

PRODUCTS

Series FR

Ultra-Thin DIP Rotaries - Through-hole



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Ultra-Thin DIP Rotaries - SMT



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Ultra-Thin DIP Rotary Switches

Environmentally friendly components and packaging materials meet RoHS directive restricting use of hazardous substances. Suited to lead-free solder processing applications because of heat resistant resin materials.

Slim .150" (3.8mm) body has the lowest profile in the industry and allows close stacking of PC boards.

Highly visible legends and choice of screwdriver or shaft actuators with arrow position indication provide trouble-free code setting. Actuator knob also available.

Detent mechanism gives crisp, positive action for accurate switch setting.

Use of heat resistant resin allows vapor phase and infrared convection reflow soldering.

Crimped terminals for through-hole models ensure secure PC mounting and prevent dislodging during soldering.

Gull-winged terminals for SMT models ensure mechanical stability during soldering and simplified solder joint inspection.

Cam activated movable contact and gold contacts assure contact reliability and continuity.

Tape Reel packaging meets EIA-481-2 Standard.

Coplanarity tolerance zone is .0059" (0.15mm)

Distinctive Characteristics

Compact dimensions and low profile allow high density mounting and close stacking of PC boards.

Highly visible legends and choice of screwdriver, shaft or dial actuators with arrow position indication provide trouble-free code setting. Knob actuator also available.

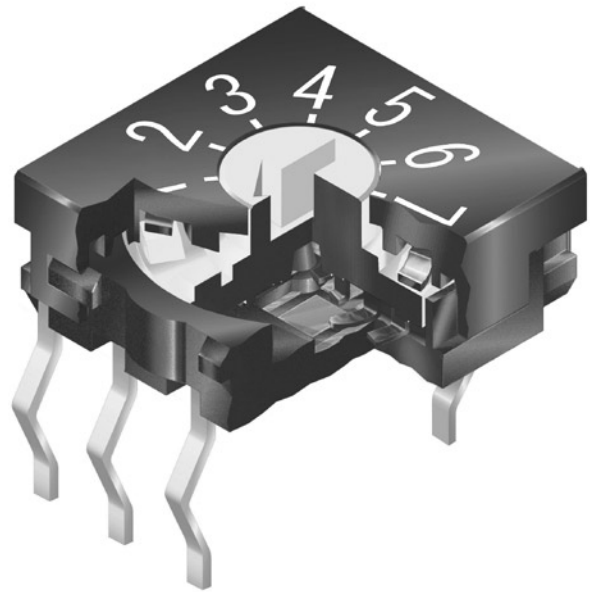
Real or complement code setting identified by color-keyed actuator.

Detent mechanism gives crisp, positive action for accurate switch setting.

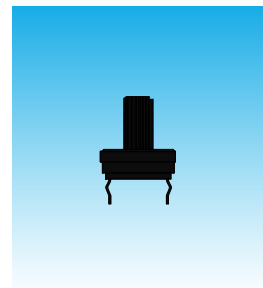
Crimped terminals ensure secure PC mounting and prevent dislodging during soldering.

Cam activated movable contact and gold contacts assure contact reliability and continuity. Patent pending.

Surface mount model with screwdriver actuation available and shown in the surface mount section.



Actual Size



General Specifications

Electrical Capacity (Resistive Load)

Switching Rating: 100mA @ 5V DC
Nonswitching Rating: 100mA @ 50V DC

Other Ratings

Contact Resistance: 100 milliohms maximum for circuit; 30 milliohms maximum for contact point
Insulation Resistance: 1,000 megohms minimum @ 250V DC
Dielectric Strength: 250V AC minimum for 1 minute minimum
Mechanical Life: 10,000 detent operations minimum
Electrical Life: 10,000 detent operations minimum

Notes: A detent operation is one actuator position operation or stepping.
 A cycle is one 360° rotation. 10,000 detent operations equal 625 cycles for hexadecimal devices or 1,000 cycles for decimal devices.

