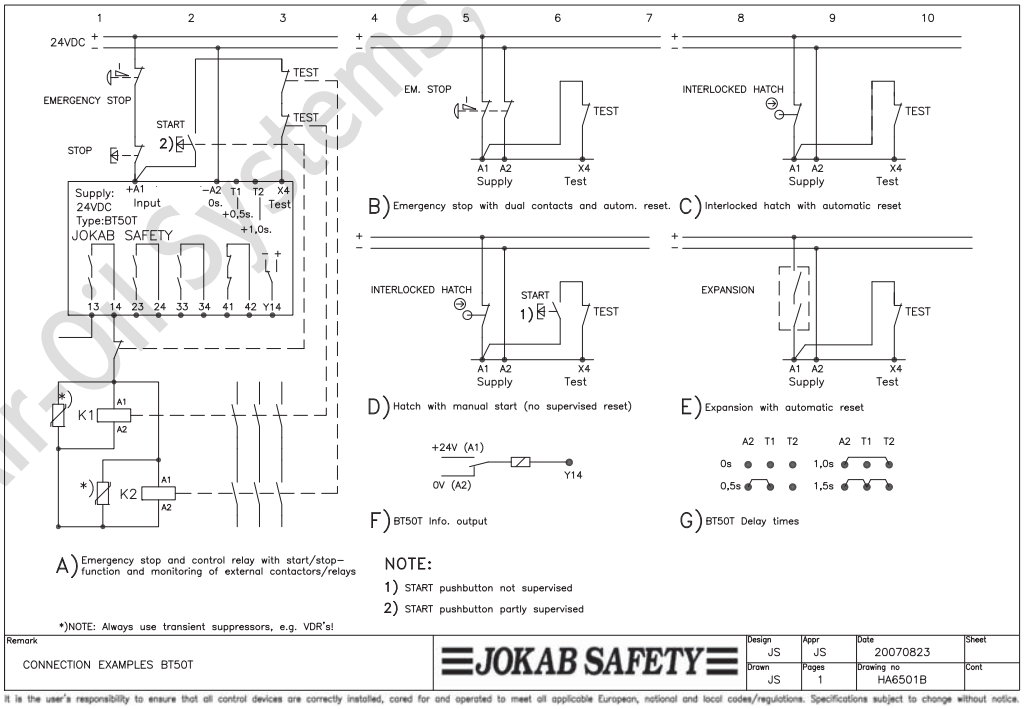
General Drawing

HA6501B Connection Example BT50T



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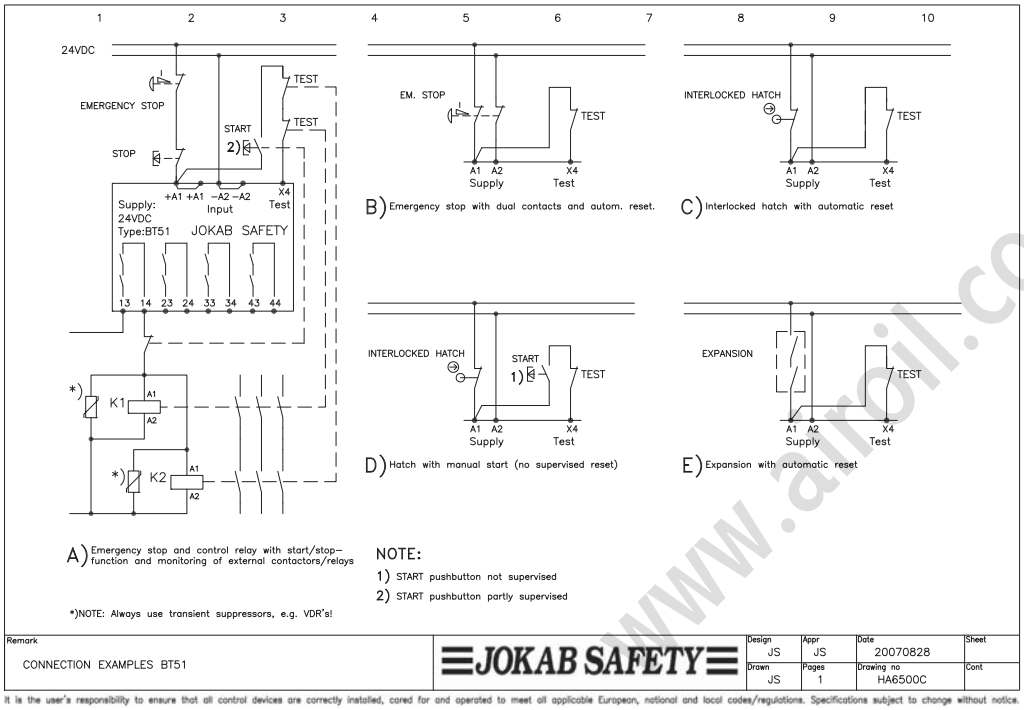
General Drawing

HA6500C Connection Example BT51



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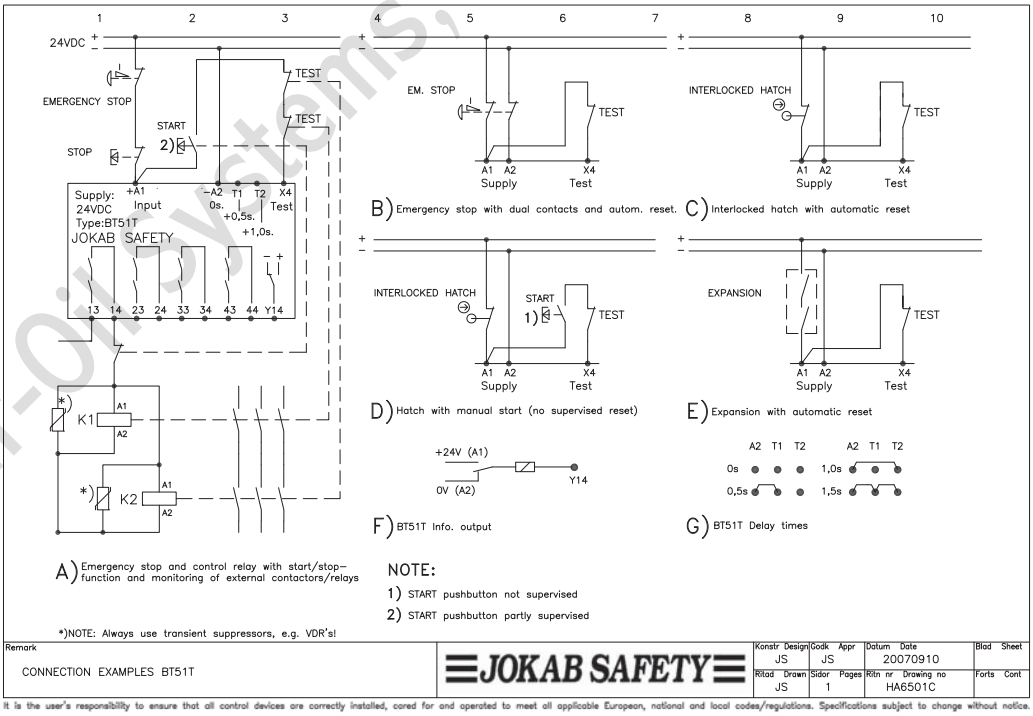
General Drawing

HA6501C Connection Example BT51T



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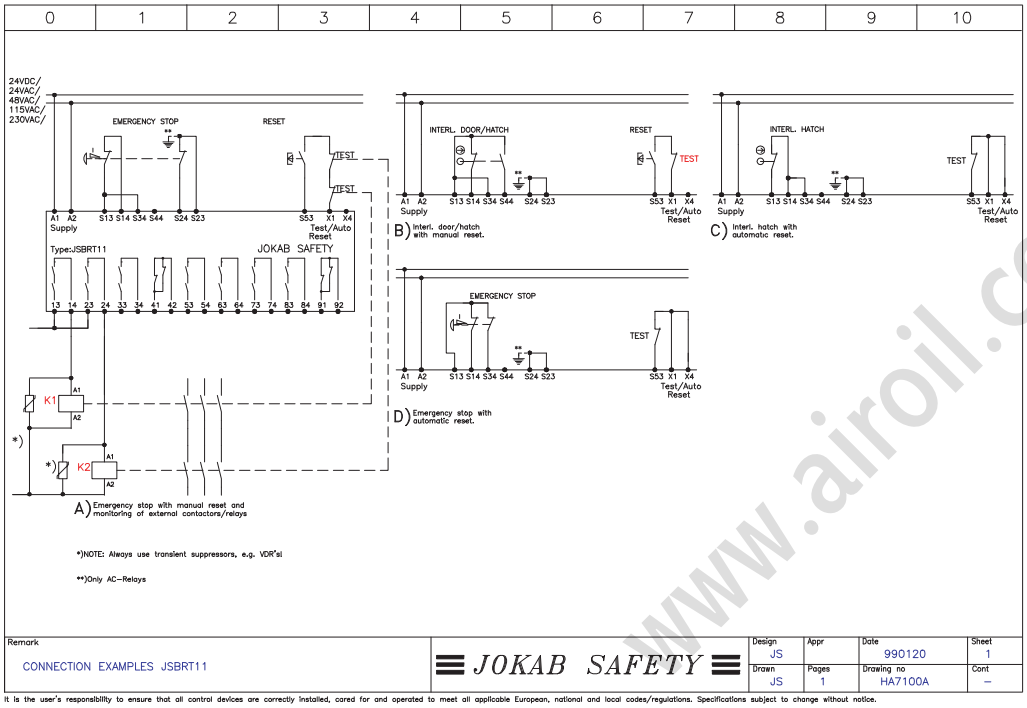
General Drawing

HA7100A Connection Example JSBRT11



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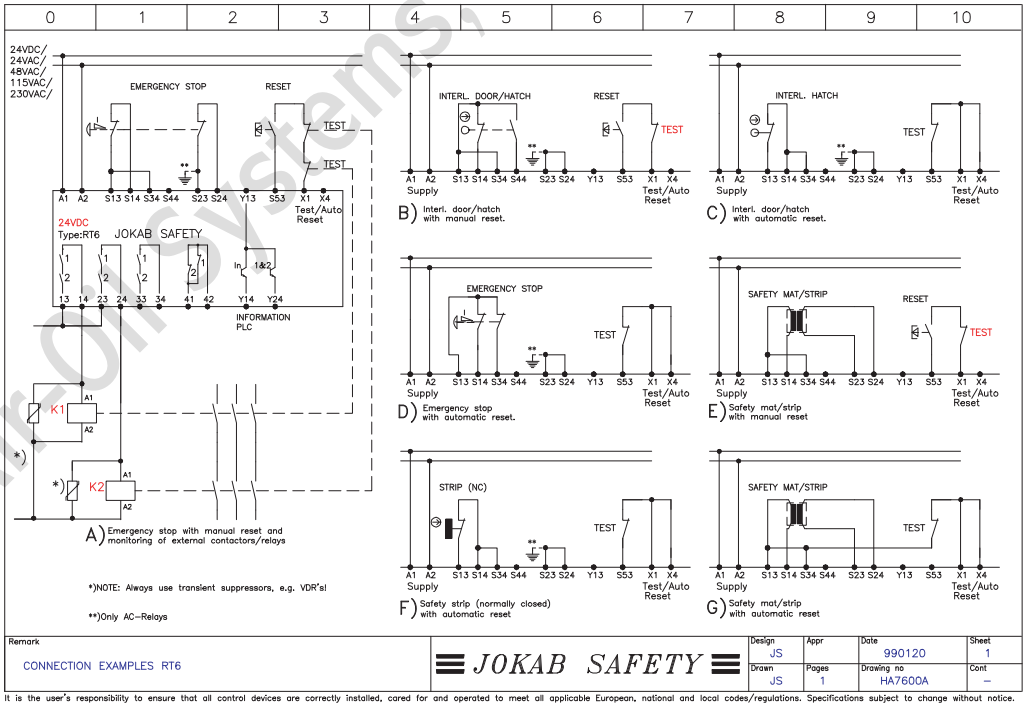
General Drawing

