Switches Function in Industrial Automation

White Paper

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INTRODUCTION

Rotary DIP Switches and DIP Switches are used in many types of devices, including Programmable Logic Controllers (PLC), I/O Modules, temperature monitoring relays, industrial automation Modbus, industrial power systems, factory automations, and panel controls. These devices have communication functions, and can be used as indicators for industrial automation and power systems. Rotary DIP Switches or DIP Switches are used to set up the node or IP address of a PLC, or Modbus I/O Module. Tactile switches would be used on industrial power systems or factory automation panel controls as Human Machine Interaction (HMI) operations feedback.

BACKGROUND

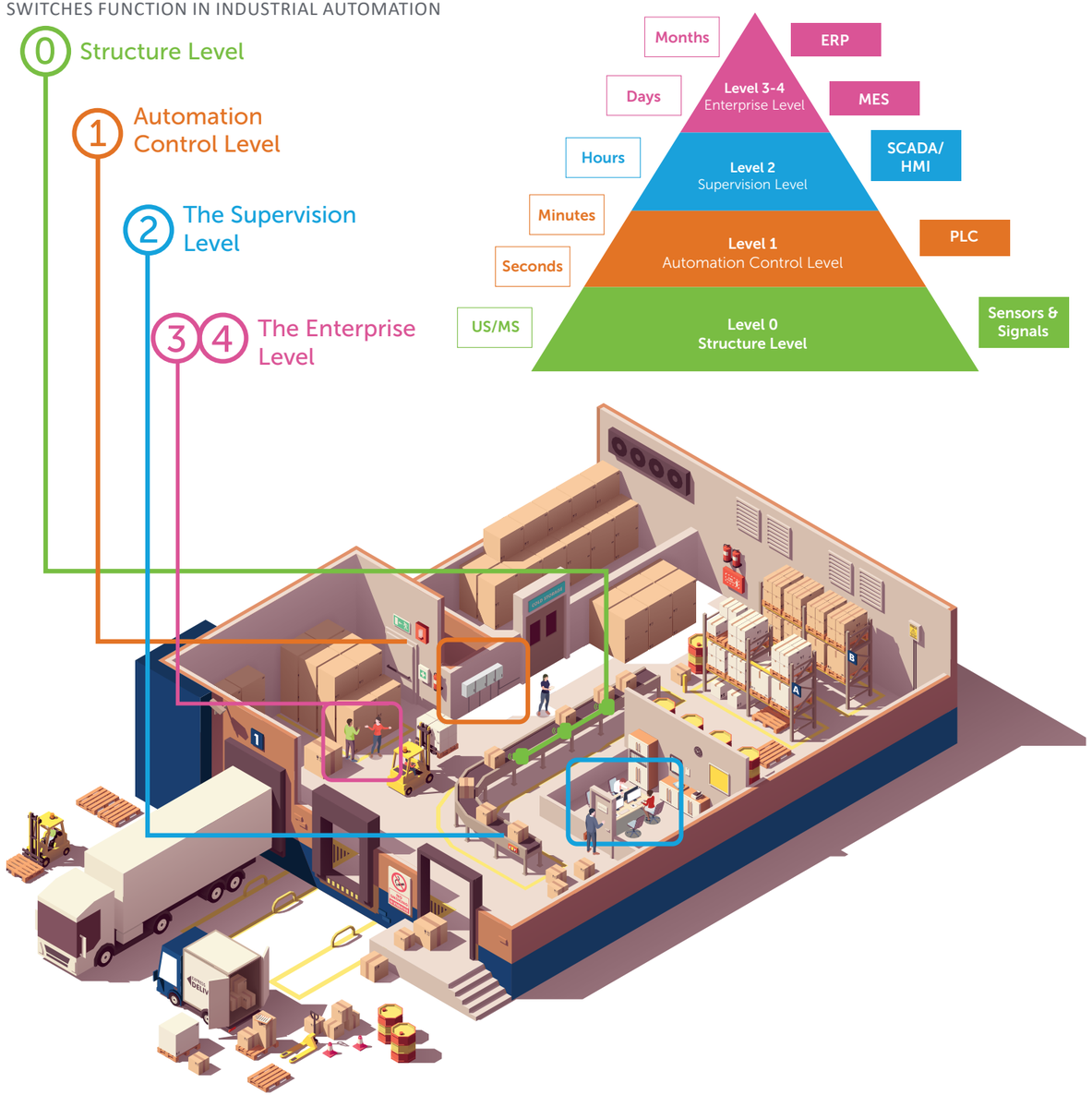
DIP Switches and Rotary DIP Switches are typically powered with 20~50 volt DC. The terminals provide the electrical output while the actuator slides, rotates, or presses upon different switch family types. DIP Switches provide a single output of either on or off, while rotary dip switches can provide variations of on and off to become 4 bit code combinations at each specific rotated position. Rotary DIP switches provide binary code decimal, hexadecimal or single pole with different output signals.