Nominal Operating Torque: Metal Shaft: 0.009Nm for decimal devices; 0.011Nm for hexadecimal devices
 All other Actuator types: 0.008Nm for decimal devices; 0.01Nm for hexadecimal devices
Contact Timing: Shorting (Avoid possible false signal by turning off power before switching.)

Materials & Finishes

Actuators: Screwdriver and Plastic Shaft - Glass fiber reinforced polyamide (UL94V-0);
 Dial - Polyoxymethylene; Metal Shaft - Brass with nickel plating
Bushing : Brass with nickel plating (for Metal Shaft model)
Outer Case: Glass fiber reinforced PBT (for Metal Shaft model)
Housing & Base: Glass fiber reinforced polyamide (UL94V-0)
Movable Contacts: Copper alloy with gold plating
Stationary Contacts: Phosphor bronze with gold plating
Terminals: Phosphor bronze with gold plating
Terminal Cover: Polyamide (Right angle model only)
Bracket: Phosphor bronze with tin plating (for Metal Shaft model)

Environmental Data

Operating Temperature Range: -25°C through +85°C (-13°F through +185°F)
Humidity: 90 ~ 95% humidity for 240 hours @ 40°C (104°F)
Vibration: 10 ~ 55Hz with peak-to-peak amplitude of 1.5mm traversing the frequency range & returning in 5 minutes; 3 right angled directions for 2 hours
Shock: 50G (490m/s²) acceleration (tested in 6 right angled directions, with 5 shocks in each direction)

