

Front-of-Panel (Operators) ①

Mechanical Ratings

Description		Plastic (D7P)	Metal (D7M)
Vibration (assembled to panel)	[G]	Tested at 10 ...2000Hz, 1.52mm displacement (peak-to-peak) max./10G max. for 3hr duration, no damage	
Shock	[G]	Tested at 1/2 cycle sine wave for 11ms; no damage at 100G	
Degree of protection ②		UL Type 3/3R/4/4X/12/13 (IP65/66)	UL Type 3/3R/4/12/13 (IP65/66)
Mechanical durability per EN 60947-5-1 (Annex C)		10,000,000 Cycles 1,000,000 Cycles 500,000 Cycles 300,000 Cycles 100,000 Cycles	Momentary push buttons, momentary mushroom Multi-function, Selector Switch, Key Selector Switch, Selector Jog Non-illuminated Push-Pull E-Stop Twist-to-Release E-Stop, Illuminated Push-Pull E-Stop, Maintained Push Buttons, selector switches Potentiometer, Toggle Switch
Operating forces (typical with one contact block)	[N]		Flush/extended = 5N E-stop = 36N Mushroom = 9N
Operating torque (typical application with one contact block)	[N·m]		Selector switch = 0.25 N·m (2.2 lb-in.)
Mounting torque	[N·m]	1.7 N·m (15 lb-in.)	4.4 N·m (40 lb-in.)
Environmental			
Temperature range (operating) ③	[°C]	-25... +70°C (-13... +158°F)	
Temperature range (short-term storage)	[°C]	-40... +85°C (-40... +185°F)	
Humidity	[%]	50...95% RH from 25...60°C (77...140°F) per: Procedure IV of MIL-STD-810C, Method 507.1 cycling test	
UV Ratings			
All plastic non-illuminated pushbutton caps & e-stops		UV grade polyester and polycarbonate blend, UL UV Category (f2)	
All plastic enclosures		UV grade polyester and polycarbonate blend, UL UV Category (f1)	

Back-of-Panel Components ①

Electrical Ratings

Standard Contact Block Ratings (See page H85)		A600, Q600 600V AC AC15, DC 13 to EN 60947-5-1 and UL 508, 17V, 5mA min.		
Low Voltage Contact Block Ratings (See page H85)		5V, 1mA DC min. C300, R150, AC 15, DC 13 to EN 60947-5-1 and UL 508		
LED Module Ratings	Nominal Voltage	Range	Current Draw	Frequency
	24...120V AC/DC	20...132V AC/DC	15 mA (AC), 12mA (DC)	50/60 Hz, DC
	24V AC	10...29V AC	31 mA	50/60 Hz
	24V DC	10...30V DC	24 mA	DC
	120V AC	102...132V AC	6 mA	50/60 Hz
	240V AC	204...264V AC	6 mA	50/60 Hz
Thermal current	[A]	10 A max. enclosed (40°C ambient) to UL 508, EN 60947-5-1		
Wire capacity	Screw terminal ⑤ [AWG]	#18...12 AWG (0.75...2.5mm ²) - Max. (2) #14 AWG or (1) #12 AWG		
	Spring-clamp terminal [AWG]	#18...14 AWG (0.75...1.5mm ²) One per spring clamp, two spring clamps per terminal		
Recommended tightening torque on screw terminals	[N]	0.7...0.9 N·m (6...8 lb-in.)		
Insulation voltage	[U _i]	U _i = 690 V (screw terminal), U _i = 300 V (screwless terminal)		
Dielectric strength (minimum)	[V]	2500V for one minute		
External short circuit protection	Standard blocks	10 A type gL/gG cartridge fuse to EN 60269-2-1 or gN (Class J to UL 248-8 or Class C to UL 248-4)		
	Low voltage contact blocks	6 A type gL/gG cartridge fuse to EN 60269-2-1 or gN (Class J to UL 248-8 or Class C to UL 248-4)		
Electrical shock protection		Finger-safe conforming to IP2X		
Mechanical Ratings				
Vibration (assembled to panel)	[G]	10...2000 Hz, 1.52mm displacement (peak-to-peak) max./10G max. 6hr		
Shock	[G]	Tested at 1/2 cycle sine wave for 11ms and no damage at 100G max.		
Contact durability per EN 60947-5-1 (Annex C)		10,000,000 cycles		
Contact operation	NO	Slow double make and break		
	NC, Guardian Block, GCB	Slow double make and break - positive opening ☹		
	NOEM	Double break / double make / early make		
	NCLB	Double break / double make, late break - positive opening ☹		
	NCEB	Double break / double make, early break - positive opening ☹		

① Performance data given in this publication is provided only as a guide for the user in determining suitability and do not constitute a performance warranty of any kind. Such data may represent the results of accelerated testing at elevated stress levels, and the user is responsible for correlating the data to actual application requirements. ALL WARRANTIES AS TO ACTUAL PERFORMANCE, WHETHER EXPRESS OR IMPLIED, ARE EXPRESSLY DISCLAIMED.

② Momentary mushroom operators are IP65, multi-function operators have no Type 13 rating. Plastic operators with keys have no Type 4X rating.

③ Operating temperatures below 0°C (32°F) are based on the absence of freezing moisture and liquids, UL recognized to 55°C (131°F) - incandescent module, max 40°C (104°F).

④ Low voltage contacts are recommended for applications below 17V, 5 mA.

⑤ Wires less than #18 (0.75mm²) may not hold in terminal securely.

