file:///C:/Users/USERNAME/Downloads/3.png
Evolves with change, towards the new stage of safety sought by the world!

TOYOPUC-Plus Safety

JTEKT, the No.1 leading company in the domestic share of safety PLC production, will offer the new safety PLC. Achieves safety control from manually operated equipment to semi-automatic and fully-automatic equipment, through an optimized structure. Plus Safety provides reliable work to improve equipment safety.

What is safety?
1. View of conventional safety
   Safety is that an accident and disaster must not happen. To pay attention and follow correct operators strictly.

What is “Risk is controlled”?
“Risk is controlled” means “There is no unacceptable risk”

What is the International Safety Standards?
The origin of International Safety Standards is the Machine Directive from European Union

1. Machinery Directive
   In EU, if someone designs, manufactures, supplies, purchases or uses a machine, must observe the Directive (EU countries must match their laws to the Directive).

2. International Safety Standards about a Safety PLC

   - IEC61508 1.7 (2010)
     Functional safety of electrical/electronic/programmable electronic safety-related system
     Safety category: SIL 1-4
   - IEC13849-1 (2008)
     Safety of machinery Safety-related parts of control systems
     Performance Level: a - e

SIL: Safety Integrity Level (IEC 61508)

   - SIL1: 10^-3 ≤ f (failure rate per hour)
   - SIL2: 10^-4 ≤ f (failure rate per hour)
   - SIL3: 10^-5 ≤ f (failure rate per hour)
   - SIL4: 10^-6 ≤ f (failure rate per hour)

SIL4 is applicable for nuclear-power station level.

Safety PLC architecture

1. Hardware and software are redundant (Redundant configuration like Arith)
2. Diagnostic function
   (System self-diagnosis and device connection diagnosis are always implemented)
3. Mutual check (operation check between A and B)
4. When an error detected, all outputs are shutdown instantly.

JTEKT safety PLC series

Optimal for large equipment

2004
- Developed safety PLC for first FA in Japan TOYOPUC-PCS
  Reduces amount of wiring through a safety network and safety signal communication.
  Provides gateway module for connecting to TOYOPUC-PCS and various open networks.

2010
- Small safety PLC TOYOPUC-PCS-J
  Achieves the highest level of program capacity and response speed, despite its small size.

Optimal for embedded usage, from large equipment to individual equipment

2015
- Board type safety PLC TOYOPUC-Plus Safety
  Layout is arbitrary because module expansion can be conducted using a cable. An optimal safety control system can be constructed from small scale to large scale by combining the unit.
Structure of TOYOPUC-Plus Safety

- **TOYOPUC-Plus Safety** is comprised of 3 types of units.

  - **Basic unit**
  - **Optional unit**
  - **IF unit**

- For each unit, the type most suited for usage can be selected from an abundant line-up.
- The basic unit can be switched to CPU, remote satellite station or expansion IO, according to usage.
- Supports remote communication and can be located in a separate place.
- The optimum safety control system can be constructed according to equipment, from small scale to large scale, by combining the unit.
- Layout is arbitrary because module expansion can be conducted using a cable.

Example of separate placement using remote communication function of TOYOPUC-Plus Safety

- **Internal IO bus**
  - Expandable up to max. 128 IO points. Communication distance has total extension of 50 m. Expansion IO module can be connected to up to max. 2 units.

- **Remote IO: 2,048**
  - Expandable up to max. 2,048 IO points. Communication distance is max. 50 m between stations. It can be expanded in max. 31 stations. Up to max. 31 remote satellite stations can be connected.

Programming, reading/writing of program, printing of drawing

- Programming of safety PLC ladder circuits can be performed with operability similar to the general PLC.
- Circuits that do not satisfy safety requirements are automatically detected as non-safety circuits by the function which checks the safety of ladder circuit programs.
- Ladder circuit programs can be printed as drawings created by CAD.

Example of separate arrangement 1 (process wiring)

- Possible to implement QUI-PUC (just put down) around the device.

Example of separate arrangement 2 (wiring between control cabinet and operation panel)

- Reduced area wiring through using communication cables.
- Easy wiring between satellite using communication cables.

Supports various networks and miniaturization of the control cabinet through combination with TOYOPUC-Plus.

- "Connectable" PLC TOYOPUC-Plus
  - ETHERNET™
  - ETHERCAT™
  - FL-net
  - DeviceNet™

PCwin-Safe2 with simple operability supports program creation for safety circuits.

**Ladder circuit program, FBD (function block diagram)**

- A safety circuit comprised of a safety relay, etc., can be created easily as a ladder circuit program of TOYOPUC-Plus Safety.
- The ladder circuit program can be blocked at each function unit, registered to the library as an FBD, and used as standard circuit.
- For ladder circuit program and FBD, it is possible to check simply the ON/OFF state of each signal from personal computer or operation panel.

**Conventional safety relay circuit**

- It takes time to conduct checks and investigations, and change is difficult.

**Ladder circuit program**

- It takes no time to conduct checks and investigations, and circuit change is easy.

Due to the hardware circuit, measurement by multimeter or similar device is necessary for monitoring the ON/OFF and cable check of the wiring.

Monitoring of ON/OFF can be performed easily, and there is no wiring. The status can be viewed immediately.

**FBD (Function Block Diagram)**

- The ladder circuit is standardized by FBD. Make it easy to design through the attachment of FBD and connection of input/output.

**Programming, reading/writing of program, printing of drawing**

- Programming of safety PLC ladder circuits can be performed with operability similar to the general PLC.
- Circuits that do not satisfy safety requirements are automatically detected as non-safety circuits by the function which checks the safety of ladder circuit programs.
- Ladder circuit programs can be printed as drawings created by CAD.

Ladder circuit programming

- Programming can be performed mainly through mouse operation, or mainly through keyboard operation using keyboard shortcuts. The safety circuit and non-safety circuit can be easily identified using the function which checks safety.

**Reading/writing of program**

- In addition to the method using a computer, it is also possible to program for reading and writing into Plus Safety by direct operation using USB memory. It is possible to operate easily without using a computer.

**Drawing style printing**

- The drawing, the contact point table, the coil cross reference, etc. of the ladder circuit can be printed like the drawing.

Possible to add units easily through drag & drop.

Possible to switch dry contact point input and light curtain input through the use of PCwin-Safe 2.

The emergency stop button and light curtain can be connected to the same input by setting the dry contact point input and the light curtain input from PCwin-Safe 2.