HA7600A Connection Example RT6



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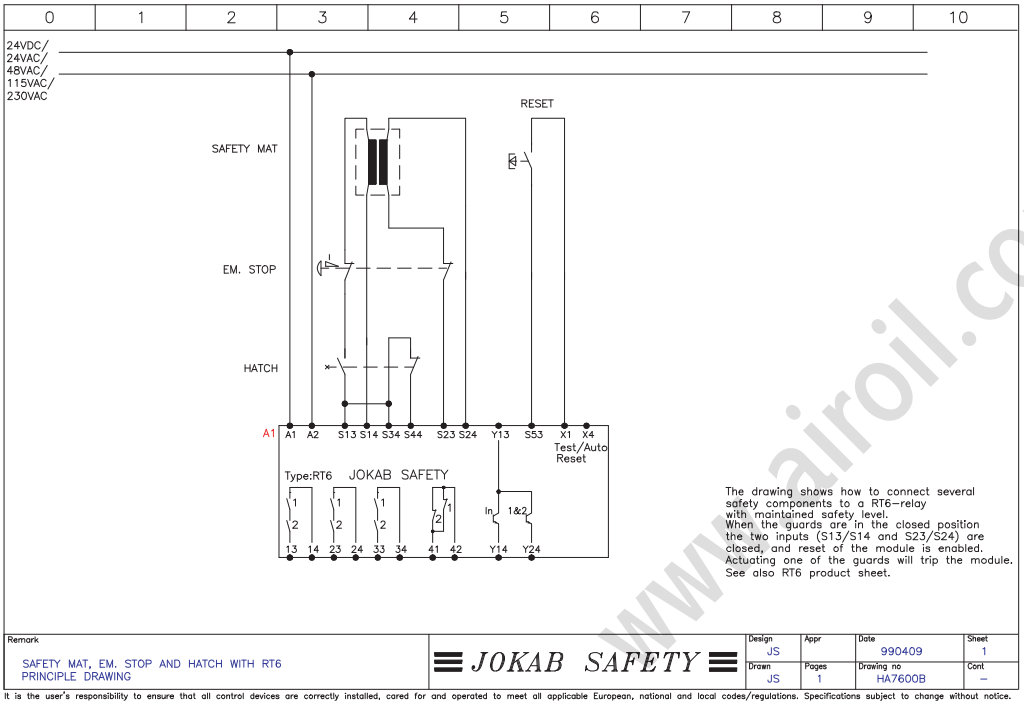
General Drawing

HA7600B Safety Mat, Emergency Stop and Hatch with RT6



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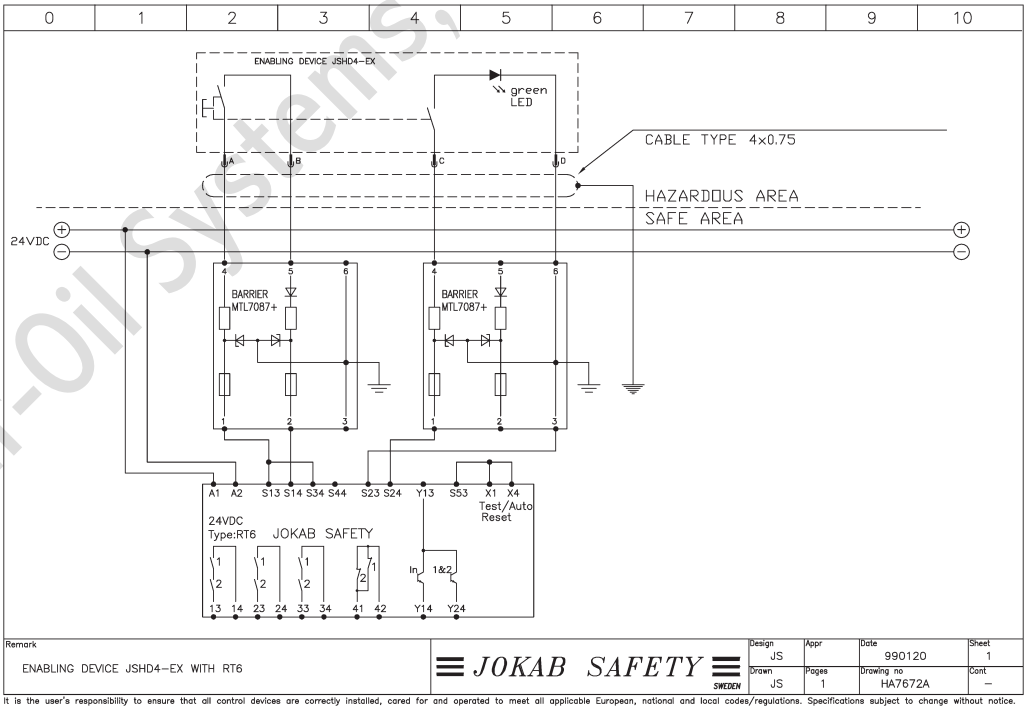
General Drawing

HA7672A Enabling Device JSHD4-EX with RT6



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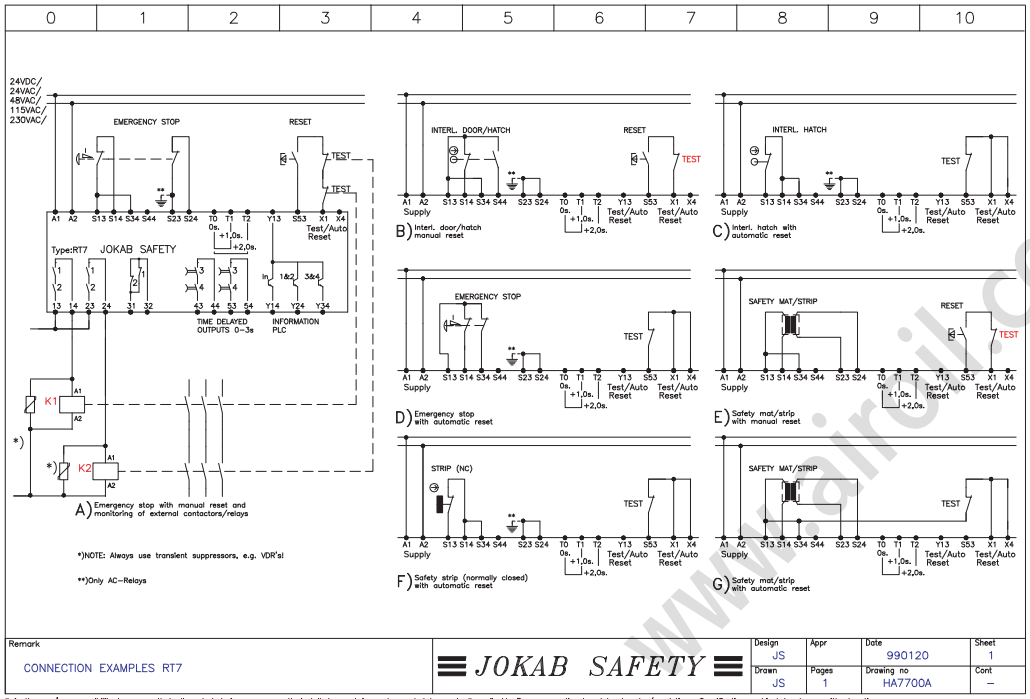
General Drawing

HA7700A Connection Example RT7



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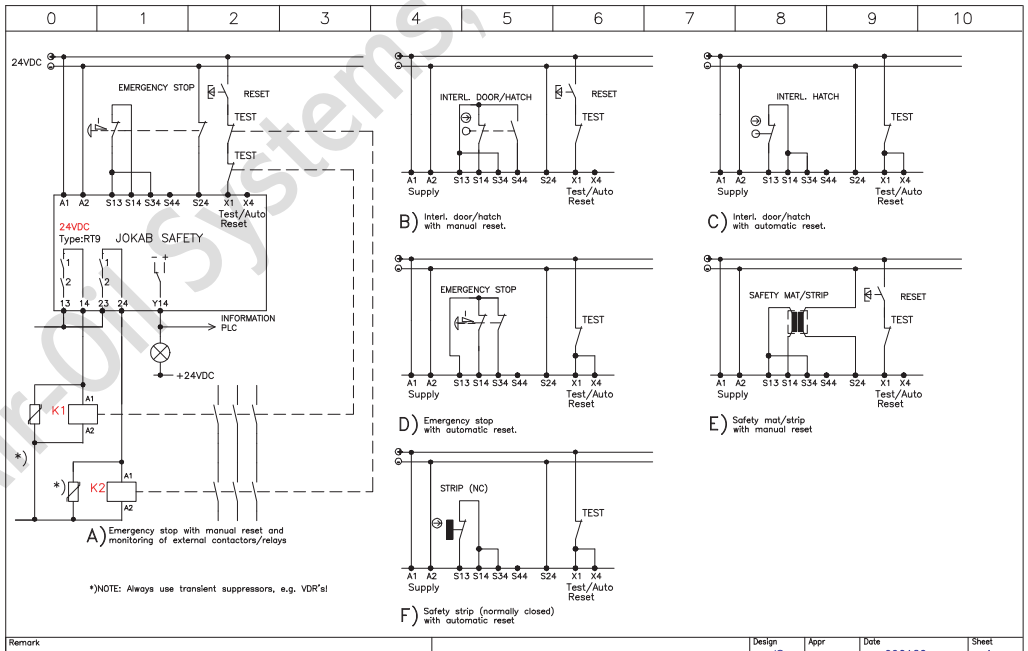
General Drawing

