



Contactors & Relays: Safety vs. General Purpose

What is the difference between them?

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Safety Contactors & Relays

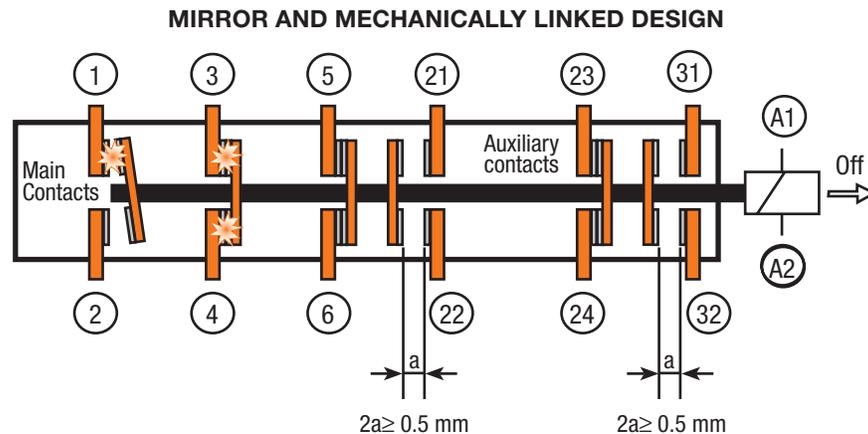
What are the distinctions between CAS7 Safety Contactors and CSS7 Relays vs. General Purpose CA7 Contactors and CS7 Relays?

Does the CA7/CS7 contactor or relay have safety ratings?

The CA7 contactor and CS7 control relay are Safety rated contactors and relays, as are the CAS7 contactors and CSS7 control relays. The only distinctive difference is the CAS7 contactors and CSS7 relays have a few additional features and ratings, specifically added for the auto industry. The only requirement for contactors and relays to qualify for safety circuits is the mechanically linked performance of the contacts, which both the CA7/CS7 and CAS7/CSS7 contactors and relays meet.

The entire CA7 and CS7 lines feature mechanically linked contacts, sometimes referred to as “positively-guided contacts” or “force-guided contacts”. If a main power pole tack-welds, adequate clearances exist ($>0.5\text{mm}$) to ensure that the auxiliary contacts do not change state when coil power is removed and the device tries to open. This is a requirement in safety circuits per IEC 60947-5-1.

General purpose CA7 contactors and CS7 control relays meet IEC 60947-5-1 for mechanically linked contacts, and meet IEC60947-4-1 for mirror contacts. Compliance with these sections of IEC requires third party verification. Sprecher + Schuh has third party verification from SUVA (Swiss Safety Organization) and other approval documentation can be obtained from our website.

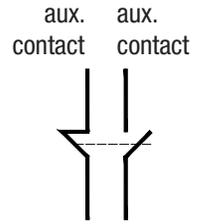


Per IEC, If normally open contact 1, or contacts 3-4 are tack-welded, then the normally closed contact 21-22 as well as 31-32 must remain open.

Mechanically linked contacts (in accordance with IEC 60947-5-1 – ANNEX L)

Definition: a combination of normally open contacts and normally closed contacts designed so that they cannot simultaneously be in the closed position.

- When a normally open contact is closed, none of the normally closed contacts may be closed.
- When a normally closed contact is closed, none of the normally open contacts may be closed.



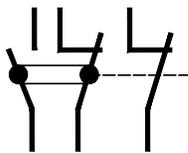
(Please note there is no mention of contacts in the base of the contactor/relay versus auxiliary contacts, which means it applies to either method)

Area of application: mechanically linked auxiliary contacts integrated in control devices where the actuating force is provided internally. Control circuit devices actuated externally (e.g. pushbutton or limit switch) do not have an actuating force limited to a maximum value, so they cannot have mechanically linked contact elements.

Mechanically linked contact elements have previously been referred to as force-guided contacts, positively-activated contacts, or linked contacts.

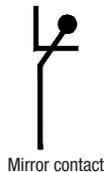
It should be noted for contactors or relays with all (only) normally open or all normally closed contacts, the term mechanically linked does not apply. The contactor or relay must have mixed contacts (open and closed) for the term to apply.

Symbols used (in accordance with IEC 60947-5-1 – Annex L)



Example of Mechanically NO and NC contacts, with an additional NC non-linked contact

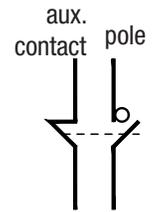
Symbols used (in accordance with IEC 60947-4-1 – Annex L)



Mirror contact

Mirror contacts (in accordance with IEC 60947-4-1 – ANNEX L)

Definition: A normally closed auxiliary contact cannot be in a closed position at the same time as one of the main power contacts (a pole, normally open) on the same contactor. So, the “mirror contacts” feature concerns the mechanical link between the auxiliary contacts and the power contacts of a contactor.



