

# Pilot and Signaling Devices

## Heavy-Duty 22.5 mm Watertight/Oiltight Pilot Devices

### C-2000

#### Nomenclature

600 VAC Max., 300 VDC Max.

10 Amps Continuous AC, 2.5 Amps Continuous DC

For use in interpreting product numbers only. Do not use for developing product numbers.

#### Standard & Illuminated Push Buttons

		Style		Illumination		Cap Color		Push Button Type		Lens Type	
P	9		P								
		<b>C</b> = Polished chrome <b>M</b> = Satin chrome <b>X</b> = Round plastic <b>S</b> = Square plastic		<b>N</b> = Nonilluminated <b>L</b> = Illuminated		<b>0</b> = No Cap <b>N</b> = Black <b>R</b> = Red <b>V</b> = Green <b>G</b> = Yellow <b>L</b> = Blue <b>B</b> = White <b>M</b> = Brown <b>H</b> = Gray <b>A</b> = Orange <b>I</b> = Clear		<b>G</b> = Flush <b>S</b> = Extended <b>E</b> = Recessed		<b>D</b> = Diffused <b>R</b> = Refracted <b>0</b> = No lens	

#### Pilot Lights

		Style		Cap Color		Lens Type	
P	9		L				
		<b>C</b> = Polished chrome <b>M</b> = Satin chrome <b>X</b> = Round plastic <b>S</b> = Square plastic		<b>R</b> = Red <b>V</b> = Green <b>G</b> = Yellow <b>L</b> = Blue <b>B</b> = White <b>I</b> = Clear <b>A</b> = Orange <b>0</b> = No cap		<b>D</b> = Diffused <b>R</b> = Refracted <b>V</b> = Glass <b>0</b> = No lens	

#### Mushroom-Head Push Buttons

		Style		Type		Mushroom-Head Diameter		Cap Color		Illumination		Position Type (1 Digit) or Key Selection (2 Digits)	
P	9		E										
		<b>C</b> = Polished chrome <b>M</b> = Satin chrome <b>X</b> = Round plastic <b>S</b> = Square plastic		<b>M</b> = Momentary <b>T</b> = Push/Pull <b>R</b> = Turn-to-reset <b>C</b> = Key-to-reset		<b>3</b> = 28mm <b>4</b> = 40mm <b>6</b> = 60mm		<b>N</b> = Black <b>R</b> = Red <b>V</b> = Green <b>G</b> = Yellow <b>L</b> = Blue <b>B</b> = White <b>I</b> = Clear <b>A</b> = Orange		<b>N</b> = Nonilluminated <b>A</b> = Positive-action, nonilluminated <b>L</b> = Illuminated		<b>Position type</b> <b>1</b> = 2-position push/pull <b>2</b> = 3-position, maintained push/momentary pull <b>3</b> = 3-position, push/pull, spring return to center <b>Keys</b> See keys selection table on page 9-64	

#### Knob- & Lever-Operated Selector Switches

		Style		Operator Type		Cam		Spring Return		Cap Color	
P	9		S								
		<b>C</b> = Polished chrome <b>M</b> = Satin chrome <b>X</b> = Round plastic <b>S</b> = Square plastic		<b>M</b> = Knob <b>V</b> = Lever <b>L</b> = Illuminated knob		<b>D, I, or H</b> = 2-position <b>E, L, U, or Z</b> = 3-position <b>X or W</b> = 4-position <b>Y</b> = 5-position		<b>0</b> = Fixed <b>1</b> = From left <b>3</b> = From left & right <b>5</b> = From right		<b>0</b> = No knob or lever <b>N</b> = Black <b>R</b> = Red <b>V</b> = Green <b>G</b> = Yellow <b>L</b> = Blue <b>B</b> = White <b>I</b> = Clear <b>A</b> = Orange	



# Pilot and Signaling Devices

## Heavy-Duty 22.5 mm Watertight/Oiltight Push Buttons

### C-2000

Standard

Illuminated

600 VAC Max., 300 VDC Max.

10 Amps Continuous AC, 2.5 Amps Continuous DC

#### Selection Process

Select operator below	+	Select power supply from pages 9-100 & 9-101	+	Select contact block from page 9-101	+	Select nameplate, if required, from pages 9-103 to 9-105	=	Complete unit
-----------------------	---	--	---	--------------------------------------	---	--	---	---------------



Flush

#### Operators

Standard Push Button Type	Operator Style	Lens Type	Product Number	List Price GO-10GC
Flush	Round Polished Chrome	Diffused	P9CPL*GD	\$11.50
Flush	Round Satin Chrome	Diffused	P9MPL*GD	\$11.50
Flush	Round Engineered Plastic	Diffused	P9XPL*GD	\$11.50
Flush	Squared Engineered Plastic	Diffused	P9SPL*GD	\$11.50
Extended	Round Polished Chrome	Diffused	P9CPL*SD	\$10.50
Extended	Round Satin Chrome	Diffused	P9MPL*SD	\$10.50
Extended	Round Engineered Plastic	Diffused	P9XPL*SD	\$10.50
Extended	Squared Engineered Plastic	Diffused	P9SPL*SD	\$10.50
Recessed	Round Polished Chrome	Diffused	P9CPL*ED	\$11.50
Recessed	Round Satin Chrome	Diffused	P9MPL*ED	\$11.50
Recessed	Round Engineered Plastic	Diffused	P9XPL*ED	\$11.50
Recessed	Squared Engineered Plastic	Diffused	P9SPL*ED	\$11.50