HA7900A Connection Example RT9



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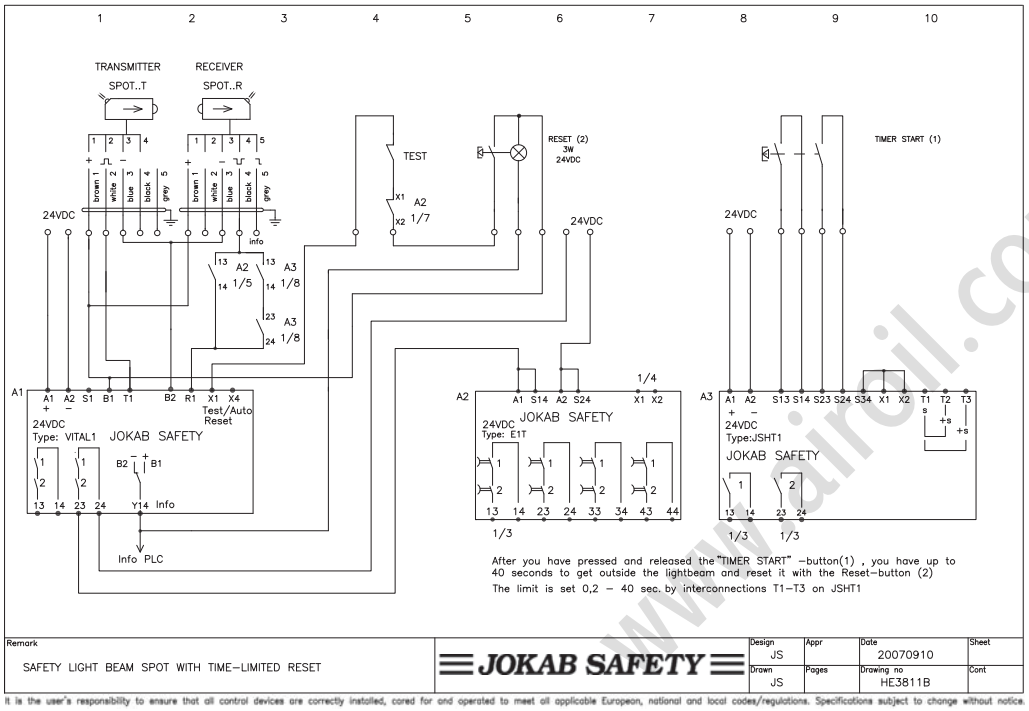
Example with Safety Light Beam

HE3811B Safety Light Beam Spot with Time-Limited Reset



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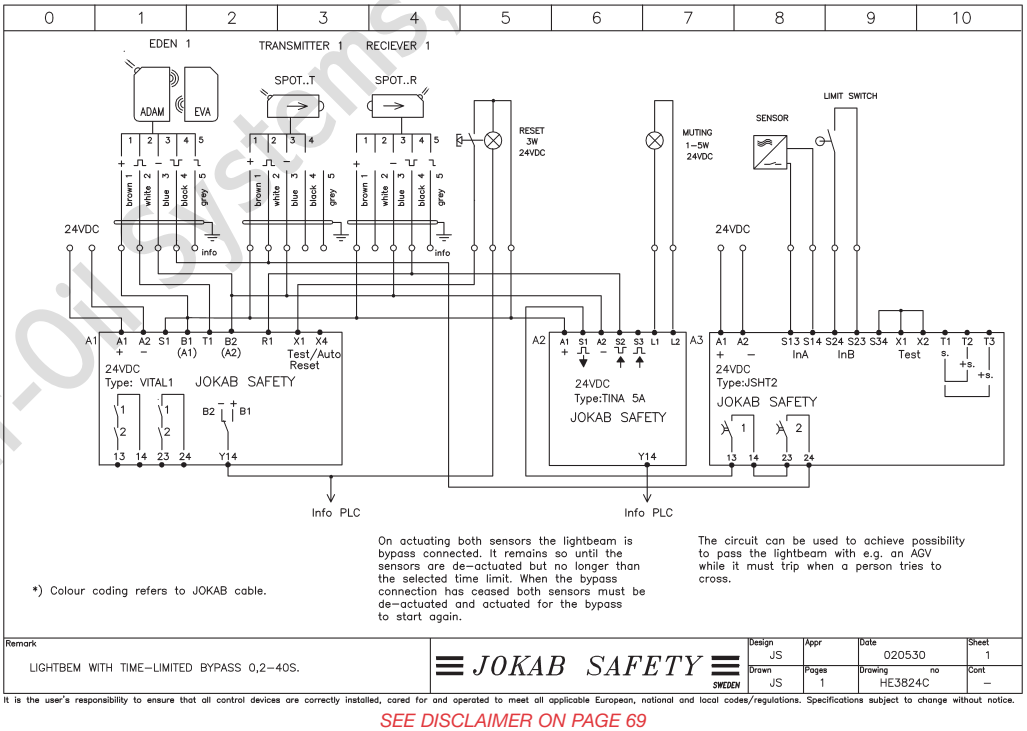
Example with Safety Light Beam

HE3824C Light Beam with Time-Limited Bypass 0.2-40 s



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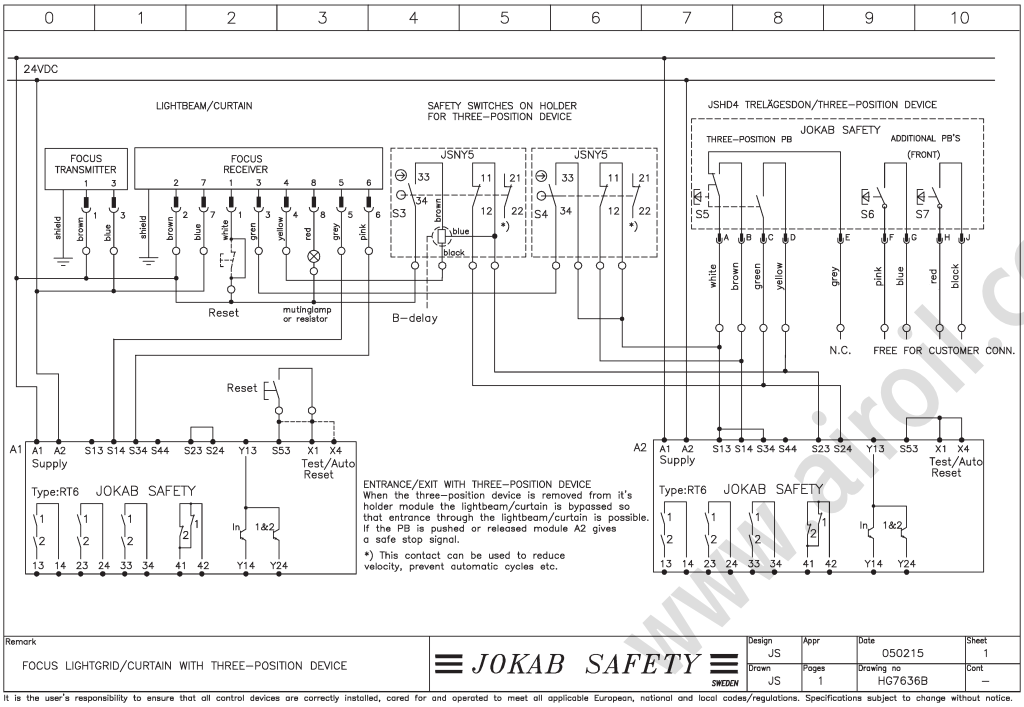
Example with Safety Light Beam

HG7636B Focus Light Grid/Curtain with Three-Position Device



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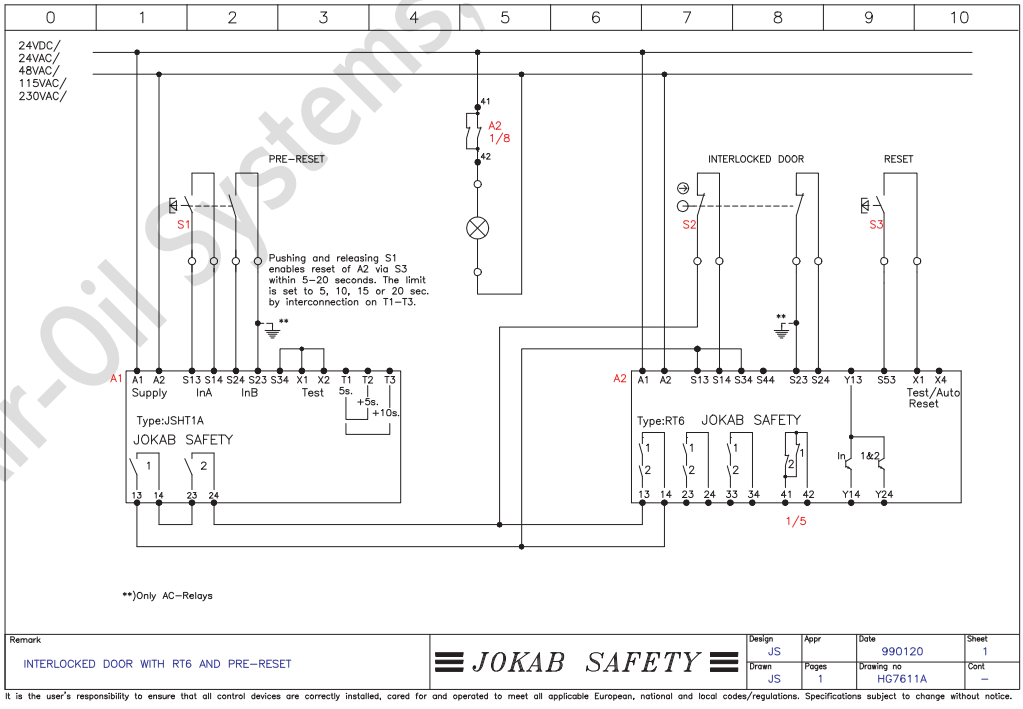
Example with Interlocked Doors/Switches

HG7611A Interlocked Door with RT6 and Pre-Reset



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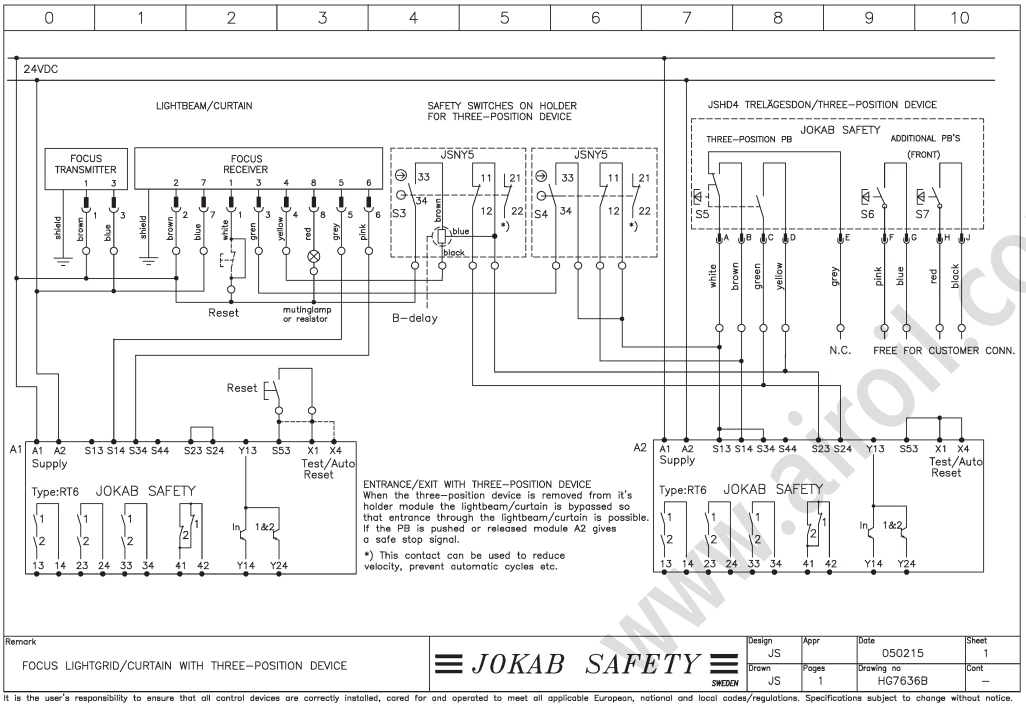
Example with Interlocked Doors/Switches