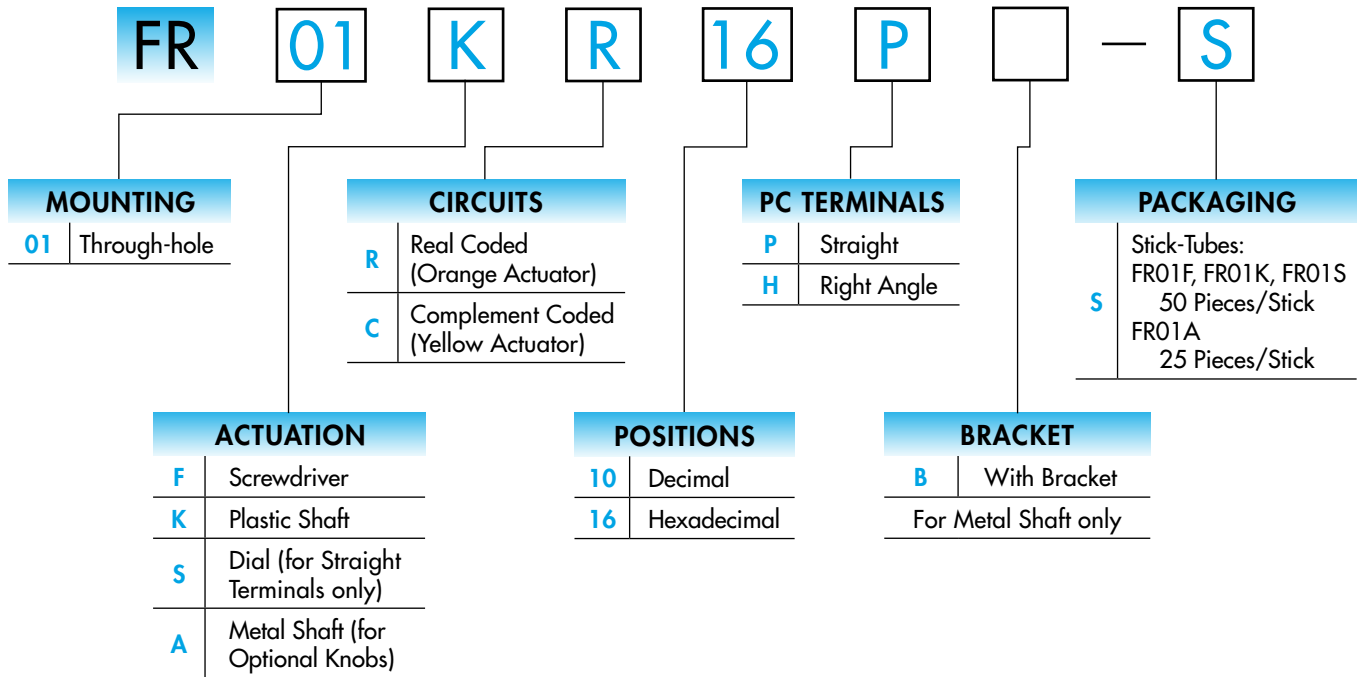
PCB Processing

Soldering: Wave Soldering Recommended. See Profile A in Supplement section.
 Manual Soldering: See Profile A in Supplement section.
Cleaning: These devices are not process sealed. Hand clean locally using alcohol based solution.

Standards & Certifications

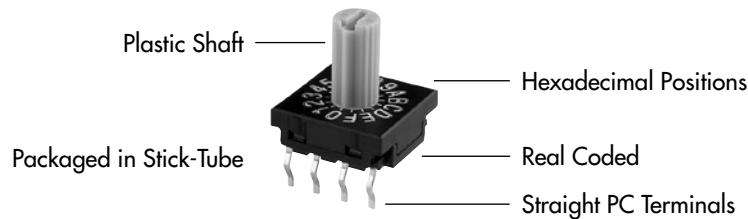
Flammability Standards: UL94V-0 rated actuator, housing and base
UL Recognition or CSA Certification: The FR01 Series rotaries have not been tested for UL recognition or CSA certification. These switches are designed for use in a low-voltage, low-current circuit. When used as intended, the results do not produce hazardous energy.

TYPICAL SWITCH ORDERING EXAMPLE



DESCRIPTION FOR TYPICAL ORDERING EXAMPLE

FR01KR16P-S



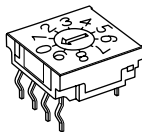
MOUNTING

01 Through-hole

ACTUATION

F Screwdriver

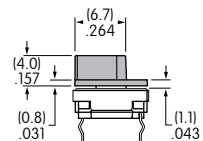
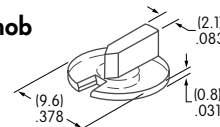
Adjusted with a flat tipped screwdriver



Actuators are fully rotational either clockwise or counterclockwise.
Actuator Colors: Orange for real coded devices; Yellow for complement coded devices.

AT4180
Optional Snap-on Knob

Polyamide
Black knob with transparent flange

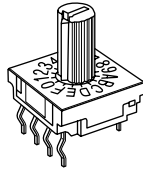


Install knob before mounting on PCB for right angle type; it should not be removed once mounted. When mounting, align slit in knob with arrowhead on actuator.

ACTUATION

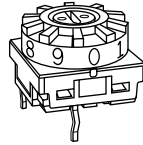
K Plastic Shaft

Adjusted by hand or with flat tipped screwdriver



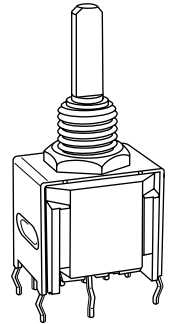
S Dial

Adjusted by hand or with flat tipped screwdriver



A Metal Shaft

Knob options illustrated below with color choices



Actuators are fully rotational and operate either clockwise or counterclockwise.
Actuator Colors: Orange for real coded devices; Yellow for complement coded devices

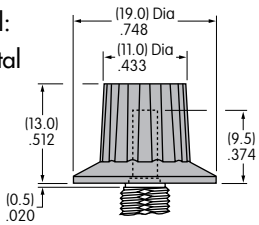
Mounting hardware is available if needed: Hexagon Nut AT513M, Locking Ring AT515M, and Lockwasher AT509; all are shown in the Accessories and Hardware section.

