700-HPS Two Pole Plug in Safety Control Relay with Mechanically Linked Contacts

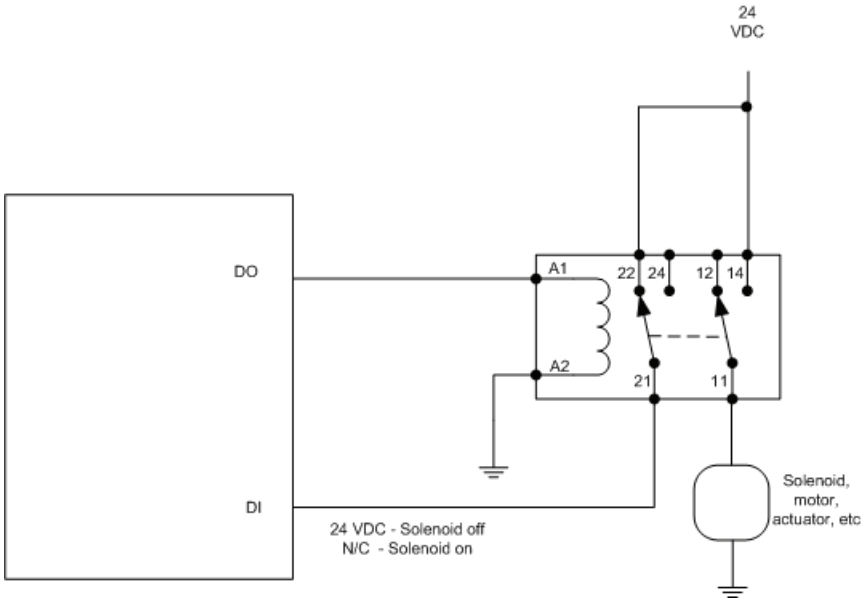
The new family of Bulletin 700-HPS plug-in safety control relays complements existing Bulletin(s) 700S-CF, 700S-P and 700S-PK mechanically-linked relay offerings. The Bul. 700-HPS is much smaller, has lower contact ratings and is a plug-in device requiring a socket. The Bul. 700-HPS is a two pole configuration with changeover (CO) contacts. There are 14 catalog numbers, with seven different DC Coil voltages. It's available with standard and gold-plated contacts.

The Bul. 700-HPS must be used in a specific manner to ensure proper operation and to conform to EN 50205- Type B. The normally open (N.O.) contact of one pole is typically used for the control of the load. This N.O. contact must be used in conjunction with the normally closed (N.C.) contact of the second pole, which is used for monitoring. The most common failure seen in relays is welded contacts. This prevents the user from being able to turn off the load. If the load control contact is welded together, the mechanical linkage will prevent the monitoring pole from transitioning to the safe state when the digital output (DO) to the load is turned off, so a problem can be immediately detected. Due to the poles being CO, the user can determine which pole is the N.O. or N.C.

One of the key uses of the new line of Bul. 700-HPS relays is as an interposing device. Safety outputs are typically limited to 24V DC and 1 A. If higher current is needed or if a different voltage (such as 120V AC) is required to drive an output, this relay can provide that interface. The Bul. 700-HPS can be used in both functional safety and non-safety systems.