Recessed

Replace asterisk (\*) in product number with color code from table below

#### \*Colors

Colors	Red	Green	Yellow	Blue	White	Orange	Clear	No Lens <sup>1</sup>
*Color code	R	V	G	L	B	A	I	0

<sup>1</sup>When ordering illuminated push buttons with no lens, change eighth digit in product number from D to O and deduct **\$1.00** from **List Price**.

Color lenses are listed separately on page 9-112.



Square Extended



# Pilot and Signaling Devices

## Heavy-Duty 22.5 mm Watertight/Oiltight Push Buttons

### C-2000

#### Technical Data

600 VAC Max., 300 VDC Max.

10 Amps Continuous AC, 2.5 Amps Continuous DC

#### General Specifications

Conformity to standards	<b>UL508</b> (USA) <b>NEMA ICS-2</b> (USA) <b>VDE 0660</b> (Germany) <b>BSI</b> (Great Britain) <b>CEI EN60947.5. 1</b> (Italy) <b>CENELEC EN 5000 7</b> (Europe)	<b>CSA C22.2 No. 14-M91</b> (Canada) <b>IEC 947.5. 1</b> (International) <b>UTE</b> (France) <b>NFC 63140</b> (France) <b>JIS</b> (Japan)	
Approvals	<b>UL listed</b> —File Number E66677 <b>CSA Certified</b> —File Number 16661-63 Manufacturing facility is registered to <b>ISO 9000</b>	<b>CE</b>	
Finger protection at terminals	<b>IP2X</b> according to IEC 529 Terminal identification per <b>CENELEC EN 50013</b>		
Enclosure ratings	Suitable for use in <b>NEMA Types 1, 3, 3R, 3S, 4, 4X, 12, and 13</b> enclosures. (Multi-function push buttons are suitable for NEMA Type 1 enclosures only unless used with protective rubber cap accessory.) <b>IP66</b> per IEC 529, when mounted in enclosures with equal or superior seal.		
Ambient temperature	<u>Operating</u> -13° to + 158°F -25° to + 70°C	<u>Storage</u> -40° to + 158°F -40° to + 70°C	
Climate suitability/humidity	<u>Climate Type</u> Temperature Wet Hot Wet Variable Wet	<u>Temperature</u> 74°F (23°C) 74°F (23°C) 104°F (40°C) 74° to 104°F (23° to 40°C)	<u>Relative Humidity</u> 50% 83% 92% 83% to 92%
Resistance to vibration	Per <b>IEC 68-2-6</b> . 16g with a frequency from 40-500 Hz and maximum peak-to-peak amplitude of 0.75mm.		
Resistance to shock	According to <b>MIL 202B, method 202A</b> . Test was performed for 1/2 sinusoid for 11ms, 38g max for all operators with transformers and 100g for all other operators.		
Operating force	Standard push button operator: 2.5 lbs. (11N) Each contact block: 1.3 lbs. (6N) Selector switch operator: 2.4 in.-lb. (0.27 N-m)		

#### Wire Terminals

	Suitable for #22-#12 AWG stranded or solid copper wires, single or parallel conductors of same size. Terminal torque: 7-12 in./lb. Parallel conductor size combinations (stranded or solid wire):		
Wire capacity and terminal torque requirements (for all power supplies and contact blocks)	<u>Parallel Conductor Size Combinations (Stranded or Solid Wire)</u>		<u>Terminal Torque</u>
	#12 with #14		12 in.-lb.
	#14 with #16		12 in.-lb.
	#16 with #18		12 in.-lb.
	#16 with #20		12 in.-lb.
	#16 with #22		12 in.-lb.
	#18 with #22		10-12 in.-lb.
	#18 with #20		10-12 in.-lb.
	#20 with #22		7-12 in.-lb.
Quick connect terminals	Suitable for one female tab connector measuring 0.25 x 0.03 inches (6.35 x 0.8 mm) or two female tab connectors measuring 0.11 x 0.03 inches (2.8 x 0.8 mm).		