Back-of-Panel Components ①, continued

Push button travel to change electrical state		N.C. and N.O.E. M. 1.5 mm (0.060 in.)
		N.O. and N.C.L.B. 2.5 mm (0.1 in.)
Operating forces (typical)	[N]	3.4 N: each single circuit contact block

Illumination

LED dominant wavelength	Green	[nm]	525 nm
	Red		629 nm
	White		—
LED luminous intensity	Green	[mcd]	780 mcd
	Red		780 mcd
	White		360 mcd
Incandescent maximum wattage	[W]		2.6W

Materials

Springs		Stainless steel and zinc coated music wire
Electrical contacts	Standard	Silver-nickel
	Low voltage	Gold-plated over silver
Terminals	Screw	Brass
	Screwless	Silver-plated brass

Environmental Approval Note: Front elements UL Recognized; Complete assemblies UL Approved. See Table A2 for your application.

This table is extracted from Sprecher + Schuh's UL 508A file and can be used to determine which D7 Pilot Device is approved for a particular enclosure type.

TABLE A2 - Openings in Enclosure

Enclosure Type	Openings May Be Closed By Equipment Marked...
2	2, 3, 3R, 3S, 4, 4X, 6, 6P, 11, 12, 12K, 13
3	3, 3R, 3S, 4, 4X, 6, 6P
3R	3, 3R, 3S, 4, 4X, 6, 6P
3S	3, 3R, 3S, 4, 4X, 6, 6P
4	4, 4X, 6, 6P
4X	4X
6	6, 6P
6P	6P
11	11
12, 12K	12, 12K, 13
13	13

Product Certifications


Certifications	UL, UR (E193035), CSA (206918), CCC, CE
Conformity of Standards - CE marked	NEMA ICS-5; UL 508, EN ISO13850, EN 60947-1, EN 60947-5-1, EN 60947-5-5
Terminal identification	IEC 60947-1
Shipping approvals	ABS
RoHS	✓

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
Material Listing

Component	For Use with	Material Used
Panel gasket	All operators	Nitrile, TPE
Diaphragm seal	Illuminated push button, non-illuminated push button	Automotive industry acceptable silicone
K-seal	Selector switch, key selector switch, push/twist-to-release E-stop, key E-stop, push/pull mushroom	Nitrile
Diaphragm retainer, return spring I	Illuminated push button, non-illuminated push button, momentary mushroom	Stainless steel
Return spring II	Reset, selector switch, key selector switch, maintained action, push/twist-to-release E-stop, key E-stop, push/pull mushroom	Zinc coated music wire
Button cap/mushroom head	Non-illuminated push button, momentary mushroom, reset, push/twist-to-release E-stop, key E-stop, push/pull mushroom, multi-function	PBT/polycarbonate blend
2-color molded button cap	Non-illuminated push button	PBT/polycarbonate blend
Lens	Multi-function	Acetal
Lens, knob	Illuminated push button, illuminated momentary mushroom, illuminated selector switch	Polyamide
Knob	Non-illuminated selector switch	Glass-filled polyamide
Plastic bezel/bushing I	Non-illuminated push button, illuminated push button, momentary mushroom, selector switch, key selector switch, push/twist-to-release E-stop, key E-stop, push/pull mushroom, multi-function, reset	Glass-filled polyamide
Plastic bezel/bushing II, jam nut	Pilot light, reset jam nut, reset pusher	Glass-filled PBT
Metal bezel/bushing	All metal operators	Zinc
Diffuser	Illuminated push button, pilot light	Polycarbonate
Legend frames	—	Glass-filled polyamide
Plastic mounting ring	All plastic operators	Glass-filled polyamide
Metal mounting ring	All metal operators	Chromated zinc
Plastic latch	—	Glass-filled polyamide
Metal latch	—	Chromated zinc + stainless steel
Plastic enclosure	—	PBT/polycarbonate blend
Metal enclosure	—	Aluminum
Terminal screws	LED module, incandescent module, contact blocks	Zinc-plated steel with chromate
Terminals	LED module, incandescent module, contact blocks	Brass with silver-nickel contacts
Screwless	LED module, incandescent module	Stainless steel
Lamp socket	Incandescent module	Brass
Housing	Incandescent module, LED module	Glass-filled polyamide
Low voltage terminals	Contact blocks	Gold plated silver-nickel contacts
Low voltage spanner	Contact blocks	Gold-plated silver-nickel contacts
Spanner	Contact blocks	Brass with silver-nickel contacts
Boot	Toggle Switch, illuminated push button, non-illuminated push button, multi-function illuminated an non-illuminated	Automotive industry acceptable silicone

Specifications
Mechanical Ratings


Vibration (assembled to panel)	Tested at 10...2000 Hz, 1.52 mm displacement (peak-to-peak) max./10 G max. for 3 hr duration, no damage	
Shock	Tested at 1/2 cycle sine wave for 11 ms; no damage at 100 G	
Degree of protection	IP 66 (Type 3/3R/4/4X/12/13)	
mechanical durability per EN 60947-5-1 (Annex C)	2,000,000 Cycles	Momentary Push Button
	300,000 Cycles	Selector Switch and E-Stop/Push-Pull
Operating forces	Flush/Extended = 9 N, E-stop = 36 N	
Operating torque (typical application with one contact block)	Selector Switch = 0.25 N•m	
Contact operation	N.O.	Slow double make and break 
	N.C.	Slow double make and break - positive opening
Push button travel to change electrical state	N.O.	2.5 mm (0.1 in.)
	N.C.	1.5 mm (0.060 in.)