Tact switches are powered with 12~32 volt DC, and provide on or off electrical outputs that apply to the end application's circuits. Either a contactor or dome is the major contact piece, joining with the insert molding frame where the switch can connect to an output. Contactors are commonly fabricated with stamped copper alloy or stainless steel plate while frames are made with polyamide resin.

EVOLUTION OF INDUSTRIAL AUTOMATION AND CONTROL SYSTEMS

Industrial automation and control systems typically have four levels: structure, automation control, supervision, and enterprise. There are sensors and actuators applied to the build at the structure level. PCs, programmable logic controllers (PLCs), distributed control systems (DCS), and monitoring relays are integrated in the automation control level. These devices are where DIP switches or Rotary DIP switches are added to provide industrial process control, giving each device a unique physical address.

The supervision level (SCADA) refers to data that is acquired from various control devices and displayed through the HMI that interacts with field devices. This is where the DIP switch that was set to a physical address can be identified by the HMI. SCADA and Human Machine Interface systems enable users to view data from the manufacturing floor and provide inputs and changes. Programmable Logic Controllers (PLCs) act as the interface between devices on the manufacturing floor and a SCADA or HMI system. PLCs communicate, monitor, and control automated processes like assembly lines, machine functions, and robotic devices.



In the enterprise level, data is used and communicated to improve the overall internal systems. Various tasks, such as product planning, sales, ordering, and scheduling become major compositions at the enterprise level. In order for the enterprise level to work effectively, the first three levels (structure, automation, and supervision) all need to be designed to communicate quickly and display important information to the user. The information that is gathered from the first three levels will drive how an enterprise continues to improve its systems.

CTS switches are an important part of ensuring that the communication between technologies is consistent. CTS DIP switches are commonly found in the PLCs and the SCADA systems, and they provide physical addresses so the technologies have links to each other. Our tact switches would be used as controls to change settings and access data from the HMI. Our switches have a stable output signal which is due to our choice in robust raw material, plating, and interior product structural design. These designs achieve very low contact resistance and are energy optimized, ensuring that we provide a low pollution and efficient manufacturing process.

Industrial Internet of Things (IIoT) is becoming more popular, and there is an increased need for data from remote locations. This will require more PLCs, monitoring relays, and computing devices which will require DIP switches and physical addressing, and will play a major role in communication between devices. This also means that tactile switches will become a practical HMI solution for factory automation panel controls and industrial power supplies.

Tactile switches are often used in device remote controls or directly on devices. CTS provides a wide range of tactile switch choices. We offer hard plastic or soft silicon rubber actuators, with the option to pair them with matching knobs to support the switch and provide long-life durability. CTS provides different force options for custom operational feel as well as stable electrical circuit output. Some upgraded models come with IP57 or IP67 waterproof protection, ideal for application in damp or dusty environments.

218 SERIES DIP SWITCHES

The IC type 218 DIP switch series is designed with half-pitch terminals, which come in compact product sizes to fit very small PCBs. This DIP switch is made with gold-plated terminals to increase performance of the soldering reflow process. CTS provides an optional top tape-sealed structure optimized for board washing during the soldering process. An operating temperature range of -40°C to +85°C provides for excellent performance.

220 SERIES ROTARY DIP SWITCHES

The 7x7mm 220 Series Rotary DIP Switch is available with Binary coded decimal (10 position), Hexadecimal code output (16 position), or Single Pole Sing Throw (SPST; 4 position only). The positive detent separated from the contactor does not deflect during actuation to make 10,000 step-life. Smaller dimensional product sizes are easier to operate by hand tools or combine with applications knobs.