OPTIONAL KNOBS FOR METAL SHAFT

AT433 Plain Black

Material: Polyacetal

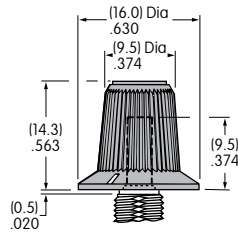
Color: Black



AT4103 Small Color Tipped

Polyester Base: Black

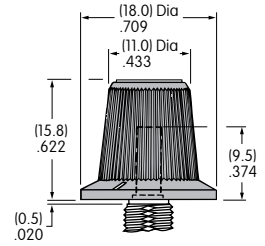
Polyamide Tip Colors: A, B, C, E, F, G, H



AT4104 Large Color Tipped

Polyester Base: Black

Polyamide Tip Colors: A, B, C, E, F, G, H



Knob Orientation: When installed with shaft flat rotated 180° from bushing flat as shown in "Typical Switch Dimensions," white line on cap points to Actuator Position 0 noted in truth tables below.

Color Codes: A Black B White C Red E Yellow F Green G Blue H Gray

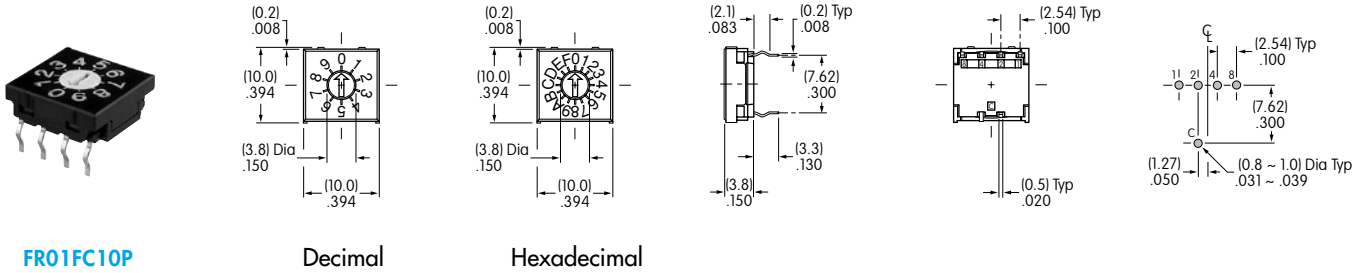
TRUTH TABLES (CIRCUITS & POSITIONS)

Terminal No. (Output)	Actuator Position ● = ON	10 Decimal									16 Hexadecimal																	
		0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
R Real Coded Model Numbers: FR01FR, FR01KR, FR01SR, FR01AR	1		●		●		●		●		●		●		●		●		●		●		●		●		●	
	2			●		●		●		●		●		●		●		●		●		●		●		●		●
	4				●	●	●	●							●	●	●	●					●	●	●	●		
	8								●	●										●	●	●	●	●	●	●	●	●
C Complement Coded Model Numbers: FR01FC, FR01KC FR01SC, FR01AC	1	●		●		●		●		●		●		●		●		●		●		●		●		●		
	2	●	●			●	●			●	●			●	●				●	●			●	●			●	
	4	●	●	●	●				●	●	●	●			●	●	●				●	●	●	●			●	
	8	●	●	●	●	●	●	●			●	●	●	●	●	●	●	●										

