Selecting the right PLC for your application

Choosing the right programmable logic controller (PLC) platform for your application and ensuring it meets the requirements of the process today and in the medium term, can be daunting. Whether it's a brand new process, or replacing an existing out-dated controller – the steps and considerations are fundamentally the same.

Understanding your machine or process is essential and drawing a simple block diagram of it will help identify the control devices and their physical locations. This will help in planning the PLC system design, calculating the level of I/O and considering network or distributed control selection.

Once the control device requirements and combinations have been defined, you can now start the process of selecting a PLC platform that meets the needs of the process.

Type of I/O	Examples
Digital Input (I)	Pushbuttons, limit-switches, float-switches, feedback from contactors (N/C or N/O circuits auxiliary circuits)
Analogue Input (I)	Thermocouples, process transducers (pressure, linear, or current/voltage)
Digital Output (O)	Relay output or Transistor outputs. Relay is easy to work with, but transistor is more reliable and ideal for higher speed or repeated switching
Analogue Output (O)	Proportional voltage of current output. Typically 0-10V or 0/4-20mA – ideal for speed control of inverters, DC motor controllers and to panel meters.

Are you replacing an existing system?

Are you upgrading or replacing an old system that you can no longer get support for or fails to meet the changing needs of the process? It is unlikely that the program from the old PLC will work with the new PLC platform, especially if they are different manufacturers, but the basic flow of the program logic will be the same and can be used as the basis for programming the new system. The existing control network could be used by the new system – check the protocols being used.

What are the I/O requirements?

From the process diagram you can quantify the amount of digital and analogue inputs & outputs required. The digital outputs could be either a relay or a transistor output, however solid state switching is more reliable. Therefore using a transistor output to control a suitable solid state relay will be more cost effective in the long term due to reduced failures and maintenance.

Are there special I/O requirements?

Some of the I/O may require special inputs and many PLC platforms offer specialty modules that provide inputs and outputs not native to the PLC's basic capability. These modules provide inputs pre-configured for devices such as temperature sensors (PT-100 or thermocouple), or high-speed counters (>50Khz) for use with shaft encoders or resolvers.

Are there any environmental issues to be considered?

Will the environment in which the controller and process be operating see extremes of temperature or humidity? To ensure maximum reliability the controller must be kept dry and within its operational temperature range.

What communication networks are required?

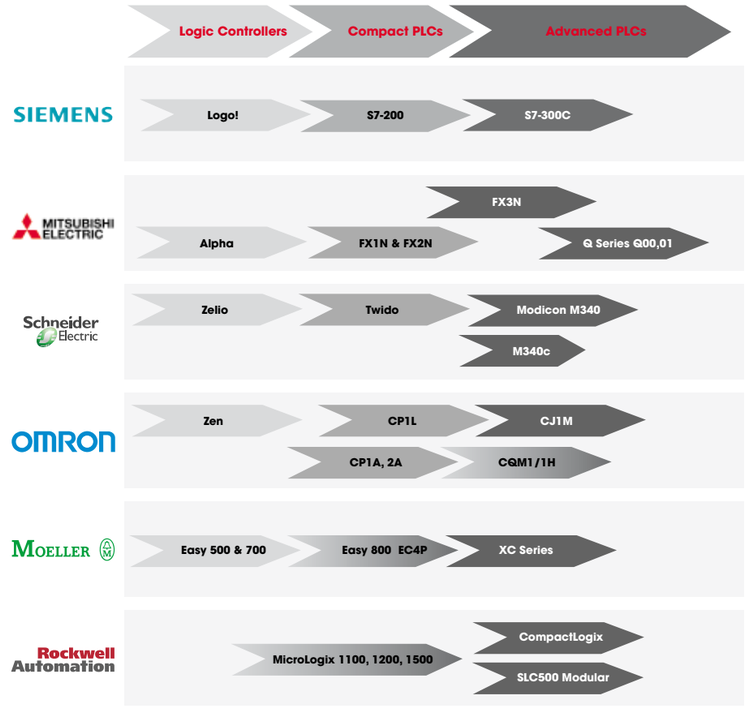
Various industrial control protocols are in use today. These include DeviceNet, Profibus, Ethernet/IP, CANopen, ModBus, DH-485 and basic ASCII over RS-422A & RS-232-C. The choice of communication protocol selected will be driven by a need to communicate with other existing equipment and any protocol this equipment uses. Many modern PLC systems offer multi-protocol communication and the option of a variety of modules to support various networking formats.

PLC Processor performance and memory requirements

Three common levels of processor performance are available from each manufacturer.

- **Logic controller** – Sometimes called a 'smart or programmable' relay. Simple to program and cost effective for low I/O, slower speed, applications.
- **Compact PLC** - An intermediate level offering increased instruction sets and higher I/O capacity than a logic controller.
- **Advanced PLC** – Offering greater processing power, larger memory capacity and even higher I/O expandability and networking options.

Greater I/O requirements Increase the processing time for each CPU cycle as the PLC processor has to respond to an increased number of inputs. This processing time is more critical as the controlled process speed increases. The following chart gives PLC platform performance positioning to help you select the level of processing power required for your application.



As a starting point you should only consider a logic controller for slower processes with an I/O requirement of less than 20 I/O. Beyond that level of I/O a compact or intermediate PLC provides a better solution with increased processing speed available. For large I/O applications with networking and remote I/O requirements an advanced PLC would be the best choice.

The amount of memory needed for the program is more difficult to size, but modern PLC processing units feature memory capacities suitable for the majority of application and have the option of expanding the program memory if required. ■

CANopen PROFIBUS DeviceNet ModBus I/O EtherNet