222K, 224A SERIES TACTILE SWITCHES

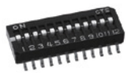
The 222K Series Tactile Switch is designed with a IP67 protection surface mount and silicon rubber actuator to make 0.5~0.7mm travel possible. CTS has created this switch design with operation forces of 145gf, 200gf, or 360gf, providing an extended life of 300,000 cycles minimum. The 224A Series comes with a larger product dimension size, 12x12mm, and larger terminal types. The 224A Series life cycle could achieve 300,000 cycles minimum.

228E, 228B SERIES ILLUMINATED TACTILE SWITCHES

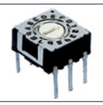
The 228E Series Illuminated Tactile Switch is designed with IP67 protection. The silicone actuator provides a smooth operational feeling that is satisfactory for the user. There are optional surface mount or through-hole terminals to combine with vertical and side actuators. Single color, bi-color, or tri-color circuit designs provide more options for various application requirements.

The 228B Series comes with vertical operation structure in the surface mount and through-hole terminals. Single color or bi-colors circuits, various kinds of plastic caps, style options, color combinations, and etching are available.

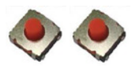
Surface Mount DIP Switches

Series		Description	Actuation	Plating	Options	Life	Operating Temperature
204		Top Actuated, Gull Wing, .100" Pitch Terminal Spacing, ESD Protection	SPST, SPDT, DPST, 3PST	Contacts — Gold, Terminals — Tin	Top Tape Seal, 3 Actuator Heights, Custom Marking, ON or OFF Shipping Position, Tape and Reel Packaging	5,000 Cycles	-55°C to +85°C
218		Low Profile, Top Actuated, .050" Pitch Terminal Spacing, Bottom Seal	SPST	Contacts — Gold, Terminals — Gold Flash	Top Tape Seal, J-Bend or Gull Wing, ON or OFF Shipping Position, Tape and Reel Packaging	1,000 Cycles	-55°C to +85°C

Rotary DIP Switches

Series		Typical Applications	Rating	Code	Options	Rotation
220 7x7 mm		Servers, Circuit Breakers, HVAC, Video, Industrial Communications, Security Systems	100 mA @ 50 VDC 10,000 Steps	BCD and Hexadecimal	4, 10, or 16 Positions, Shaft Style, Through-Hole, SMT-Gullwing	360° Continuous
221 10x10 mm		Servers, Circuit Breakers, HVAC, Video, Industrial Communications, Security Systems	100 mA @ 50 VDC 10,000 Steps	BCD and Hexadecimal	10 or 16 Positions, Shaft Style, Through-Hole, SMT-Gullwing or J-bend	360° Continuous

Tactile Switches

Series		Rating	Force	Options	Actuation Direction
222A 6.2x6.2 mm		12 VDC @ 50 mA 200,000 Cycles, 1 Million Cycles	100 gf 160 gf 260 gf	Actuator Height, Through-Hole and SMT	Vertical Side
222K (IP67) 6.2x6.2 mm		32 VDC @ 50 mA 300,000 Cycles, 500,000 Cycles 5 Million Cycles	145 gf 200 gf 360 gf	SMT Gullwing or J-Bend	Vertical
223A 4.7x3.5 mm		12 VDC @ 50 mA 100,000 Cycles, 300,000 Cycles	160 gf 260 gf	SMT Gullwing or J-Bend	Vertical
224A 12x12 mm		12 VDC @ 50 mA 300,000 Cycles, 500,000 Cycles	160 gf 260 gf	Through-Hole and SMT, Actuator Height, Boss	Vertical
228C 7.2x6.8 mm		12 VDC @ 50 mA 100,000 Cycles	160 gf	SMT Gullwing or Through-hole, Single, Bi or Tri-LED	Vertical
228E 6.8 x 7.2 mm 7.4 x 7.9 mm		12 VDC @ 50 mA 100,000 cycles	200 gf	SMT Gullwing or SMT J-Bend or Through-hole, Single, Bi or Tri-LED	Verticle Side

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