- These auxiliary contacts are called “mirror contacts” to avoid confusion with “mechanically linked contacts” (IEC 60947-5-1).
- A typical application of mirror contacts is to have, in the machine control circuit, a highly reliable monitoring of the status of the contactor. However, mirror contacts should not be relied upon exclusively as a means to ensure safety.

Main Differences

These two devices use “basically” the same parts, but the following applies specifically to the CAS7 Safety Contactors and CSS7 Safety Relays:

- Permanently installed cover to prevent manual operation and ensure that covers are present at all times. (CA7 60...90 Amp covers are removable)
- Permanently installed auxiliary contact blocks which are factory installed and permanently attached. (CA7/CS7 auxiliaries are field installable and removable)
Note: features #1 and #2 above are from GM’s Design for Health and Safety standard (DHS-1). The requirement is for the auxiliary contacts to be integral to the device or screwed on and cannot be removed by an end user.
- Devices are colored red to highlight to maintenance personnel the contactor is used in a safety control circuit. The ‘red’ color was added as an easy identifier and has no bearing on the specifications of the contactors or relays.
- Mechanically linked symbol shown on the front of the device clearly identifies functionality. The mechanically linked symbol was included to easily identify the separate product line.
- Entire contactor is factory tested with all auxiliary contact blocks attached to the contactor. (CA7 and CS7 devices with field installed accessories may require additional start up procedures to document/verify installation). The safety auxiliary contacts on the CAS7, are factory tested to make sure they are well beyond the tolerances required for mechanically linked performance.

Safety Contactors & Relays vs. General Purpose

- The red auxiliaries added to the contactors and relays (CAS7/CSS7-P_ part numbers) are taken from the production run of CA7/CS7-P_ auxiliaries and tested for a “wider” stroke when the contacts are open. This is to ensure that the 0.5mm gap (when open with the power contacts tack-welded) on the auxiliary contacts is still there after the 13 million minimum operations in case there is any internal wear on the auxiliary contact upper deck.
- After the auxiliary is installed onto the CA7 (base contactor) and tested for reliability, a sticker is added to the assembly. This sticker contains the CAS7 part number and is applied so it overlaps both the contactor and auxiliary.
- Both devices (CAS7 & CA7) have mechanically linked contacts. The top and side mount auxiliary contacts are mechanically linked with each other and with the main relay contacts. However, if providing feedback in a safety circuit, the side mounted auxiliary contacts should not be used for this function since they are not permanently attached to the relay like the front auxiliary of a CAS7/CSS7 device (with a locking clip installed at the factory).

When the customer is selecting a CA7 or CAS7 contactor or CS7 or CSS7 control relay, consideration should be given during the equipment risk assessment as to the implications of not having one or more of these optional features (listed above) that are offered by the CAS7 safety contactor and CSS7 safety relay product line.

Comparing CA6 Contactors versus CAS6 Safety Contactors

While the above specifically explains the CA7/CAS7 and CS7/CSS7 product line, the larger CA6 and CAS6 product lines are similar but not exactly the same. CA6 and CAS6 contactors do not meet IEC60947-5-1 for mechanically linked contacts. CAS6 safety contactors do meet the requirement of mirrored contacts, as defined in IEC 60947-4-1 Annex F. However, CA6 general purpose contactors cannot fulfill the requirements for mirror contacts as standardly provided.

Using normally closed auxiliary contacts to monitor the contactor crossbar and main power pole position/status, the CA6 can fulfill the requirements for mirror contacts. By providing two normally closed, side-mounted auxiliary contact blocks, mounted one on each side of the contactor and wired in series, a mirror contact is achieved similar to the CAS6 safety contactors. It cannot fulfill the requirements of mirror contacts with only one side-mounted auxiliary contact block and the distance between the power poles is too great when stacking two auxiliaries on one side.

Sprecher + Schuh CAS6 safety contactors address the needs of modern safety applications requiring feedback and monitoring of the energy isolating switchgear used in hazardous motion loads. The CAS6 meets these needs through its mirror contact design. If a power pole tack-welds, the normally closed auxiliary contacts will not change state. This feature provides reliable indication about the open/closed status of the main power poles. In addition, the gold-plated bifurcated auxiliary contacts are ideally suited for low-energy applications or feedback control circuits with multiple series-connected normally closed auxiliary contacts.

Technical Summary

Sprecher+Schuh Contactors	Mechanically Linked Contacts IEC 60947-5-1 Annex L	Mirror Contacts IEC 60947-4-1 Annex F
CA7 / CAS7	CA7/CAS7-9...97 + CA7/CS7-PV_ (except L11, L22)	CA7/CAS7-9...97 + CA7/CS7-PV_ (except L11, L22)
	CA7/CAS7-9...55 + CA7/CS7-PVB_	CA7/CAS7-9...97 + CA7-PA_ CA7/CAS7-9...97 + CA7/CS7-PVB_
CA6 / CAS6	Do Not Meet	CA6... + 2 X CA6-S1-11
		CAS6... + 2 X CAS6-S1-11

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