#### Contact Data

Electrical reliability data	Electrical life and reliability in low level current: 80 million operations at 12V, 5mA, resistive load. (32 contacts tested successfully for 2.5 million operations.)								
Dust resistance	In extremely dusty environments, electrical life at low level current is 250,000 operations at 12 V, 5mA, resistive load. In a clean environment, electrical life at low level current is 10 million operations at 12 V, 5mA, resistive load.								
Thermal current	I <sub>th</sub> = 10A per IEC 947-5-1								
Insulation voltage	U <sub>i</sub> = 660 Volts ac/dc (opposite polarity) except 2NO and 2NC blocks 300 Vac/dc								
Protection from electrical shock	Class I per IEC 536 for metal operators Class II (double insulation) per IEC 536 for plastic operators								
Insulation category	Group "C" per VDE 0110								
Dielectric strength	2500 Volts								
Short circuit protection	10A type gG fuse, per IEC 269.1 & 269.3								
Pilot duty ratings	<b>A600</b> (maximum make volt-amperes = 7200; maximum break volt-amperes = 720; PF = .25)								
	Volts (V)	12	24	48	60	120	240	480	600
	Continuous (A)	10	10	10	10	10	10	10	10
	Making (A)	60	60	60	60	60	30	15	12
	Breaking (A)	10	10	10	10	6	3	1.5	1.2
	<b>Q300</b> (maximum make or break volt-amperes = 69)								
	Volts (V)	12	24	48	60	125	250	300	
	Continuous (A)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	
	Making (A)	2.5	2.5	1.4	1.1	0.55	0.27	0.23	
	Breaking (A)	2.5	2.5	1.4	1.1	0.55	0.27	0.23	



**Publications and Reference:** See Section 17 for a complete list of additional product-related publications

# Pilot and Signaling Devices

## Heavy-Duty 22.5 mm Watertight/Oiltight Push Buttons

### C-2000

## Section 9

#### Technical Data

600 VAC Max., 300 VDC Max.

10 Amps Continuous AC, 2.5 Amps Continuous DC

#### Materials

Component	Material
Cap/levers/knobs (nonilluminated)	Polyamide/acetal
Cap/levers/knobs (illuminated)	Polycarbonate
Metal housing	Copper-nickel-chrome plated zinc/aluminum alloy
Plastic housing	Polyamide/acetal
Plunger	Polyester
Springs	Stainless steel
Body-to-panel gasket	Polyester elastomer
Cap-to-body gasket	Vinyl nitrile rubber
Lubricant	Lithium grease
Cams for nonilluminated selector switches	Polyamide/acetal
Cams for illuminated selector switches	Polyester
Cam followers	Polyamide/acetal
Contact block and power supply housings	Polyamide/acetal
Contacts	Pure silver
Conductors	Brass alloy
Flanges	Polyamide/acetal
Flange latches	Polyamide/acetal
Printed circuit board adapter	Polyamide/acetal
Joystick protective housing	Vinyl nitrile rubber
Joystick plunger, lever & cam	Acetal resin
Joystick actuator	Polyamide/acetal
Push-to-latch, turn-to-release actuator & plunger	Polyamide/acetal
Wobble stick	Polycarbonate
Toggle switch lever	Polyamide/acetal
Protective caps (clear)	Silicon rubber
Protective caps (colored)	Vinyl nitrile rubber
Push button protective guards	Polycarbonate
Mushroom-head guards	Polyamide/acetal
Padlockable cover	Polycarbonate and zinc-plated zinc/aluminum alloy
Metal locking rings	Zinc-plated zinc/aluminum alloy
Keys	Plated brass
Nameplate holders	Polyamide/acetal
Nameplate inserts	Laminated polyester
Hole plug	Polyamide/acetal

#### Power Supply Selection

Type	Principle of Operation	Benefit
<b>Full voltage</b>	Supplies input voltage directly to bulb.	Smallest and least expensive. Can be used with LEDs.
<b>Transformer</b>	Utilizes a transformer to step the input voltage down to 6 volts.	Transformer has the effect of damping the inrush current and voltage spikes from the switching device seen when the light is turned on, actually protecting the bulb from these factors that shorten life. Generates less heat than the resistor power supplies. Reduces unsafe supply voltages (up to 600 V) down to a safe level for lamp servicing. Can be used with LEDs. Able to withstand a short circuit of the lamp or lamp socket without damage.
<b>Normal resistor</b>	Utilizes a resistor in series with the incandescent lamp to drop the lamp voltage to 50% of the input voltage.	Least expensive way to reduce unsafe supply voltages (up to 240 V) down to a safe level for lamp servicing.
<b>Diode resistor</b>	Utilizes a resistor and a diode in series with the lamp to rectify and drop a 240 Vac input voltage to operate a 130 V incandescent lamp.	Provides the same function as the normal resistor, but takes up only one position in the flange rather than two. Generates less heat than the normal resistor power supplies.
<b>Long-life resistor</b>	Utilizes a resistor in series with the 130 V incandescent lamp to provide a lamp voltage 80% that of the input voltage.	Extends life of a 130 V incandescent bulb by 1300% (from 2000 to 28,000 hours).
<b>Flashing (full-voltage or transformer)</b>	Utilizes a flashing circuit which can be enabled or disabled by externally switching (shorting) two connections.	Allows the lamp to be switched between OFF, ON, and FLASHING modes.
<b>Panel test (full-voltage or standard resistor)</b>	Utilizes a diode to isolate the lamp test circuit from the supply circuit.	Allows use of indicating lights and "panel test" feature rather than individual push-to-test illuminated push buttons. Eliminates the need for the NO/NC contacts used on conventional push-to-test pilot lights.