HG7636A Interlocked Door with Three-Position Device



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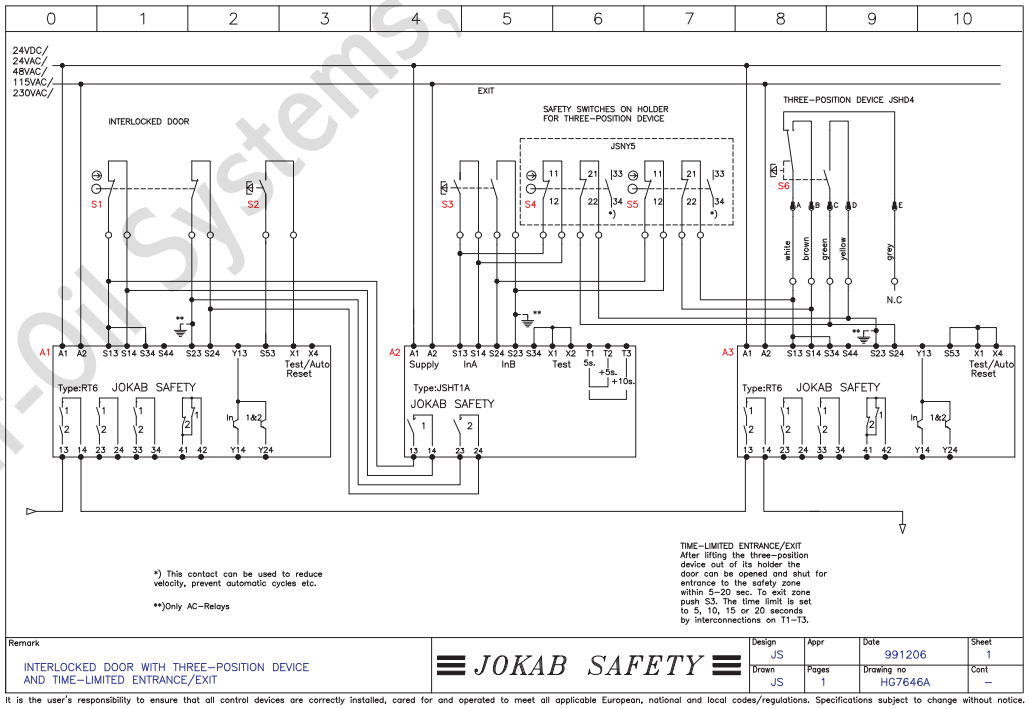
Example with Interlocked Doors/Switches

HG7646A Interlocked Door with Three-Position Device and Time-Limited Entrance/Exit



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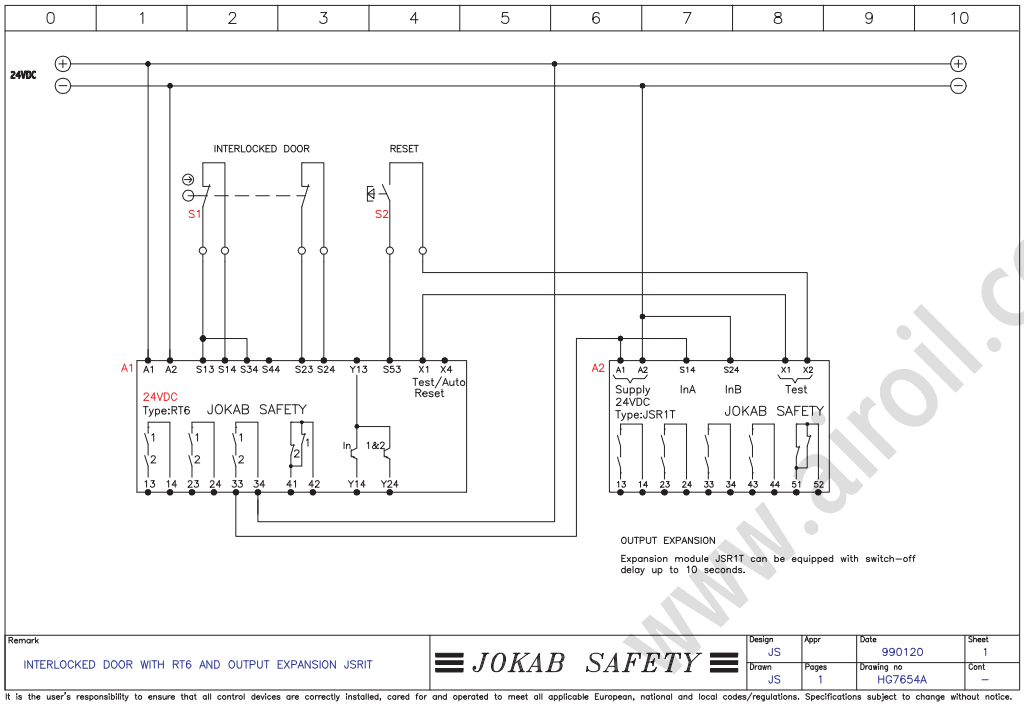
Example with Interlocked Doors/Switches

HG7654A Interlocked Door with RT6 and Output Expansion JSR1T



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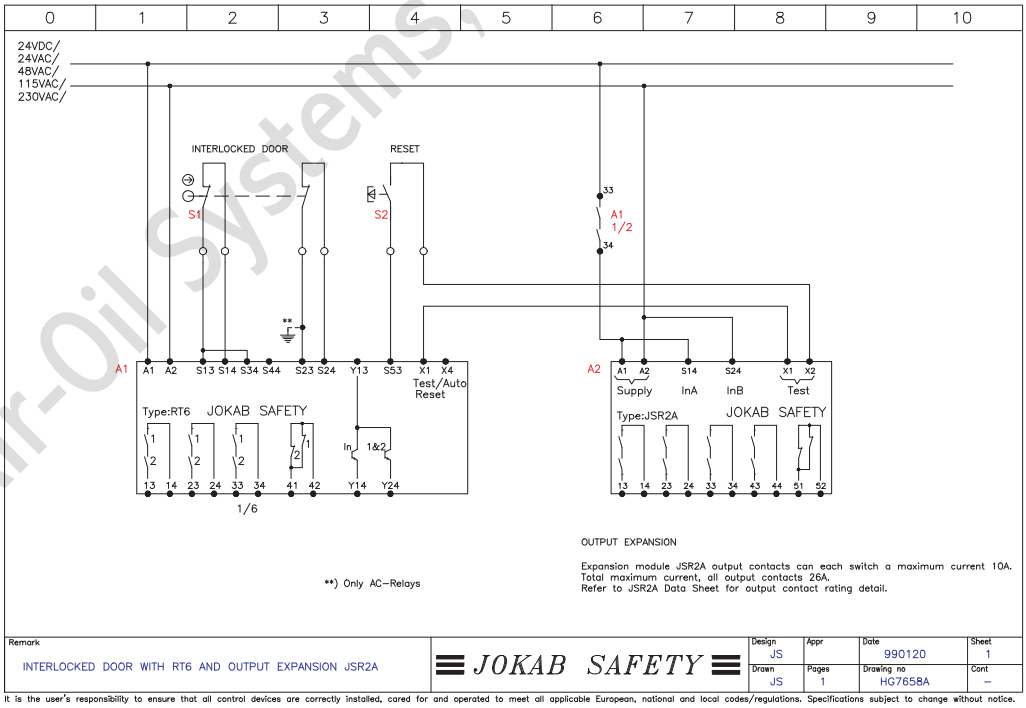
Example with Interlocked Doors/Switches

HG7658A Interlocked Door with RT6 and Output Expansion JSR2A



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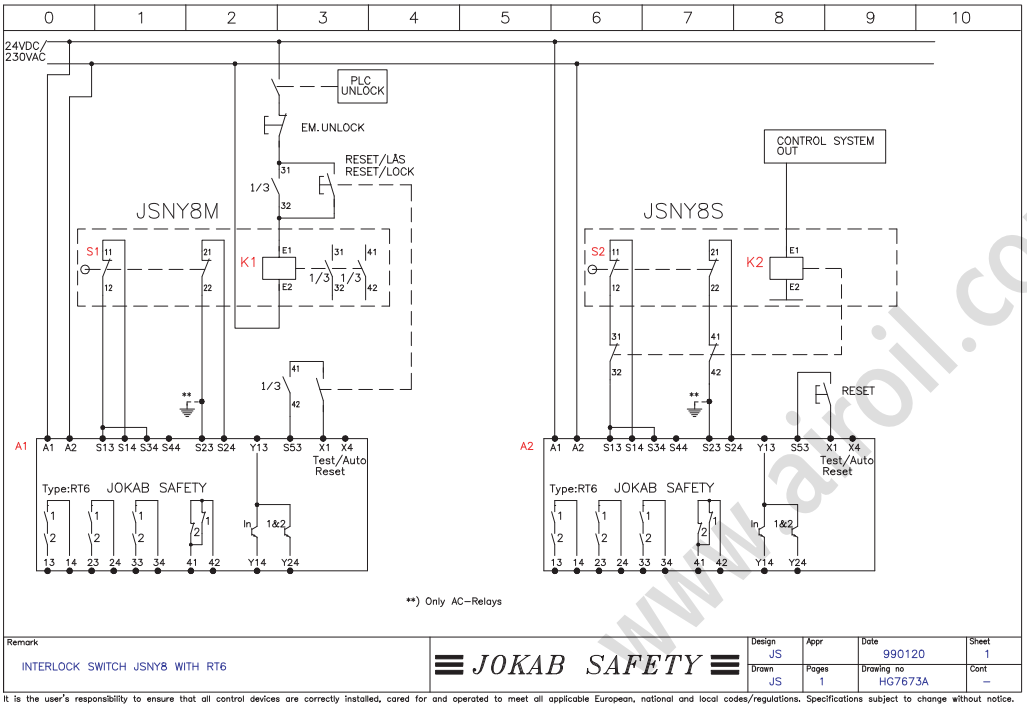
Example with Interlocked Doors/Switches