Environmental


Temperature range (operating) 	-25...+60 °C (-13...140 °F)
Temperature range (short term storage)	-40...+85 °C (-40...185 °F)
Humidity	50...95% RH from 25...60 °C (77...140 °F)

UV Ratings

All plastic non-illuminated pushbutton caps & e-stops	UV grade polyester and polycarbonate blend, UL UV Category (f2)
All plastic enclosures	UV grade polyester and polycarbonate blend, UL UV Category (f1)

 Positive Opening per EN60947-5-1 (applies to all NC contact block styles)

Electrical Ratings

Standard contact block ratings	B300, R300; AC 15, DC 13; 300 VAC; EN/IEC 60947-5-1 and UL 508, 17V, 5 mA min. (See page H85)			
LED Module Ratings	Nominal Voltage	Range	Nominal Current Draw	Frequency
	24V AC	20...26V AC	32 mA	50/60 Hz
	24V DC	18...30V DC	24 mA	DC
	120V AC	102...132V AC	22 mA	50/60 Hz
	240V AC	204...264V AC	22 mA	50/60 Hz
Thermal current	5 A max. enclosed (40 °C ambient) to UL508, EN/IEC 60947-5-1			
Insulation voltage (Ui)	300V			
Wire capacity (screw terminal)	#18...14 AWG (0.75...2.5 mm ²), Max. (2) #14 AWG, uses same size wire only			
Recommendations for Ring Lug termination option 	6.35 mm (0.250 in.) Max. outer diameter with 3.8 mm (0.148 in.) hole diameter			
Recommended tightening torque on screw terminals	0.7...0.9 N•m (6...8 lb-in.)			
Dielectric strength (minimum)	2500V for one minute			
External short circuit protection	5 A type gL/gG cartridge fuse to EN 60269-2-1 or gN (Class J to UL 248-8 or Class CC to UL 248-4)			
Electrical shock protection	Finger-safe conforming to IP2X			

Illumination

LED Dominant Wavelength	Green	Red	Yellow	Blue	White
	525 nm	629 nm	590 nm	470 nm	
LED Luminous Intensity	Green	Red	Yellow	Blue	White
	780 mcd	780 mcd	600 mcd	168 mcd	360 mcd
Incandescent maximum wattage	2.6 W				


Materials

Springs	Stainless steel and zinc coated music wire
Electrical contacts	Brass with silver-nickel contacts
Terminals	Brass and phosphor bronze
Panel gasket	nitrile and polyester-based TPE
Seal	Nitrile
Button cap/mushroom head	Polyester/polycarbonate blend
Lens (pilot light)	Acrylic
Knob (selector switch)	Glass-filled polyamide
Bezel/bushing, housing	Glass filled polyester
Legend frames	Glass filled polyamide
Mounting ring	Glass filled polyamide
Terminal screws	Zinc-plated steel with chromate
Lamp Socket	Brass and Phosphor bronze

Product Certifications

Certifications	UL, CSA, CCC, CE
Conformity to standards - CE marked	UL 508, EN ISO13850, EN 60947-1, EN 60947-5-1, EN 60947-5-5
Terminal Identification	EN/IEC 60947-1

 Operating temperatures below 0°C (32°F) are based on the absence of freezing moisture and liquids.

 3M MV018-R/S (#22...18 AWG) or 3M MVU14-6R/S (#16...14 AWG)

IEC Ratings and Test Values for AC (50 and 60Hz) Control Circuit Contacts ②

Designation ① AC	Utilization Category	Conventional Thermal Current I_{the} (A)	Rated Operation Current I_e (A) at Rated Operational Voltage U_e						VA Rating	
			120V	240V	380V	480V	500V	600V	Make	Break
A600	AC-15	10.0	6.0	3.0	1.9	1.5	1.4	1.2	7200	720
B300	AC-15	5.0	3.0	1.5	~	~	~	~	3600	360
C300	AC-15	2.5	1.5	0.75	~	~	~	~	1800	180

IEC Ratings and Test Values for DC Control Circuit Contacts ②

Designation ① DC	Utilization Category	Conventional Thermal Current I_{the} (A)	Rated Operation Current I_e (A) at Rated Operational Voltage U_e					VA Rating	
			125V	250V	440V	500V	600V	Make	Break
Q600	DC-13	2.5	0.55	0.27	0.15	0.13	0.1	69	69
R150	DC-13	1.0	0.22	~	~	~	~	28	28
R300	DC-13	1.0	0.22	0.1	~	~	~	28	28

NEMA Ratings and Test Values for AC (50 and 60Hz) Control Circuit Contacts ③

Designation ① AC	Therm. Continuous Test Current (A)	Maximum Current (Amps)								VA Rating	
		120V		240V		480V		600V			
		Make	Break	Make	Break	Make	Break	Make	Break	Make	Break
A600	10	60	6.0	30	3.00	15	1.50	12	1.20	7200	720
B300	5	30	3.0	15	1.50	~	~	~	~	3600	360
C300	2.5	15	1.5	7.5	0.75	~	~	~	~	1800	180

NEMA Ratings and Test Values for DC Control Circuit Contacts ③

Designation ① DC	Therm. Continuous Test Current (A)	Maximum Make or Break Current (Amps)			Make or Break at 300V or less [VA]
		125V	250V	301...600V	
Q600	2.5	0.55	0.27	0.10	69
R150	1	0.22	~	~	28
R300	1	0.22	0.11	~	28

① The letter stands for the conventional thermal current, and identifies AC or DC. For example, B is 5A AC. The numbers following the letter are the rated insulated voltage.

② From IEC 60947-5-1.

③ From NEMA Standard ICS 5-2000, Part 1.