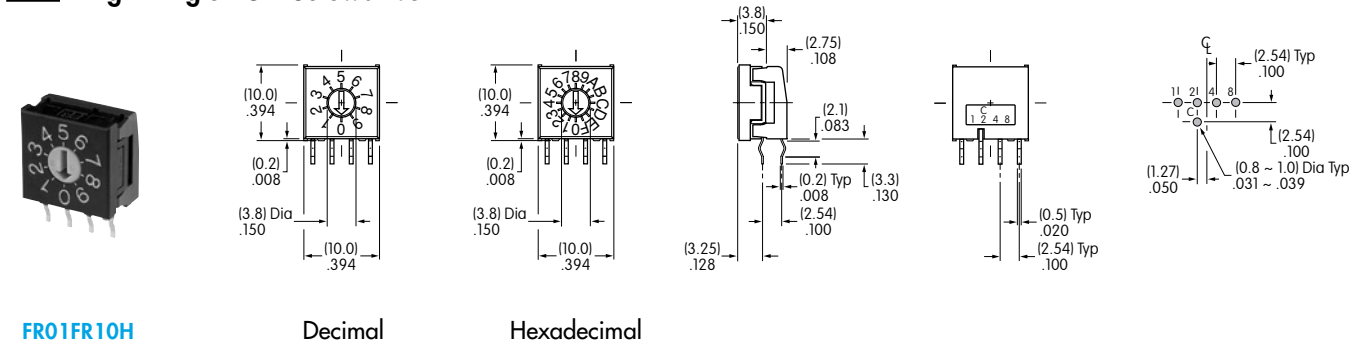
Terminal numbers are actually on the switch.
Above sequence shown for clockwise rotation.