HG7673A Safety Interlock Switch JSNY8 with RT6



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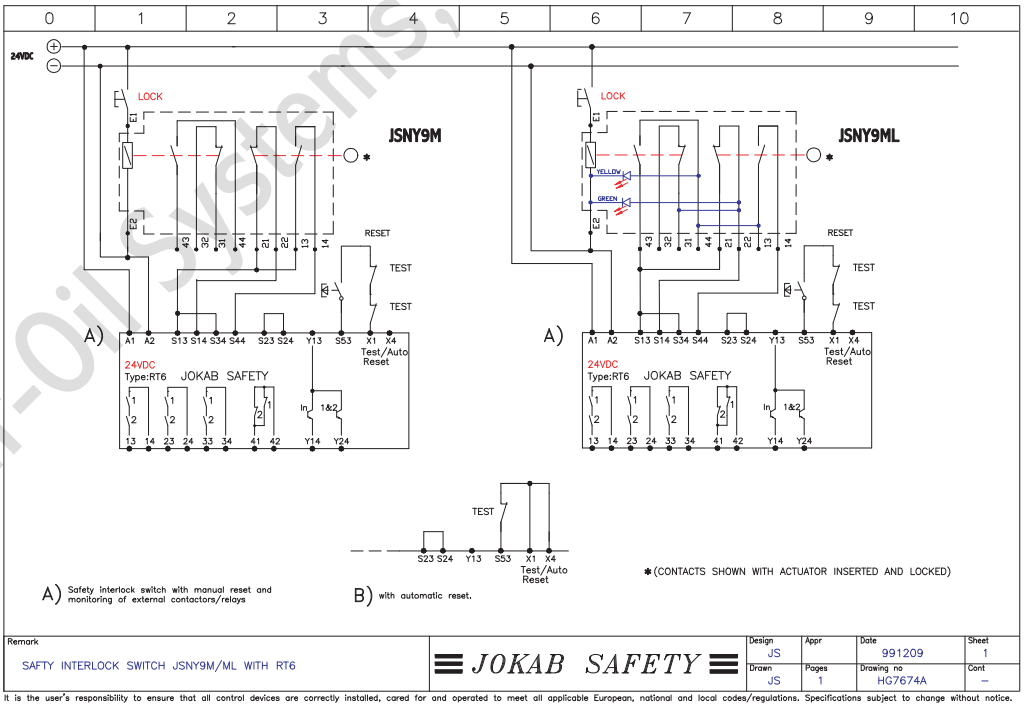
Example with Interlocked Doors/Switches

HG7674A Safety Interlock Switch JSNY9M/MLA with RT6



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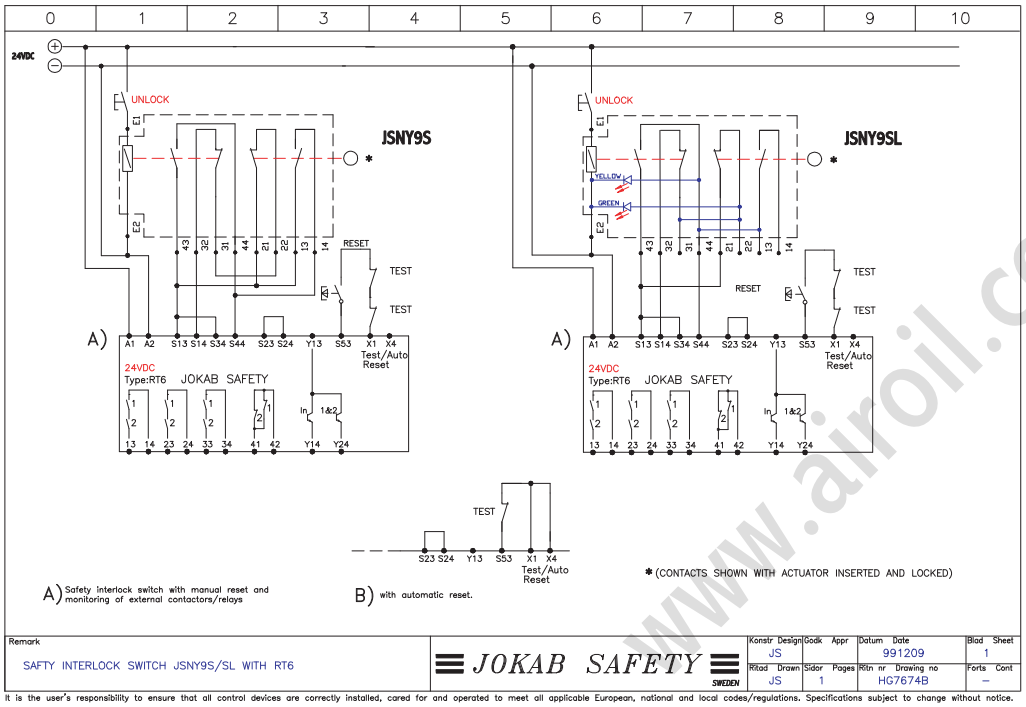
Example with Interlocked Doors/Switches

HG7674B Safety Interlock Switch JSNY9S/SLA with RT6



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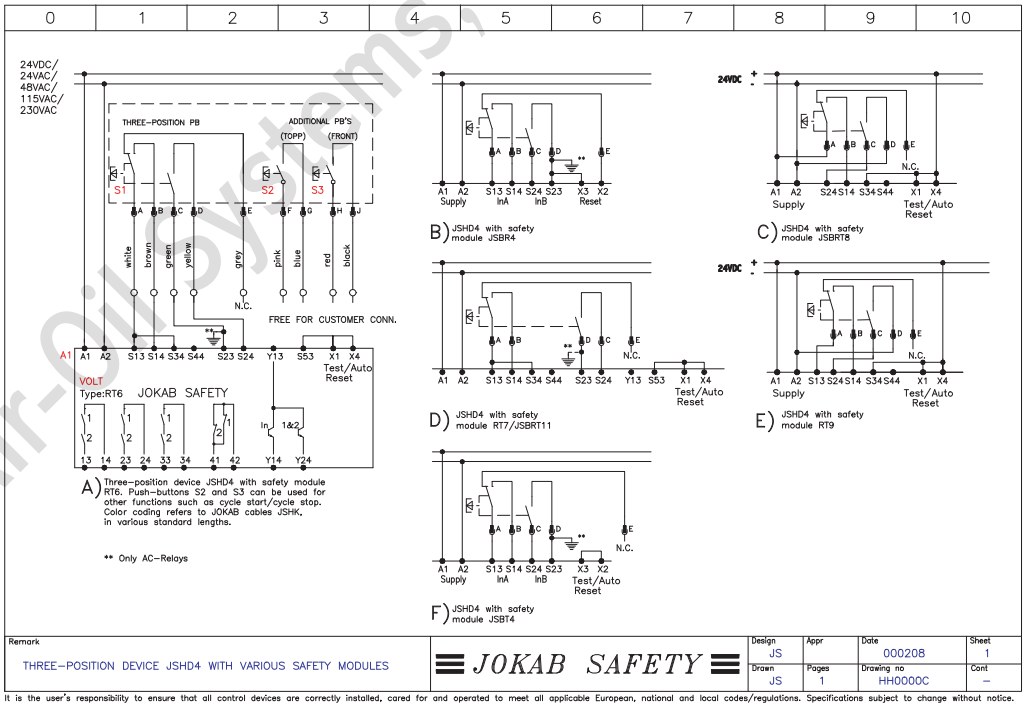
Additional Example

HH0000C Three-Position Device JSHD4 with Various Safety Modules



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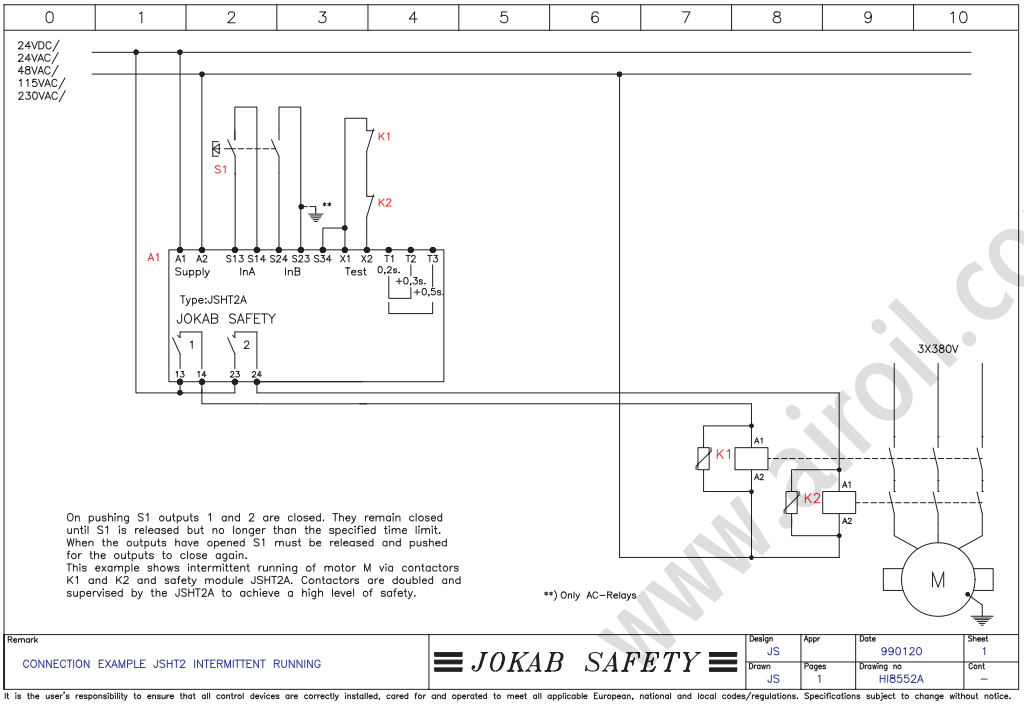
Additional Example

