

Figure 2.7 – Discrete inputs designation

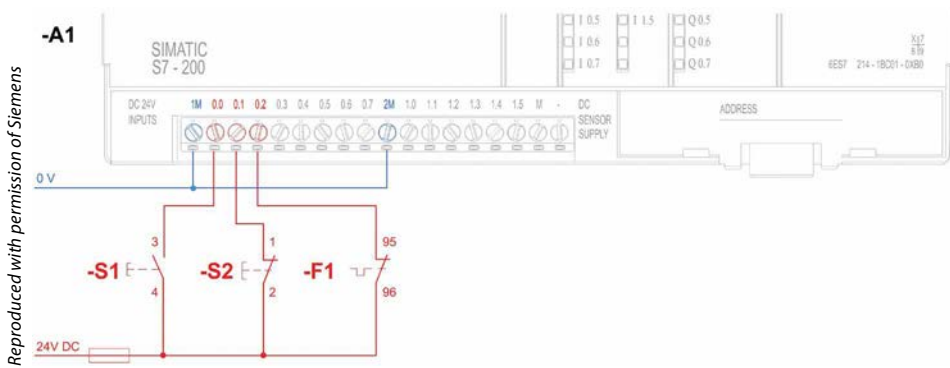


Figure 2.8 – PLC discrete inputs wiring example 1

As shown in Figure 2.7, start pushbutton –S1 (NO contact 3/4) is wired with discrete input /I0.0, stop pushbutton –S2 (NC contact 1/2) is wired with discrete input /I0.1 and overcurrent relay –F1 (NC contact 95/96) is wired with discrete input /I0.2.

Similar input designation is used on the PLC discrete inputs' terminals, making it easy to locate the physical input when required. An example of discrete input wiring with Siemens Simatic S7 PLC is provided in Figure 2.8.

The 0 V conductor is wired to the PLC discrete input common terminals 1M and 2M. Each discrete input is connected to the fused 24 V positive line at one terminal (–S1/4, –S2/2 or –F1/96), while the other terminal (–S1/3, –S2/1 and –F1/95) is wired to the respective input terminals (0.0, 0.1 and 0.2). An application example of a PLC simulator wired with discrete inputs devices is shown in Figure 2.9.

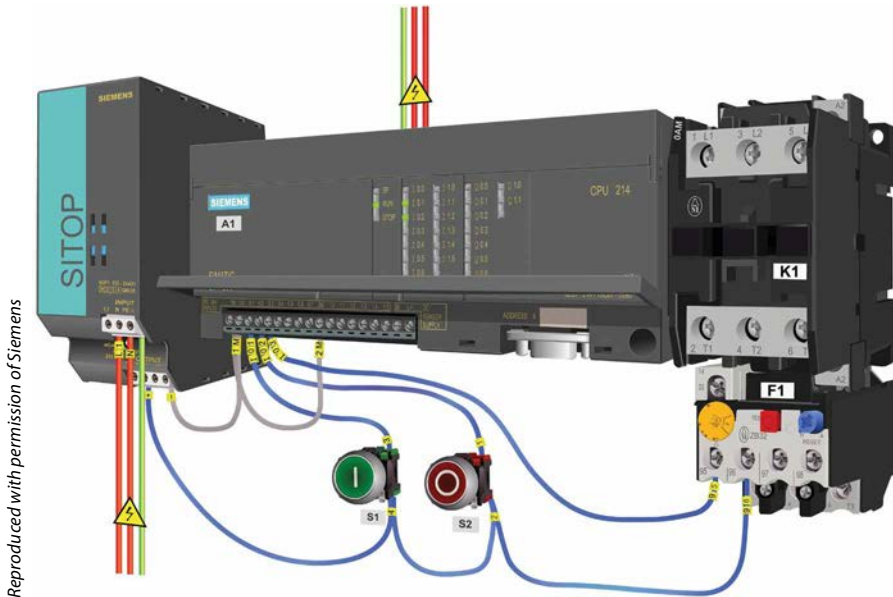


Figure 2.9 – Wiring for PLC-based simulator discrete inputs

Another example of discrete inputs wiring with Siemens LOGO! PLC is shown in Figure 2.10.

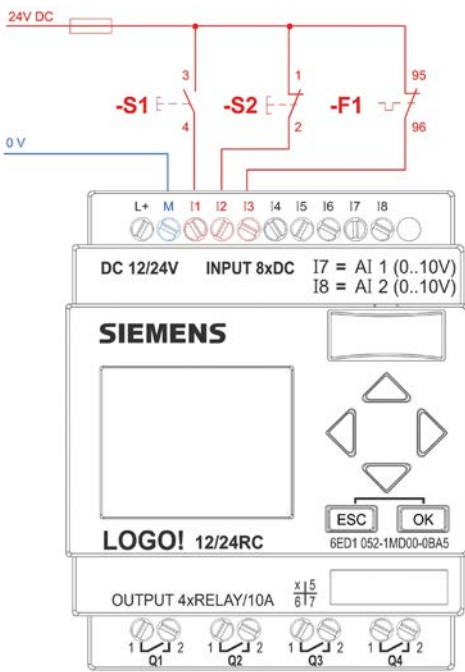


Figure 2.10 – PLC discrete inputs wiring example 2

Similar to the previous example, the 0 V conductor is wired to the PLC discrete inputs common terminal M. Each discrete input is connected to the fused 24 V positive line at one terminal (–S1/3, –S2/1 or –F1/95), while the other terminal (–S1/4, –S2/2 and –F1/96) is wired to the respective input terminals (I1, I2 and I3).