Approximate Dimensions – millimeters ①

Illuminated and Non-illuminated Momentary Mushroom Operators 40mm and 60mm (D7x-LMM & D7x-MM)

Operator	A
40mm	39.8
60mm	59.8

Illuminated and Non-illuminated 3-Position Mushroom Operators 40mm (D7M-MM4/MP4_E3 & D7M-LMM4/LMP4_E3)

Dimension B Position	
Out	37.9
Center	35.3
In	32.9

Illuminated and Non-illuminated Selector Switch Operators (D7x-LS, D7x-S & D7x-H Long)

Non-illuminated 3-Position Multi-Function Operators (D7x-U3)

Illuminated and Non-illuminated Push-Pull Mushroom Operators 30mm, 40mm, and 60mm (D7x-MP)

Operator	A
30mm	30
40mm	40
60mm	60

Illuminated and Non-illuminated Twist-to-Release Operators 30mm, 40mm, and 60mm (D7x-MT)

Operator	A
30mm	30
40mm	40
60mm	60

Illuminated and Non-illuminated 2-Position Multi-Function Operators (D7x-LU2 & D7x-U2)

Mushroom Key Release Operator 40mm (D7x-MK)

Key Selector Switch Operators (D7x-K)

Back-of-Panel Components — Incandescent Module with Latch (D7-DOC & D7-ALP/M)

Back-of-Panel Components — Contact Cartridges with Latch (D7-X/Q + D7-ALP/M)

30 x 40mm Snap-in-Legend Plate (D7-11)

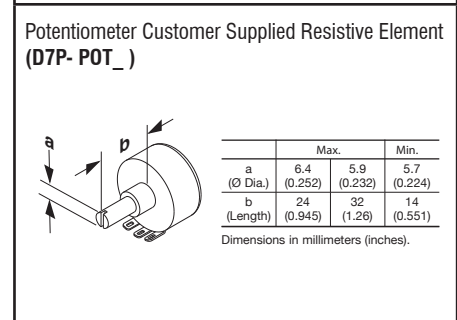
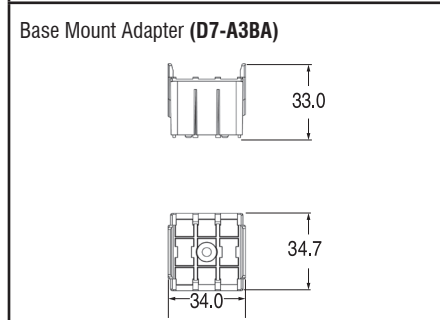
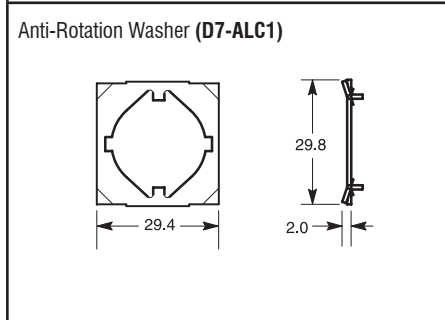
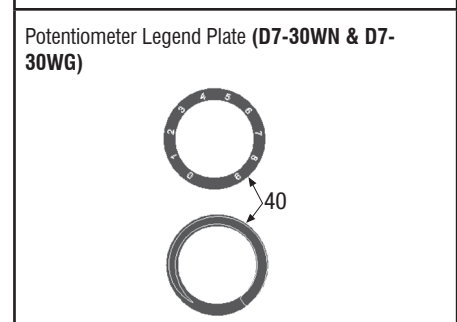
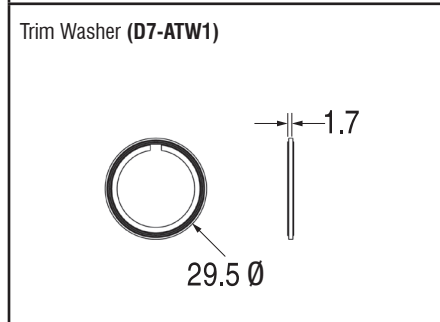
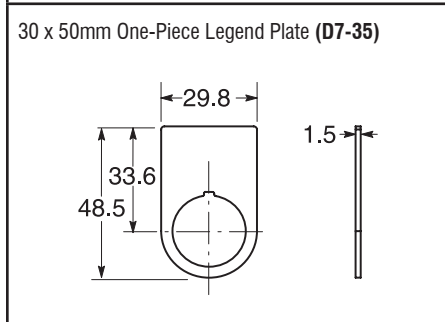
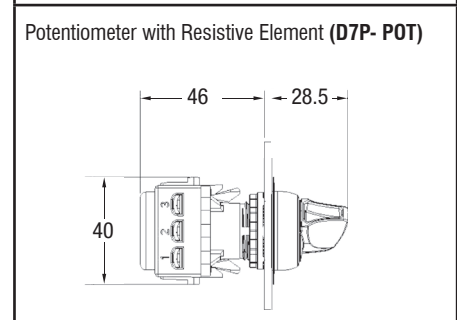
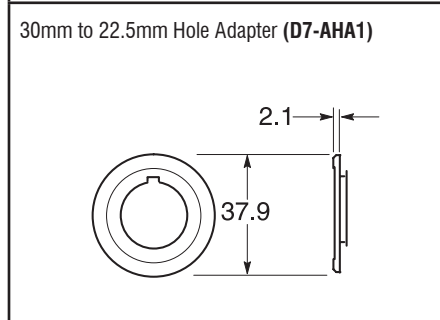
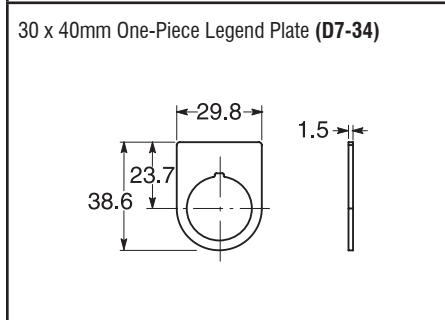
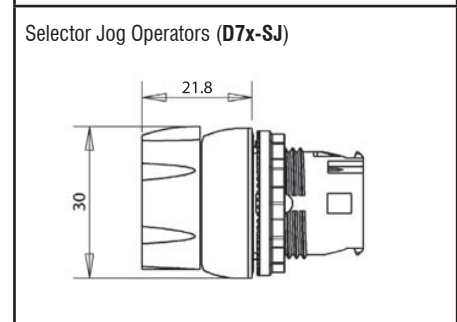
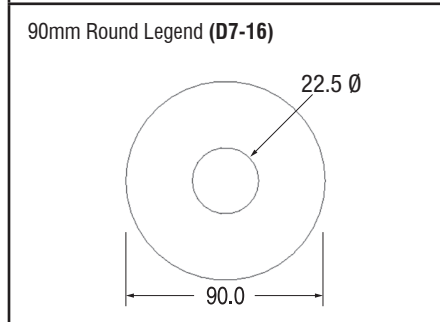
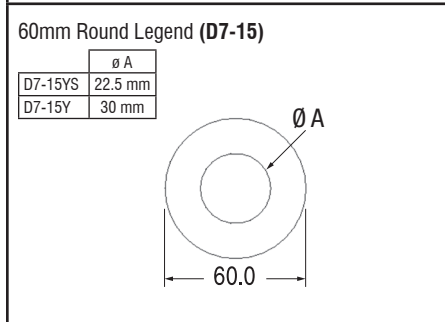
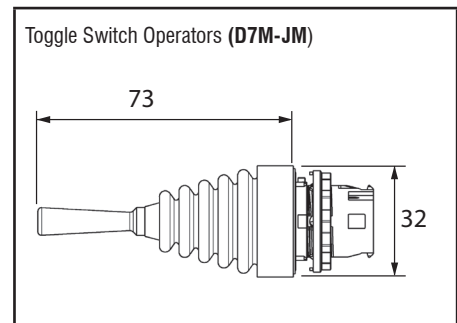
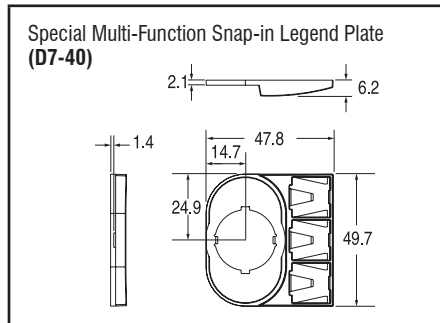
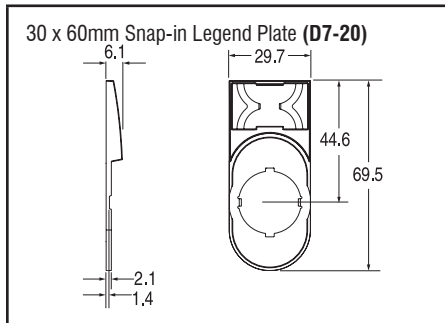
Back-of-Panel Components — LED Module with Latch (D7-N/Q & D7-ALP/M)