HI8552A Connection Example JSHT2 Intermittent Running



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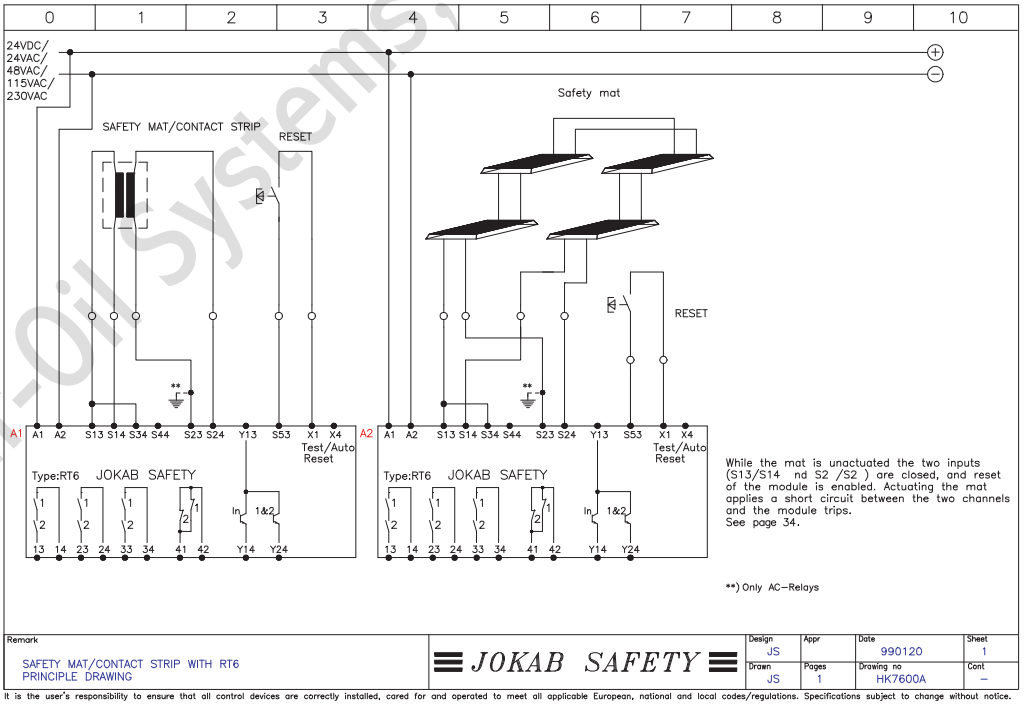
Example with Safety Mats and Contact Strips

HK7600A Safety Mat/Contact Strip with RT6



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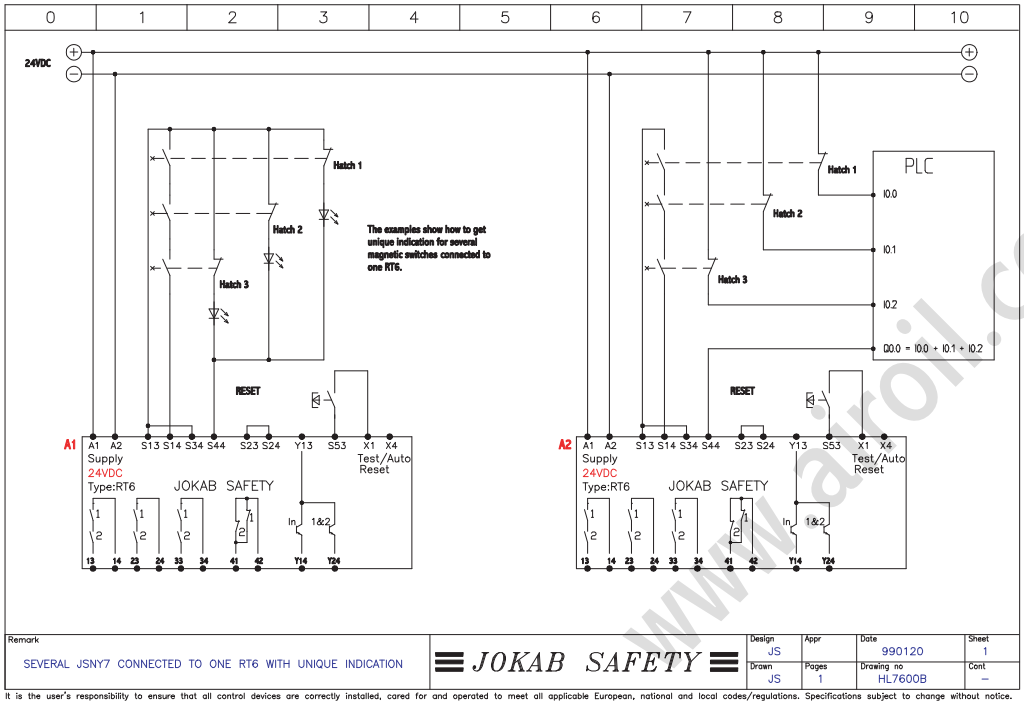
Example with Hatches

HL7600B Several JSNY7 connected to one RT6 with Unique Indication



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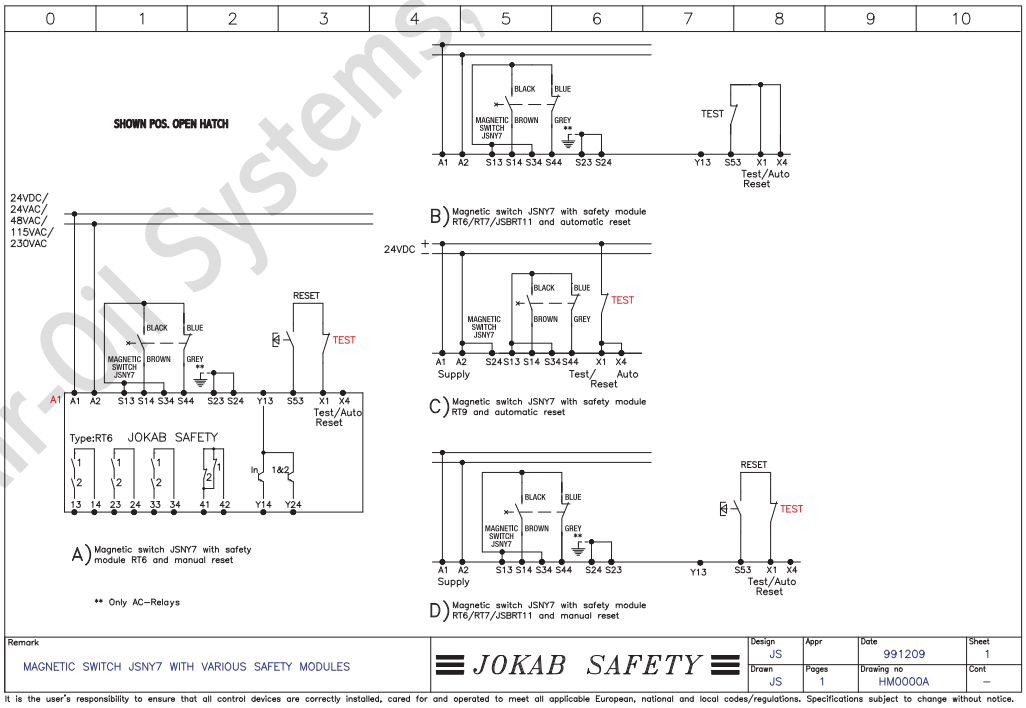
Example with Magnetic Switches

HM0000A Magnetic Switch JSNY7 with Various Safety Modules



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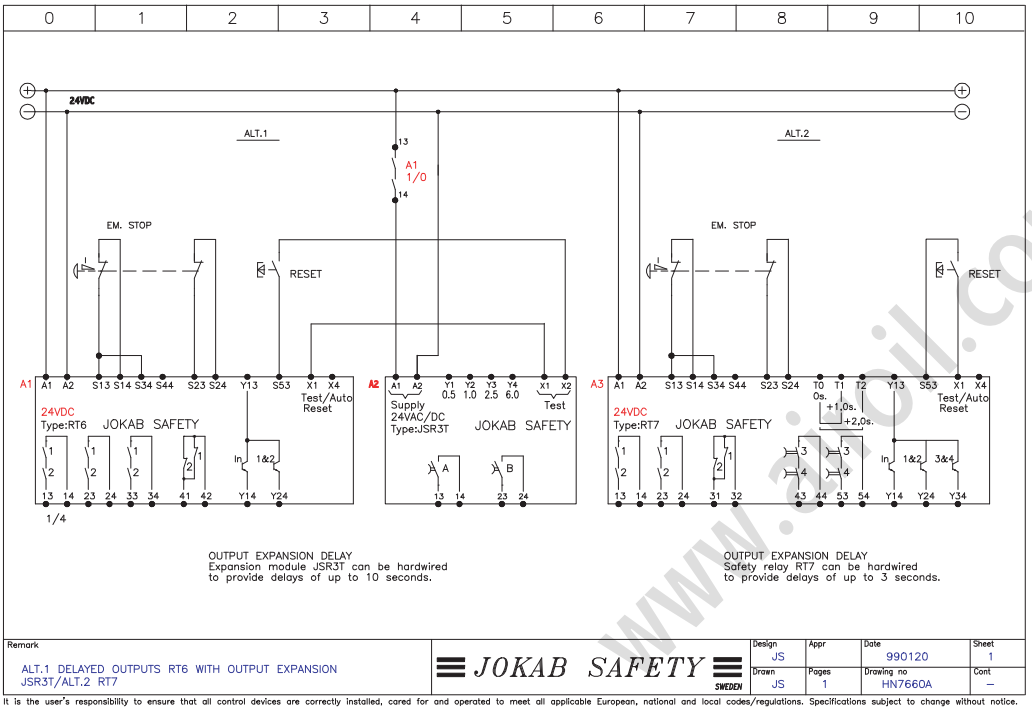
Output Example

HN7660A Delayed Outputs RT6 with Output Expansion JSR3T/RT7



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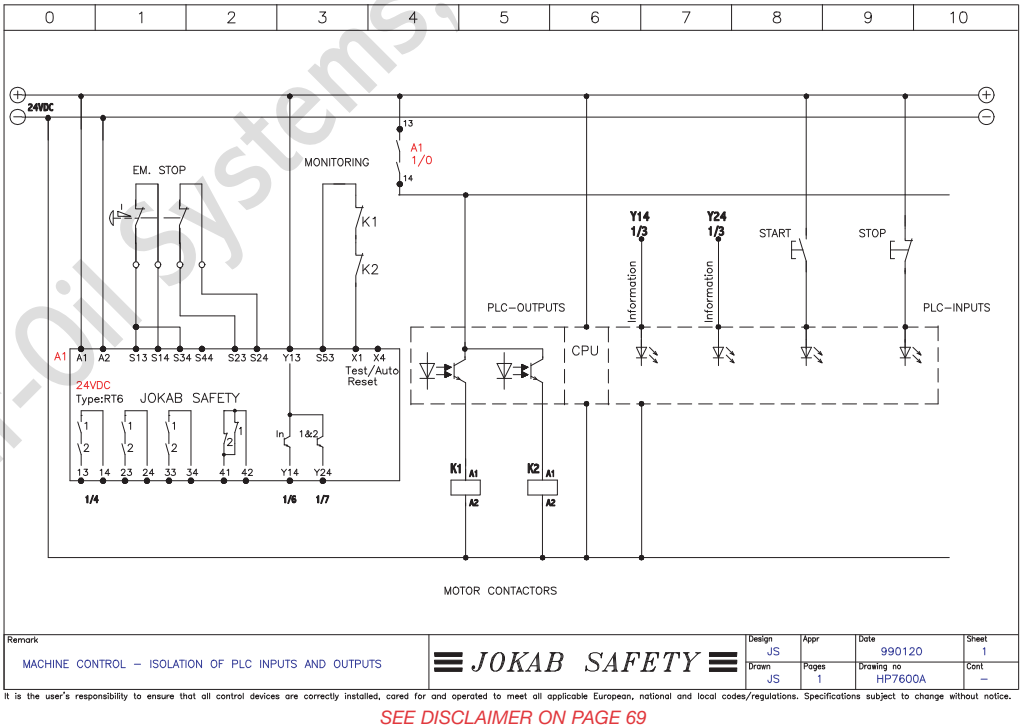
Common Example