2.6 Analogue Inputs

An **analogue input** is a continuous, variable signal coming from an analogue sensor in response to a specified physical input that the sensor measures. For example, a **pressure transducer** is a sensor

that converts a pressure difference into variable electrical output. The term **transducer** is generally used to refer to a device that converts a signal from one form to a different physical form. Thus, sensors are often transducers. The PLC module connected with the analogue signals is called the **Analogue Input Module (AI)**. Unlike discrete input modules, analogue input modules have no LED status indication.

Typical analogue inputs are connected with the following sensors:

- Pressure transducers
- resistance temperature detectors
- thermocouples
- speed monitoring pickups
- proximity sensors
- feedback potentiometers
- measuring transducers for AC motor current.

2.7 Inputs Expansion Modules

To extend the number of inputs connected through the PLC network as well as to connect analogue input signals, a standardised DIN rail module installation is employed by manufacturers for the following PLC-based applications:

- Discrete input module
- analogue input module for RTD
- analogue input module for thermocouples
- analogue input module for 0–20 mA (4–20 mA)
- analogue input module for 0–10 VDC.

An example of a plug-in analogue 0–10 VDC/0–20 mA inputs expansion module for a Siemens LOGO! PLC is provided in Figure 2.11.

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Figure 2.11 – Siemens LOGO! PLC analogue expansion module

The analogue expansion module interlocking latch and communication bus are shown in engaged state moved out towards the PLC. The interlocking latch should be moved with a screwdriver to the right (disengaged state) before a module is inserted.

shown in Figure 2.12. The communication bus is seen right at the top of the module.



If you have several expansion modules connected together and need to disassemble the one closest to the CPU module, it is advisable to begin removal with the last module on the right-hand side.



Always switch off the power supply before removing or inserting an expansion module. Ignoring this rule can lead to severe damage to the expansion module and/or the CPU module.

When reading an application diagram where expansion modules are used, it is essential to understand which module a certain physical input signal belongs to. The byte's identification number is used to manage this, as illustrated in Figure 2.13. In this application example, there is a CPU (Siemens S7-200) and two expansion modules (EM223) and these are designated 1A1, 1A2 and 1A3 respectively. Each module has a different byte address, which is marked below the module's designation, eg module 1A1 has byte addresses 0 and 1 and all the physical inputs related to it bear these numbers prior to the bit number (ie 0.1, 0.2, 1.3, etc). Outputs from different expansion modules should be identified in a similar manner.

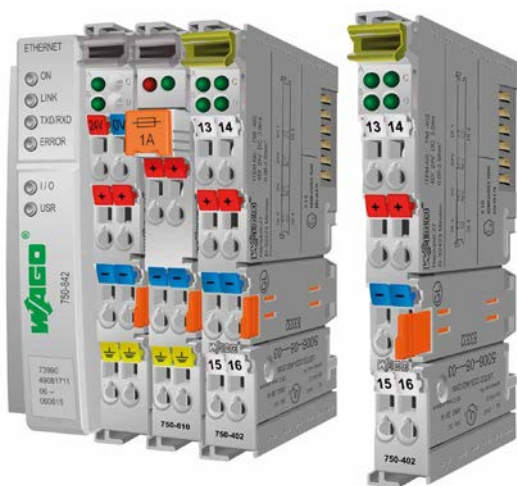


Figure 2.12 – Discrete expansion modules

Another example of a plug-in discrete expansion module utilised for a PLC-based alarm system is

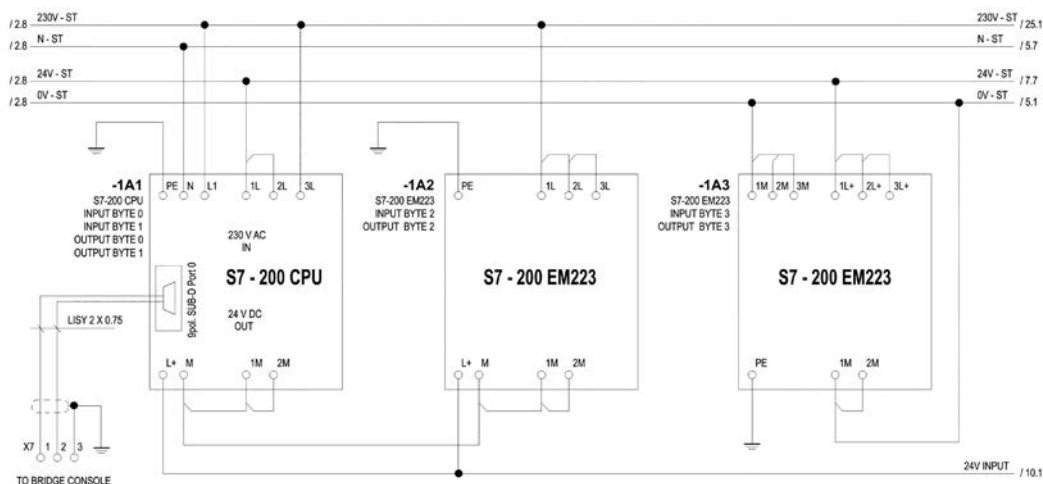


Figure 2.13 – CPU and I/O expansion module arrangement

In a modular-type PLC, the address of the I/O interface expansion modules (also called I/O boards) may relate to the physical location of the module in the rack slots. In Figure 2.14, the E-41 input boards

addresses are 00 and 01, and inputs are grouped from 0.0 to 0.3 through to 7.0 to 7.3 for each board. The following discrete inputs are active: module address 00, inputs 0.1, 0.2, 1.0 and 5.0; module address 01, input 4.1.



Figure 2.14 – Modular-type PLC discrete expansion modules