Example 1

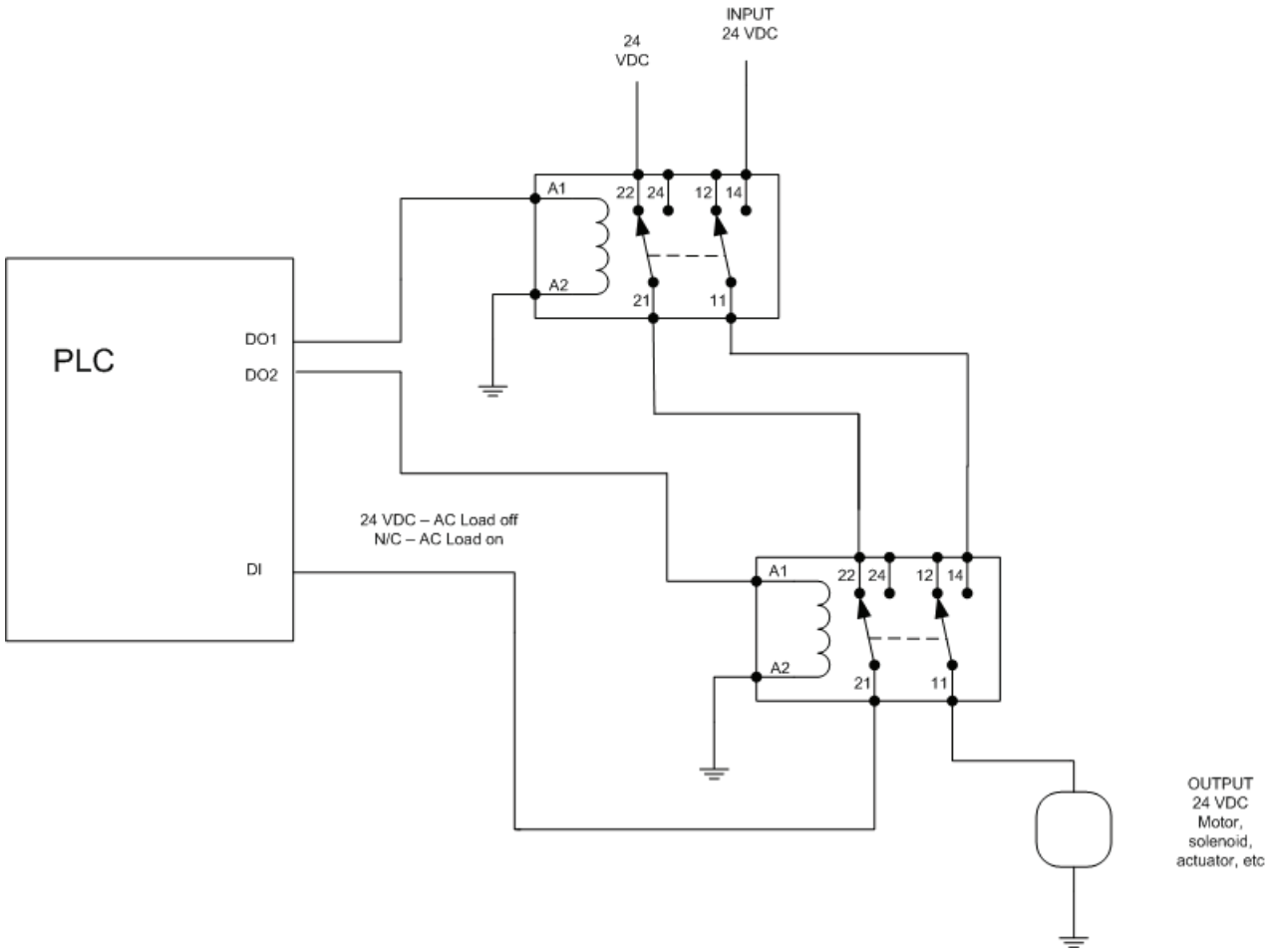
Example 1 shows a feedback application that could be useful in numerous control applications. The primary reason this is not considered a functional safety application is there is no redundancy of control. Anytime there is a requirement to use a relay for control, the Bul. 700-HPS can be used and provide a feedback signal reliably identifying when the control power is not present, thus in a safe position.



In this example, the DO is being used to control a device. The digital input (DI) is being used to monitor when the output or device in this case is in a safe unpowered or off state. When the DO is off, the DI is 24V DC and represents that the power to the controlled device is off. This is considered a safe state. When the DO is enabled or on, the power to the controlled device is active and the DI monitoring input has no voltage present. The controlled device is operating and as such caution should be taken. This is considered an unsafe condition. The use of the Bul. 700-HPS eliminates the need to monitor the controlled device directly to know when it is in a safe condition. It would no longer be necessary to create secondary circuits to monitor when power is removed from a motor or if power was still present on a controlled circuit.