HP7600A Machine Control - Isolation of PLC Inputs and Outputs



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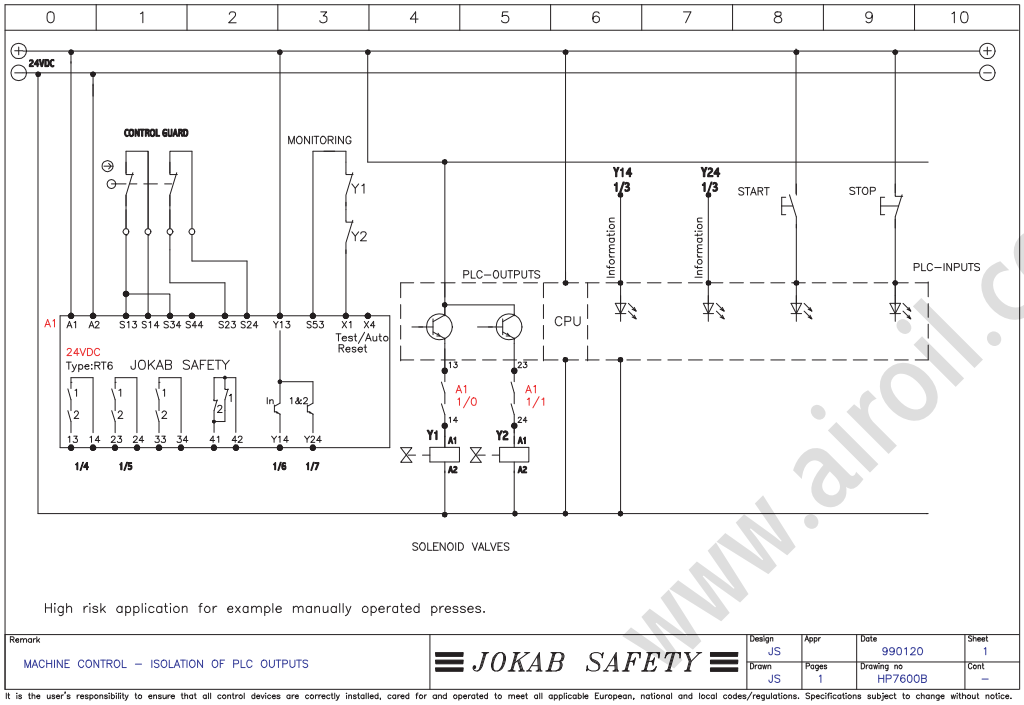
Common Example

HP7600B Machine Control - Isolation of PLC Outputs



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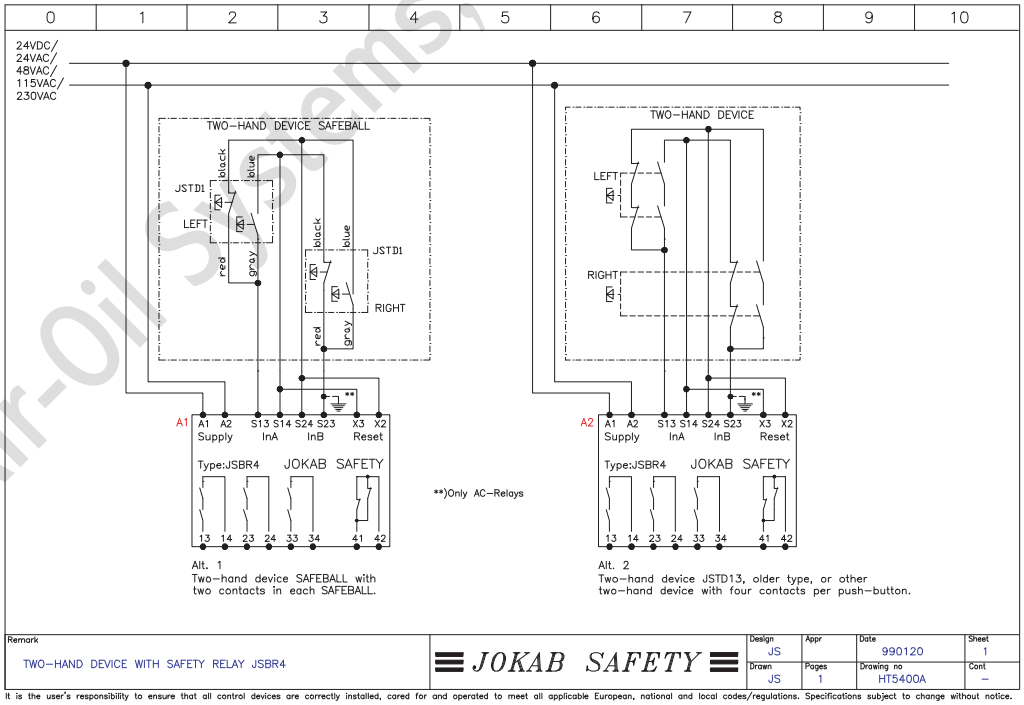
Example with Two-Hand Device

HT5400A Two-Hand Device with JSBR4



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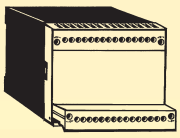
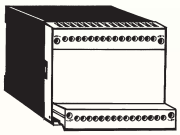
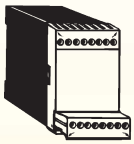
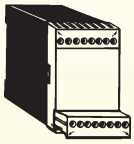
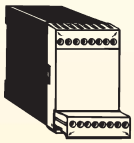
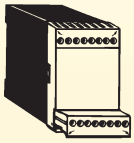
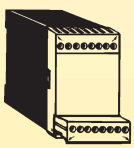
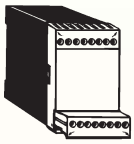
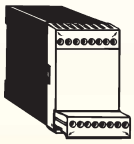
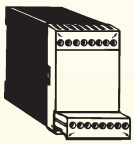
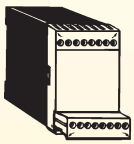
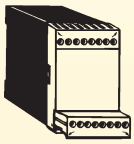
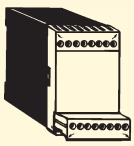
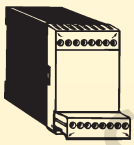
Component List - Safety Relays

Designation		Article Number	Description
RT6 24VDC		10-026-00	Safety relay with 3 safety outputs, 5 selectable input options (single or dual channel), automatic or manual supervised reset, test input for monitoring of external positive guided relays/contactors, 5 LED indicators, 1 NC information output and 2 potential free transistor information outputs, quick release terminal blocks, 45mm wide, 24VDC supply. Meets safety category 1 to 4.
RT6 115VAC		10-026-04	Safety relay with 3 safety outputs, 5 selectable input options (single or dual channel), automatic or manual supervised reset, test input for monitoring of external positive guided relays/contactors, 5 LED indicators, 1 NC information output and 2 potential free transistor information outputs, quick release terminal blocks, 45mm wide, 115VAC supply. Meets safety category 1 to 4.
RT7 A 24VDC		10-028-20	Safety relay with 4 safety outputs (2 outputs can be off-delayed by 0, 0.5, 1 or 1.5 seconds via hardwire jumpers), 5 selectable input options (single or dual channel), automatic or manual supervised reset, test input for monitoring of external positive guided relays/contactors, 6 LED indicators, 1 NC information output and 3 potential free transistor information outputs, quick release terminal blocks, 45mm wide, 24VDC supply. Meets safety category 1 to 4.
RT7 A 115VAC		10-028-24	Safety relay with 4 safety outputs (2 outputs can be off-delayed by 0, 0.5, 1 or 1.5 seconds via hardwire jumpers), 5 selectable input options (single or dual channel), automatic or manual supervised reset, test input for monitoring of external positive guided relays/contactors, 6 LED indicators, 1 NC information output and 3 potential free transistor information outputs, quick release terminal blocks, 45mm wide, 115VAC supply. Meets safety category 1 to 4.
RT7 B 24VDC		10-028-10	Safety relay with 4 safety outputs (2 outputs can be off-delayed by 0, 1, 2 or 3 seconds via hardwire jumpers), 5 selectable input options (single or dual channel), automatic or manual supervised reset, test input for monitoring of external positive guided relays/contactors, 6 LED indicators, 1 NC information output and 3 potential free transistor information outputs, quick release terminal blocks, 45mm wide, 24VDC supply. Meets safety category 1 to 4.
RT7 B 115VAC		10-028-14	Safety relay with 4 safety outputs (2 outputs can be off-delayed by 0, 1, 2 or 3 seconds via hardwire jumpers), 5 selectable input options (single or dual channel), automatic or manual supervised reset, test input for monitoring of external positive guided relays/contactors, 6 LED indicators, 1 NC information output and 3 potential free transistor information outputs, quick release terminal blocks, 45mm wide, 115VAC supply. Meets safety category 1 to 4.
RT9 24VDC		10-029-00	Safety relay with 2 safety outputs, 5 selectable input options (single or dual channel), automatic or manual supervised reset, test input for monitoring of external positive guided relays/contactors, 5 LED indicators, 1 dual purpose information output, quick release terminal blocks, 22.5mm wide, 24VDC supply. Meets safety category 1 to 4.
JSBRT11 24VDC		10-025-00	Safety relay with 7 safety outputs, 4 selectable input options (single or dual channel), automatic or manual supervised reset, test input for monitoring of external positive guided relays/contactors, 5 LED indicators, 2 NC information outputs, quick release terminal blocks, 100mm wide, 24VDC supply. Meets safety category 1 to 4.