Back-of-Panel Components — (Max. of 1 Deep) (D7-X01S)

30 x 50mm Snap-in-Legend Plate (D7-12)

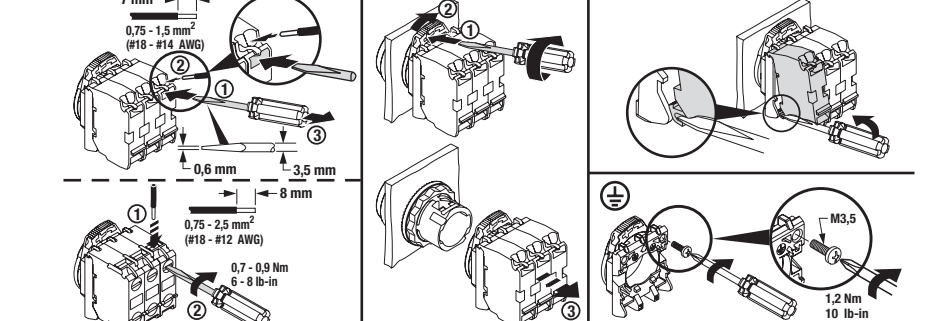
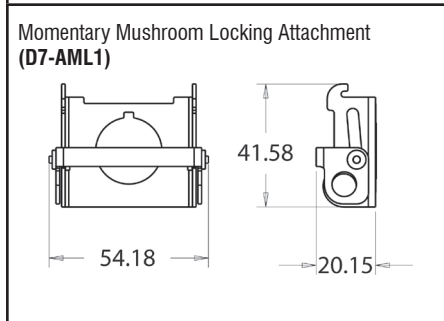
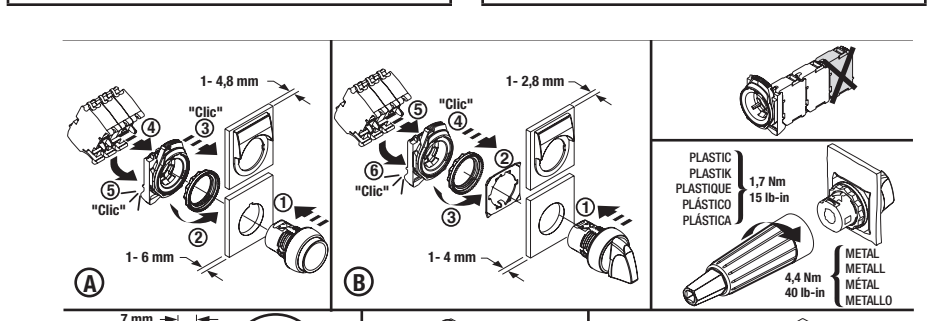
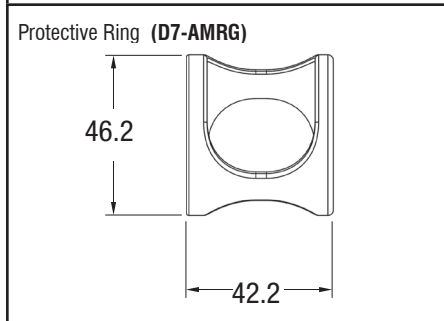
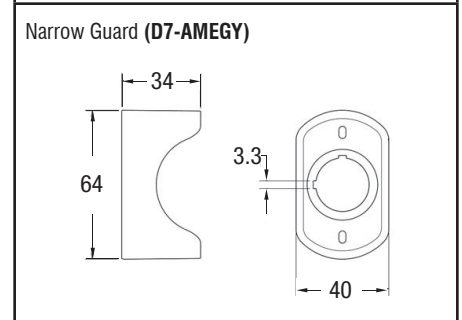
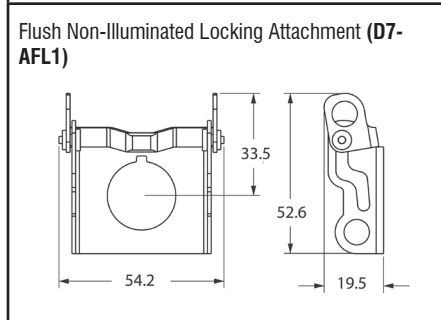
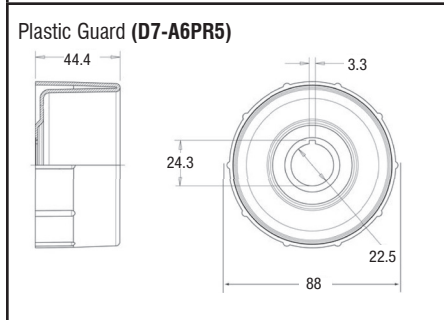
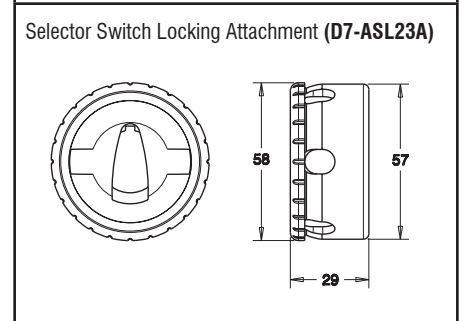
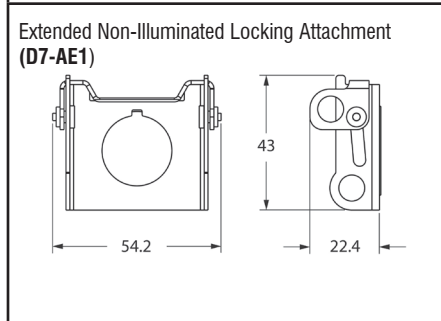
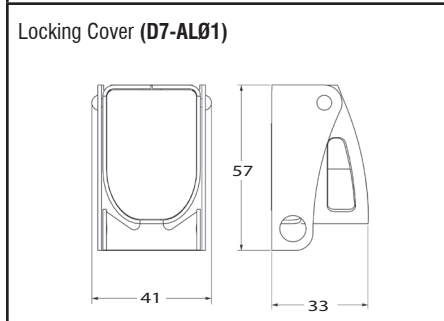
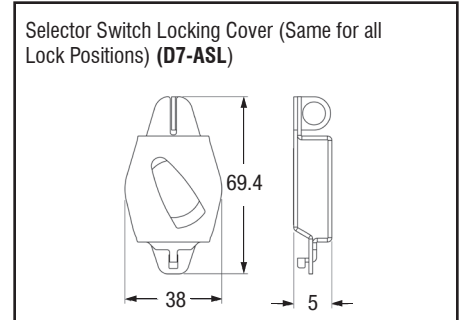
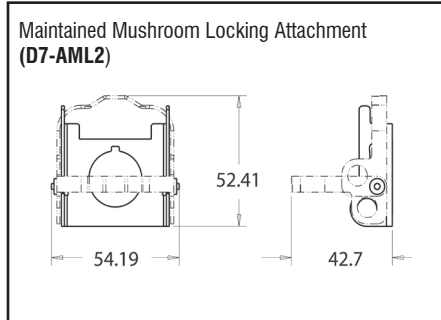
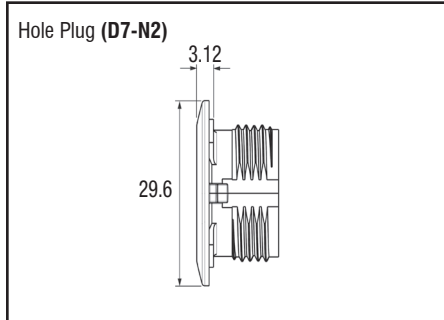
① Dimensions are not intended to be used for manufacturing purposes.