Example 2

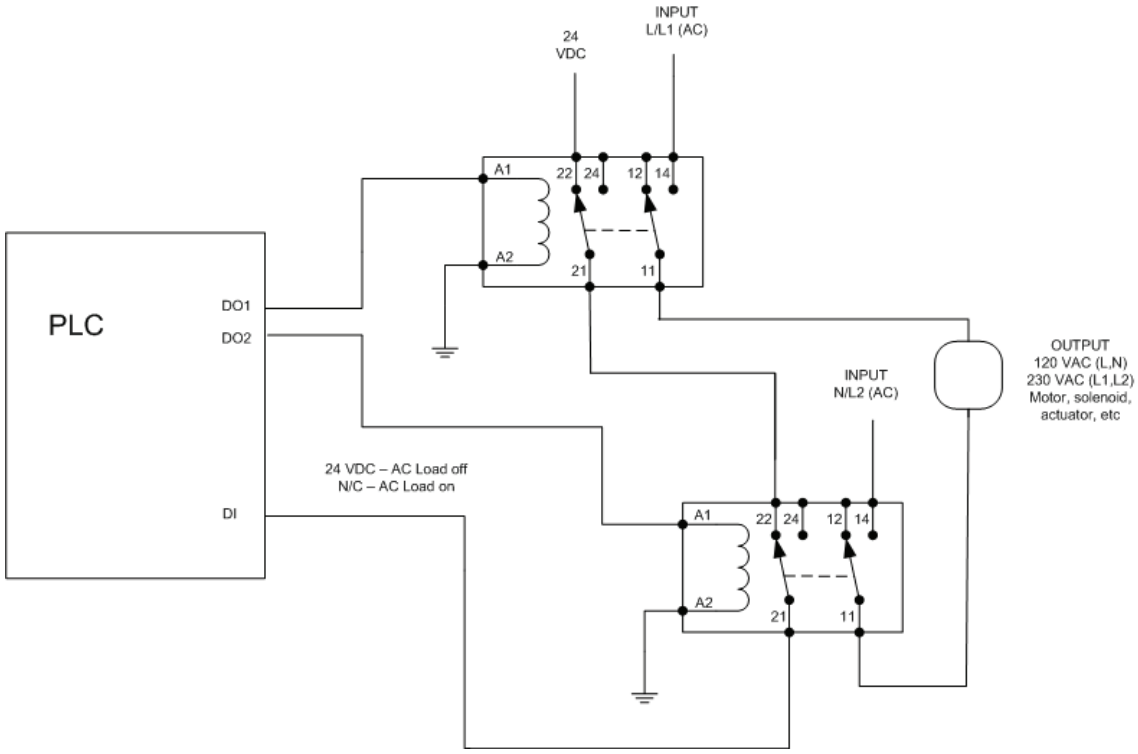
Example 2 is similar, but now with redundancy. The redundancy is mandatory for use as a functional safety circuit.



There are now two DOs - DO1 and DO2. In order to turn on the device, both DO1 and DO2 have to be enabled at the same time (the contacts are connected in series). If the PLC is damaged or the PLC software is corrupt and only one DO is enabled, the solenoid will not be allowed to turn on and the system will remain in a safe unpowered condition. In this case, the feedback DI will indicate an unsafe operating state as this is not a valid operating mode thereby indicating a problem. There is only one DI as the monitoring poles of both relays are now also connected in series. If either one of the control relay contacts becomes welded, the 24V DC feedback signal on the monitoring pole will not be seen at the DI and an unsafe error condition is identified. The advantage of this setup is that even though the monitored contact is not indicating a safe condition, the properly functioning relay is still able to remove power to the device and provide a safe operating condition even with a welded contact. This usage creates a system with single fault failure tolerance.

Example 3

The next approach can be applied to an AC application. In this case, rather than using redundancy on a single control line, both sides of the power will be controlled as outlined in Example 3. This is very similar in principle to Example 2, but is certainly different.



In Example 3, rather than having redundancy on a single control line (ie 24V DC), both sides of the AC input are controlled (L/N or L1/L2). Two DOs (DO1, DO2) are once again used, but in this case, DO1 is used to control the line side (L or L1) while DO2 is used to control the second input (N or L2). Similar to Example 2, both DO1 and DO2 have to be enabled at the same time (the contacts are connected in series) in order to turn on the device. If the PLC is damaged or the PLC software is corrupt and only one DO is enabled, the solenoid will not be allowed to turn on and the system will remain in a safe unpowered condition. Again, the feedback DI will indicate an unsafe operating state as this is not a valid operating mode thereby indicating a problem. There is only one DI as the monitoring poles of both relays are now also connected in series. If either one of the control relay contacts becomes welded, the 24V DC feedback signal on the monitoring pole will not be seen at the DI and an unsafe error condition identified. Once again, even though the monitored contact is not indicating a safe condition, the properly functioning relay is still able to remove power to the device and provide a safe operating condition even with a welded contact. This design still creates a system with single fault failure tolerance without having true redundancy.

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