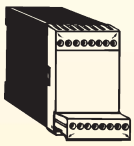
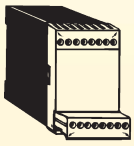
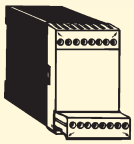
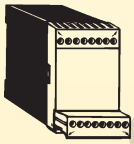
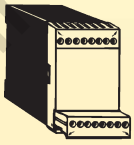
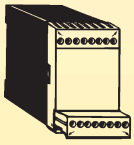
Component List - Safety Relays

Designation		Article Number	Description
JSBRT11 115VAC		10-025-04	Safety relay with 7 safety outputs, 4 selectable input options (single or dual channel), automatic or manual supervised reset, test input for monitoring of external positive guided relays/contactors, 5 LED indicators, 2 NC information outputs, quick release terminal blocks, 100mm wide, 115VAC supply. Meets safety category 1 to 4.
JSBR4 24VDC		10-002-00	Safety relay with 3 safety outputs, dual channel and two-hand device monitoring, manual supervised reset, test input for monitoring of external positive guided relays/contactors, 3 LED indicators, 1 NC information output, quick release terminal blocks, 45mm wide, 24VDC supply. Meets safety category 4. Dual input channel synchronism 0.5s.
JSBR4 115VAC		10-002-04	Safety relay with 3 safety outputs, dual channel and two-hand device monitoring, manual supervised reset, test input for monitoring of external positive guided relays/contactors, 3 LED indicators, 1 NC information output, quick release terminal blocks, 45mm wide, 115VAC supply. Meets safety category 4. Dual input channel synchronism 0.5s.
JSBT4 24VDC		10-004-00	Safety relay with 3 safety outputs, dual channel, automatic reset, test input for monitoring of external positive guided relays/contactors, 3 LED indicators, 1 NC information output, quick release terminal blocks, 45mm wide, 24VDC supply. Meets safety category 4. Dual input channel synchronism 0.5s.
JSBT4 115VAC		10-004-04	Safety relay with 3 safety outputs, dual channel, automatic reset, test input for monitoring of external positive guided relays/contactors, 3 LED indicators, 1 NC information output, quick release terminal blocks, 45mm wide, 115VAC supply. Meets safety category 4. Dual input channel synchronism 0.5s.
BT50 24VDC		10-033-00	Safety relay with 3 safety outputs, 1 NC status output, 2 selectable input options (single or dual channel), manual supervised reset, test input for monitoring of external positive guided relays/contactors, 3 LED indicators, quick release terminal blocks, 22.5 mm wide, 24VDC supply.
BT50T 24VDC		10-033-10	Safety relay with 3 safety outputs, 1 NC status output, 2 selectable input options (single or dual channel), manual supervised reset, test input for monitoring of external positive guided relays/contactors, 3 LED indicators, quick release terminal blocks, 22.5mm wide, 24VDC supply. Output delay times hardwire selectable between 0s, 0.5s, 1s or 1.5s.
BT51 24VDC		10-033-20	Safety relay with 4 safety outputs, 2 selectable input options (single or dual channel), manual supervised reset, test input for monitoring of external positive guided relays/contactors, 3 LED indicators, quick release terminal blocks, 22.5mm wide, 24VDC supply.
BT51T 24VDC		10-033-30	Safety relay with 4 safety outputs, 2 selectable input options (single or dual channel), manual supervised reset, test input for monitoring of external positive guided relays/contactors, 3 LED indicators, quick release terminal blocks, 22.5mm wide, 24 VDC supply. Output delay times hardwire selectable between 0s, 0.5s, 1s or 1.5s.
JSHT1A 24VDC		10-011-00	Safety timer relay with 2 single NO outputs (hardwire time selection of 5, 10, 15 or 20 seconds timing function), selectable single or dual channel, test input for monitoring of external positive guided relays or contactors, 3 LED indicators, 45mm wide, 24VDC supply. Meets safety category 1 to 4. Quick release terminal blocks.

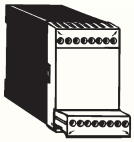
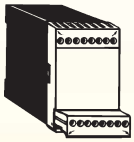
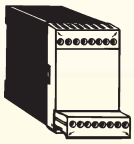
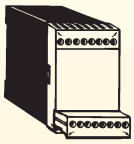
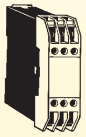
Component List - Safety Relays

Designation		Article Number	Description
JSHT1A 115VAC		10-011-04	Safety timer relay with 2 single NO outputs (hardwire time selection of 5, 10, 15 or 20 seconds timing function), selectable single or dual channel, test input for monitoring of external positive guided relays or contactors, 3 LED indicators, 45mm wide, 115VAC supply. Meets safety category 1 to 4. Quick release terminal blocks.
JSHT1B 24VDC		10-011-10	Safety timer relay with 2 single NO outputs (hardwire time selection of 5, 15, 30 or 40 seconds timing function), selectable single or dual channel, test input for monitoring of external positive guided relays or contactors, 3 LED indicators, 45mm wide, 24VDC supply. Meets safety category 1 to 4. Quick release terminal blocks.
JSHT2A 24VDC		10-012-00	Safety timer relay with 2 single NO outputs (hardwire time selection of 0.2, 0.5, 0.7 or 1 seconds timing function), selectable single or dual channel, test input for monitoring of external positive guided relays or contactors, 3 LED indicators, 45mm wide, 24VDC supply. Meets safety category 1 to 4. Quick release terminal blocks.
JSHT2A 115VAC		10-012-04	Safety timer relay with 2 single NO outputs (hardwire time selection of 0.2, 0.5, 0.7 or 1 seconds timing function), selectable single or dual channel, test input for monitoring of external positive guided relays or contactors, 3 LED indicators, 45mm wide, 115VAC supply. Meets safety category 1 to 4. Quick release terminal blocks.
JSHT2B 24VDC		10-012-10	Safety timer relay with 2 single NO outputs (hardwire time selection of 5, 10, 15 or 20 seconds timing function), selectable single or dual channel, test input for monitoring of external positive guided relays or contactors, 3 LED indicators, 45mm wide, 24VDC supply. Meets safety category 1 to 4. Quick release terminal blocks.
JSHT2B 115VAC		10-012-14	Safety timer relay with 2 single NO outputs (hardwire time selection of 5, 10, 15 or 20 seconds timing function), selectable single or dual channel, test input for monitoring of external positive guided relays or contactors, 3 LED indicators, 45mm wide, 115VAC supply. Meets safety category 1 to 4. Quick release terminal blocks.
JSHT2C 24VDC		10-012-20	Safety timer relay with 2 single NO outputs (hardwire time selection of 5, 15, 30 or 40 seconds timing function), selectable single or dual channel, test input for monitoring of external positive guided relays or contactors, 3 LED indicators, 45mm wide, 24VDC supply. Meets safety category 1 to 4. Quick release terminal blocks.
E1T 0s		10-030-00	Expansion relay with 4 safety outputs for expansion of safety relay, single or dual channel connection, 2 LED indicators, quick release terminal blocks, 22.5mm wide, 24VDC supply. Meets safety category 1 to 4.
E1T 0.5s		10-030-10	Expansion relay with 4 safety outputs (off-delayed by 500ms.) for expansion of safety relay, single or dual channel connection, 2 LED indicators, quick release terminal blocks, 22.5mm wide, 24VDC supply. Meets safety category 1 to 4.
E1T 1s		10-030-20	Expansion relay with 4 safety outputs (off-delayed by 1s.) for expansion of safety relay, single or dual channel connection, 2 LED indicators, quick release terminal blocks, 22.5mm wide, 24VDC supply. Meets safety category 1 to 4.

Component List - Safety Relays

Designation		Article Number	Description
E1T 1.5s		10-030-30	Expansion relay with 4 safety outputs (off-delayed by 1.5s.) for expansion of safety relay, single or dual channel connection, 2 LED indicators, quick release terminal blocks, 22.5mm wide, 24VDC supply. Meets safety category 1 to 4.
E1T 2s		10-030-40	Expansion relay with 4 safety outputs (off-delayed by 2s.) for expansion of safety relay, single or dual channel connection, 2 LED indicators, quick release terminal blocks, 22.5mm wide, 24VDC supply. Meets safety category 1 to 4.
E1T 3s		10-030-50	Expansion relay with 4 safety outputs (off-delayed by 3s.) for expansion of safety relay, single or dual channel connection, 2 LED indicators, quick release terminal blocks, 22.5mm wide, 24VDC supply. Meets safety category 1 to 4.
JSR1T 0s		10-015-00	Expansion relay with 4 safety outputs for expansion of safety relay, single or dual channel connection, 2 LED indicators, 1 NC information output, quick release terminal blocks, 45mm wide, 24VDC supply. Meets safety category 1 to 4.
JSR1T 0.5s		10-015-10	Expansion relay with 4 safety outputs (off-delayed by 500ms.) for expansion of safety relay, single or dual channel connection, 2 LED indicators, 1 NC information output, quick release terminal blocks, 45mm wide, 24VDC supply. Meets safety category 1 to 4.
JSR1T 1s		10-015-30	Expansion relay with 4 safety outputs (off-delayed by 1s.) for expansion of safety relay, single or dual channel connection, 2 LED indicators, 1 NC information output, quick release terminal blocks, 45mm wide, 24VDC supply. Meets safety category 1 to 4.
JSR1T 1.5s		10-015-05	Expansion relay with 4 safety outputs (off-delayed by 1.5s.) for expansion of safety relay, single or dual channel connection, 2 LED indicators, 1 NC information output, quick release terminal blocks, 45mm wide, 24VDC supply. Meets safety category 1 to 4.
JSR1T 2s		10-015-40	Expansion relay with 4 safety outputs (off-delayed by 2s.) for expansion of safety relay, single or dual channel connection, 2 LED indicators, 1 NC information output, quick release terminal blocks, 45mm wide, 24VDC supply. Meets safety category 1 to 4.
JSR1T 3s		10-015-50	Expansion relay with 4 safety outputs (off-delayed by 3s.) for expansion of safety relay, single or dual channel connection, 2 LED indicators, 1 NC information output, quick release terminal blocks, 45mm wide, 24VDC supply. Meets safety category 1 to 4.
JSR1T 5s		10-015-60	Expansion relay with 4 safety outputs (off-delayed by 5s.) for expansion of safety relay, single or dual channel connection, 2 LED indicators, 1 NC information output, quick release terminal blocks, 45mm wide, 24VDC supply. Meets safety category 1 to 4.

Component List - Safety Relays

Designation		Article Number	Description
JSR1T 8s		10-015-06	Expansion relay with 4 safety outputs (off-delayed by 8s.) for expansion of safety relay, single or dual channel connection, 2 LED indicators, 1 NC information output, quick release terminal blocks, 45mm wide, 24VDC supply. Meets safety category 1 to 4.
JSR1T 10s		10-015-20	Expansion relay with 4 safety outputs (off-delayed by 10s.) for expansion of safety relay, single or dual channel connection, 2 LED indicators, 1 NC information output, quick release terminal blocks, 45mm wide, 24VDC supply. Meets safety category 1 to 4.
JSR2A 24VAC/0V		10-027-01	Expansion relay with 4 safety outputs (10A/250V maximum rating) for expansion of safety relay, single or dual channel connection, 3 LED indicators, 1 NC information output, quick release terminal blocks, 45mm wide, 24VDC/AC supply. Meets safety category 1 to 4.
JSR2A 115VAC		10-027-04	Expansion relay with 4 safety outputs (10A/250V maximum rating) for expansion of safety relay, single or dual channel connection, 3 LED indicators, 1 NC information output, quick release terminal blocks, 45mm wide, 115VAC supply. Meets safety category 1 to 4.
JSR3T 24VAC/0V		10-017-01	Expansion relay with 2 single NO outputs (hardwire selectable off-delay of 500ms. to 10s.) for expansion of safety relay, single or dual channel connection, 1 LED indicator, 22.5mm wide, 24VAC/DC supply. Meets safety category 1 to 4.