Approximate Dimensions – millimeters ①②



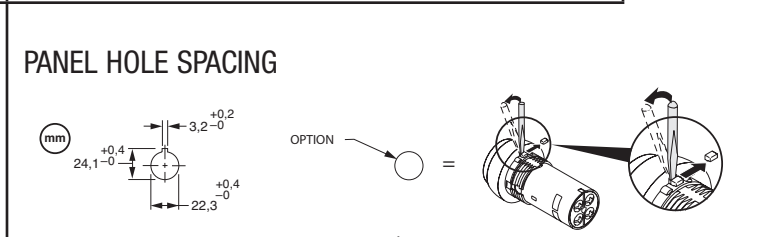
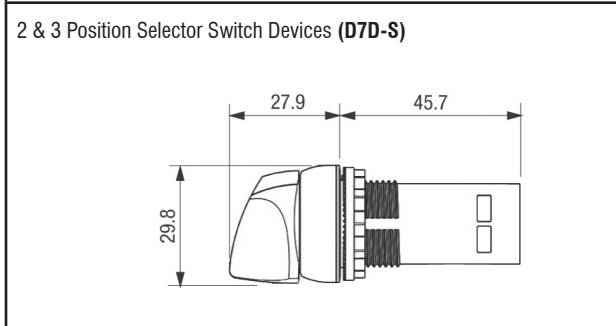
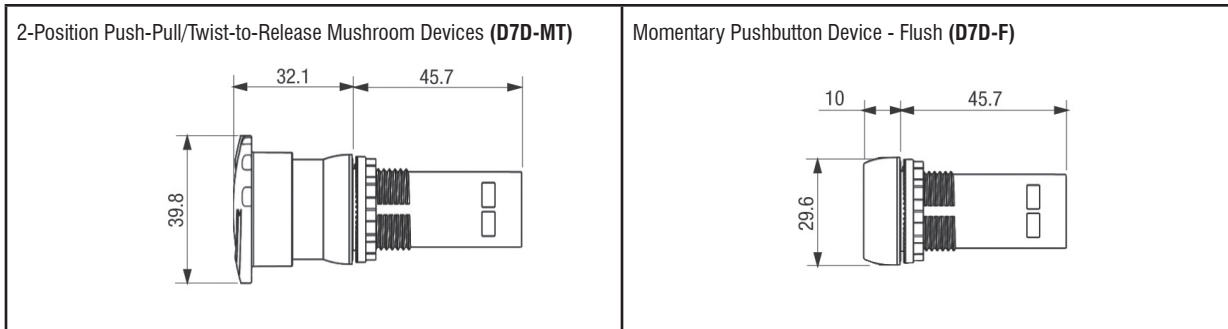
① Dimensions are not intended to be used for manufacturing purposes.
 ② Panel thickness range is 1.0...6.0 maximum. Panel thickness reduced to 4.5 when optional legend plates are used.

Approximate Dimensions – millimeters ①

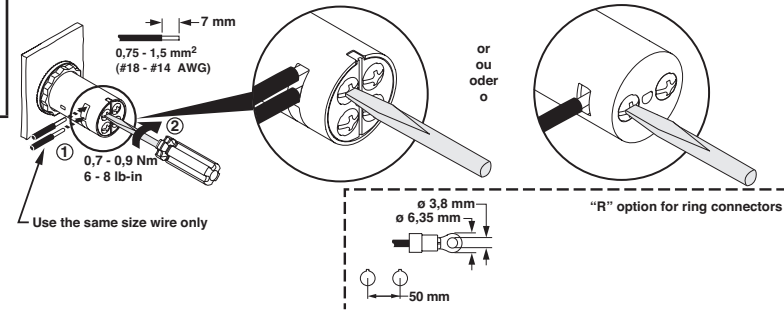
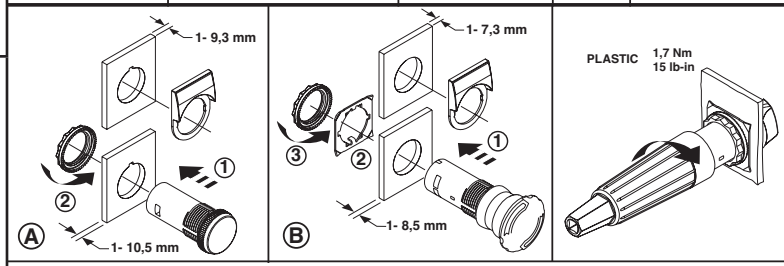
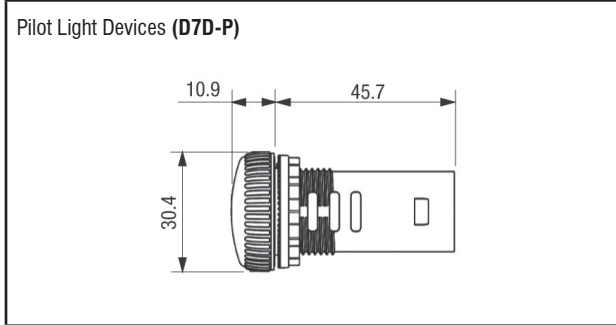
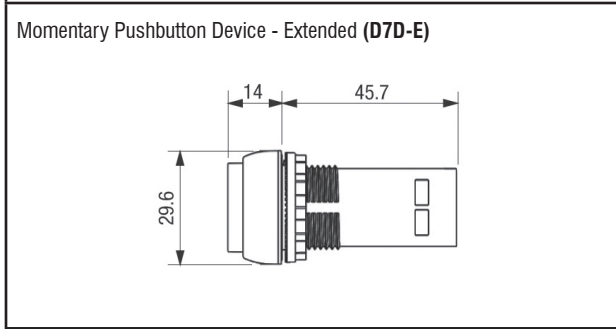


① Dimensions are not intended to be used for manufacturing purposes.