TYPICAL SWITCH DIMENSIONS

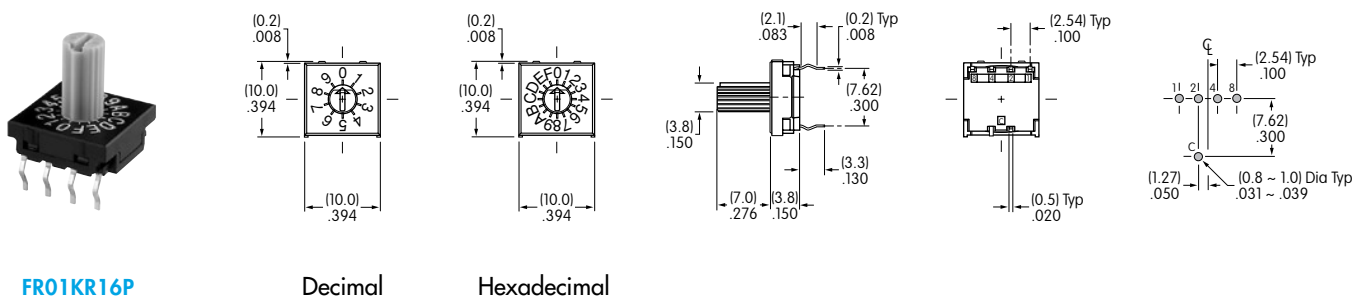
P Straight PC • Screwdriver



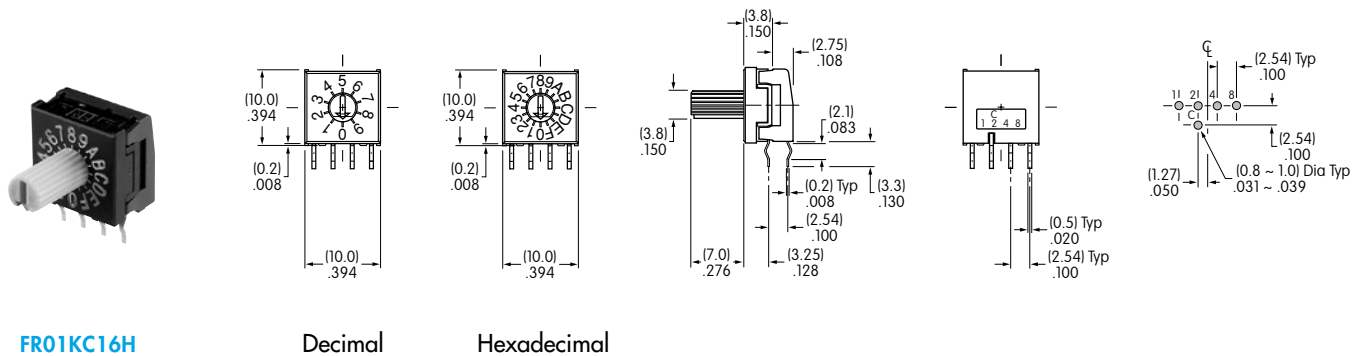
H Right Angle PC • Screwdriver



P Straight PC • Plastic Shaft

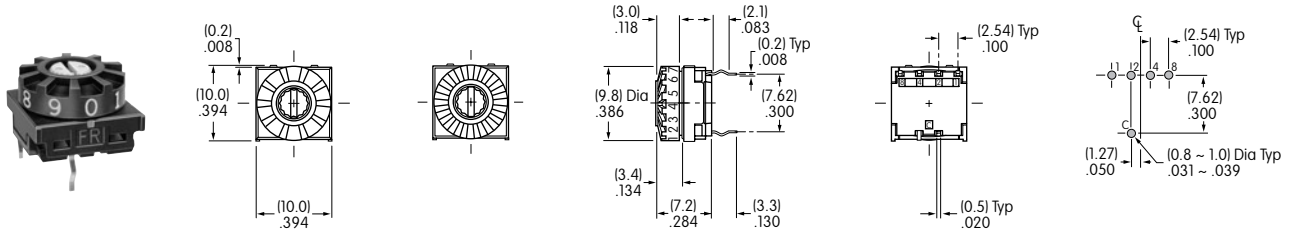


H Right Angle PC • Plastic Shaft



TYPICAL SWITCH DIMENSIONS

P Straight PC • Dial

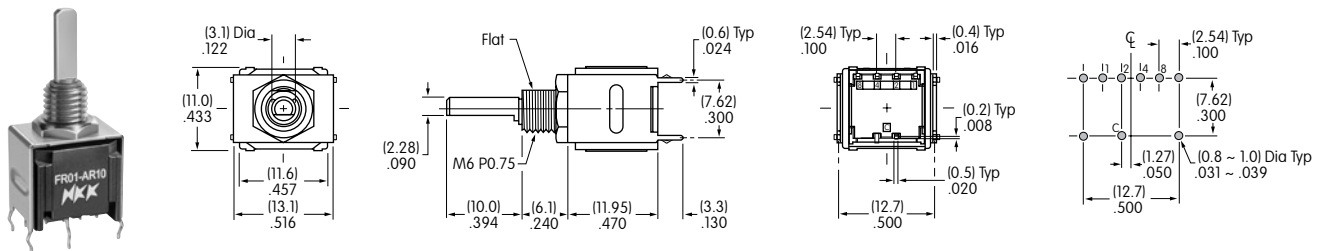


FR01SR10P

Decimal

Hexadecimal

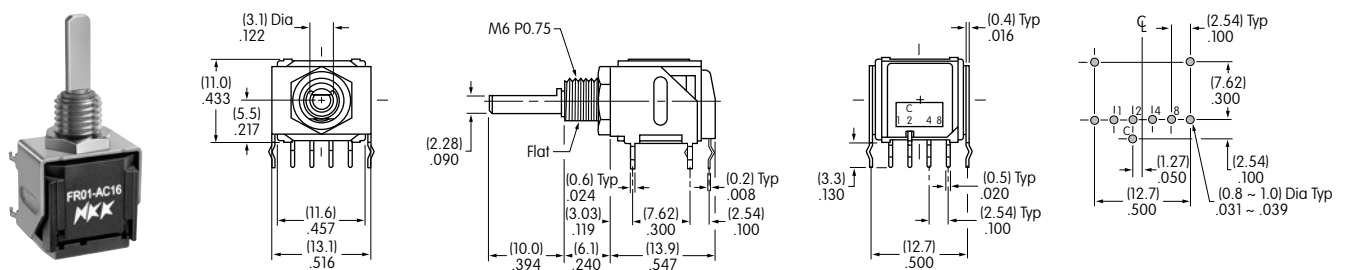
P Straight PC • Metal Shaft



FR01AR10PB

Shown in Position 0 with shaft flat rotated 180° from bushing flat

H Right Angle PC • Metal Shaft



FR01AC16HB

Shown in Position 0 with shaft flat rotated 180° from bushing flat