Approximate Dimensions – millimeters ①

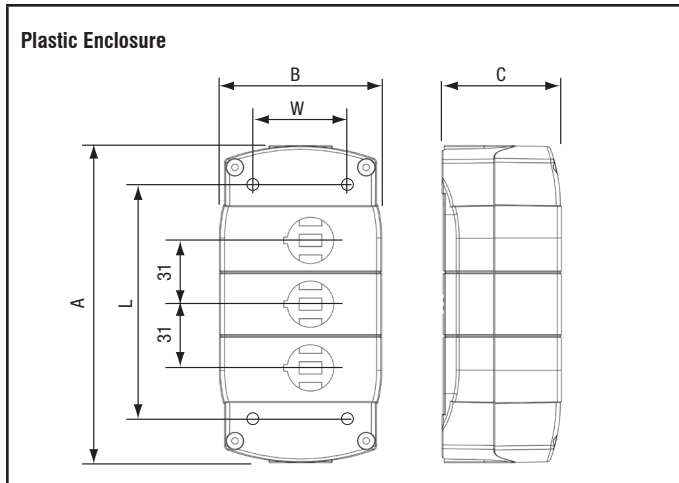


(A)						
(A)						
(B)						
						ø60, ø90
	30	40	50	40	50	60 / 90
	30		40			



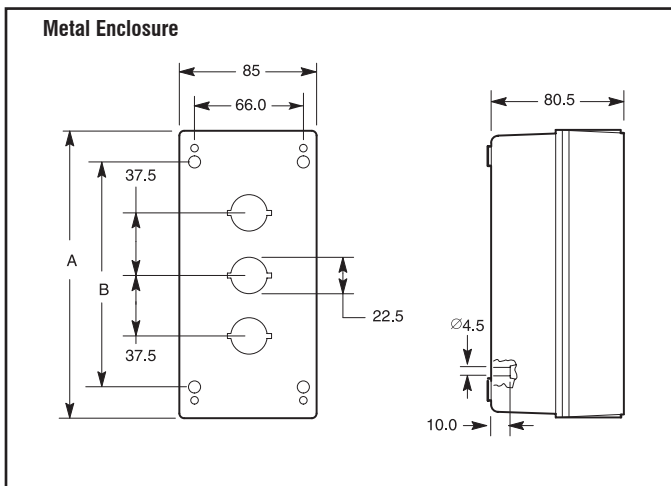
① Dimensions are not intended to be used for manufacturing purposes.

Approximate Dimensions – millimeters ❶



Type - 4/4X13 (IP66) - Plastic Enclosures ❷

Cat. No.	No. of Units (Holes)	Length A	Width B	Depth C	Mtg. Holes		Knockout/Conduit Openings
					W	L	
D7-1PP (1YP)	1	85 (3-11/32)	89 (3-1/2)	58 (2-9/32)	58	59	PG11 PG16
D7-2PP	2	124 (4-7/8)	79 (3-1/8)	58 (2-9/32)	48	102.5	PG11 PG16
D7-3PP	3	155 (6-3/32)	79 (3-1/8)	58 (2-9/32)	48	133	PG11 PG16
D7-4PP	4	186 (7-5/16)	79 (3-1/8)	58 (2-9/32)	48	164.5	PG11 PG16
D7-6PP	6	248 (9-3/4)	87 (3-7/16)	64 (2-17/32)	55	224	PG16



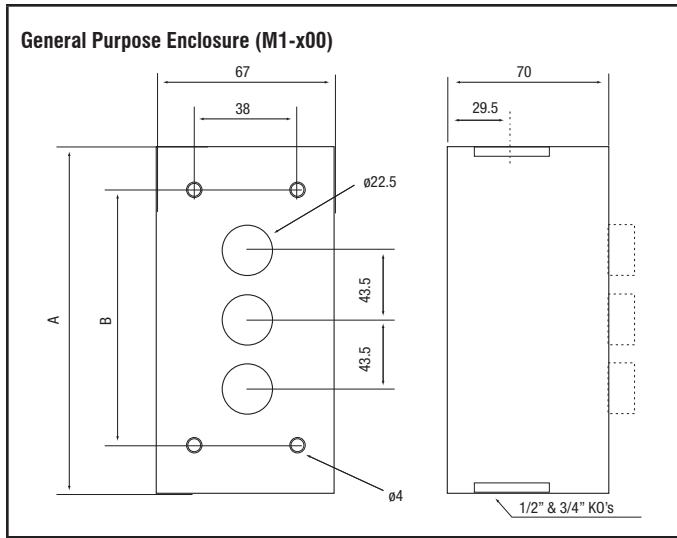
Type 4/13 (IP66) - Metal Enclosures

Cat. No.	No. of Units (Holes)	Length A	Mtg. Holes B	Knockout/Conduit Openings
D7-1MP (1MY)	1	99 (3-9/10)	62 (2-7/16)	PG11 PG16
D7-2MP	2	137 (5-13/32)	100 (3-15/16)	PG11 PG16
D7-3MP	3	174 (6-27/32)	137 (5-13/32)	PG11 PG16
D7-5MP	5	249 (9-13/32)	212 (8-11/32)	PG16

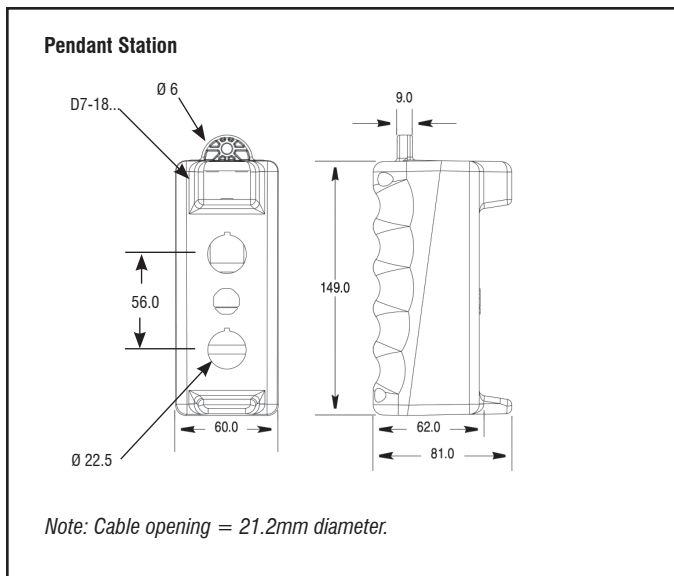


❶ Dimensions are not intended to be used for manufacturing purposes.
 ❷ Mounting screw head diameter = 7mm max. for 1P enclosures

Approximate Dimensions – millimeters ①



Type 1 - Metal Enclosures			
Cat. No.	No. of Units (Holes)	A	B
M1-100	1	114 (4-1/2)	51 (2)
M1-200	2	114 (4-7/8)	51 (2)
M1-300	3	157 (6-1/4)	102 (4)



① Dimensions are not intended to be used for manufacturing purposes.