



## Our Philosophy

- We expect the best of ourselves and each other.
- We are committed to attracting, developing, and keeping a diverse work force that reflects the nature of our global business.
- Our communications with one another are open, honest, and timely.
- We strive for the active involvement of every employee in our continued success and growth.
- We accept the challenge of lifelong learning.
- We do our work with a sense of urgency.
- We are accountable for our commitments and expect that our performance will be measured.
- Compensation at Eaton is fair and competitive for performance that contributes to the success of the business.
- We value employees' ideas, and we purposefully build an environment in which new ideas will flourish.

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## Product Application and Warranty Disclaimer

It is buyer's responsibility to determine the suitability of the particular device for its application, and Eaton Corporation makes no warranties, and assumes no liability as to the suitability or sufficiency for the buyer's application of the device.

Ratings and switch performance are valid only on devices which have not been subjected to unauthorized modifications or misapplications.

Dimensional drawings are available upon request. For assistance contact your Eaton Sales Representative.

## Specialty Switches and Controls

This catalog represents a broad selection of popular switches and controls offered by Eaton. Bold face catalog numbers indicate "off-the-shelf" availability through the national network of Authorized Distributors.

In addition to our standard product offering, Eaton can adapt products and develop products which accommodate your specific needs. Working with your engineering staff at the concept stage, we routinely design solutions for

specific customer needs. By leveraging existing product platforms, we can create custom solutions with minimum lead-time and tooling investments. For more information, contact your local Eaton Sales Representative or Distributor.

## COMMERCIAL CONTROLS

# The Power of Reliability

### Reliability: a global concern.

Eaton Corporation manufactures highly engineered products that serve industrial, vehicle, construction, commercial and semiconductor markets from 145 manufacturing sites in 28 countries. Eaton Commercial Controls Division (CCD) leverages Eaton's resources and expertise to compete as a global leader. With this support, CCD maintains a position as a leading supplier of reliable controls, switches and circuit breakers.

### Reliability: begins with a commitment to quality.

Eaton Corporation has embraced total quality management to continually improve products, service and overall customer satisfaction. At the heart of the quality initiative are robust processes, rigorous measurements and strong leadership. Robust processes provide the capability for excellence. Rigorous



measurements validate our progress toward excellence. And strong leaders continue to raise the bar. Our success with the quality initiative is reflected in ISO9001 and QS9000 certifications at CCD.

A variety of programs are used to promote improvement of overall company performance. Two key programs that underly the majority of these initiatives are The Eaton Philosophy and the Eaton Quality Award.

*The Eaton Philosophy:  
Excellence Through People*

Eaton's success depends on the superior performance of each Eaton employee in support of

our customers. Sustained high performance occurs when employees share certain key beliefs and become committed to the goals of the organization. The Eaton Philosophy sets out these shared beliefs and describes a culture in which employees make exceptional contributions.



*Eaton Quality  
Award*

Using Malcolm Baldrige criteria, CCD annually conducts a

self-assessment to measure performance on a wide range of business performance indicators. Cross-divisional teams at Eaton review the assessments and recognize areas of excellence as well as areas needing improvement. CCD is benchmarked against the rest of Eaton and best practices are shared across the organization.

### Reliability: a critical design component.

Our primary design strategy is platform engineering — adapting products developed on a standard platform to meet specific needs of individual customers. By investing in a common platform, CCD can provide a higher return on customer investments.



3-D design software is used in the Design Center to improve initial design concepts and reduce development cycles. Electronic drawings are also readily available to our customers.

The Eaton Innovation Center is a full service research and development facility focused on control products and system controls. World-class expertise at the Innovation Center is used by CCD to generate advanced product concepts and investigate new technologies.

### Reliability: built into every product.

We employ a wide variety of manufacturing operations to ensure conformance to quality standards, including:

- Precision metal stamping.
- Plastic injection molding.
- Fully and semi-automated assembly.
- Electronic assembly.
- Custom harness assembly.
- Welding and soldering.
- Legend engraving and pad printing.
- Laser marking.
- In house tool production and maintenance.
- Integrated testing.

### Reliability: a product of teamwork.

Customer satisfaction is the prime concern. We engage customers early in the development process to define product roadmaps and confirm new product specifications. Customers participate in concept and design reviews on a regular basis. Rigorous analysis by our customers helps to ensure the product works the first time. Every time.

# COMMERCIAL CONTROLS

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# COMMERCIAL CONTROLS

## General Information

### SWITCH SELECTION

The selection of the appropriate switch control for an intended application is most important. The performance and acceptance of the completed end product will, in most instances, depend on the ability of the switch to handle the electrical load characteristics of the application without failure over a reasonable number of life cycles.

### ENGINEERING ASSISTANCE

If your switching requirements cannot be fulfilled by one of the standard switches or options offered in this catalog, we may be able to suggest alternatives or, if desired, custom design a device to your exact specifications. Inquiries should describe the application fully, giving mechanical and electrical specifications in detail, along with an estimate of annual volume.

### RESPONSIBILITY

**It is the buyer's responsibility to qualify the product selected for the application.** EATON makes no warranties and assumes no liabilities as to the suitability or capabilities of a device in the final application.

### ENVIRONMENTAL CONSIDERATIONS

- Vibration — Shock.
- Contamination — Sand, dust, grease, metal chips, etc.

- Temperature extremes.
- Salt spray or corrosive atmosphere.
- Humidity.

### SEALED SWITCH AND/OR HOUSING

Sealing should be considered when the switch is used in an environment where concentration of sand, dust, metal particles and/or moisture could penetrate the switch housing and make the switch ineffective.

- The 7800 is available with a silicone seal in the toggle bushing to guard against moisture and contaminants.
- The Splashguard Series of rocker switches employs a water resistant seal to shield the contact mechanism from moisture.

### SELECTION PROCESS

Basic considerations in the selection of a switch control should be:

- Load Requirement of the Application — Voltage, current, horsepower, AC/DC, AC only, DC only.
- Type of Load —
  - Resistive.
  - Motor: Inrush, locked rotor, running current.

- Lamp, incandescent: AC only, AC/DC.
- Lamp, electric discharge.
- Inductive: Magnet coils, inrush, sealed.
- Rectifier, power supply: Transformer, inrush, normal.
- Low energy.
- Dry circuit.

- Type of duty.

- Environmental conditions.

### INDUSTRY APPROVALS

#### Underwriters Laboratories

Most of the switches in this catalog are recognized by the Underwriters Laboratories, Inc., under UL Standard 1054, Special Use Snap Switches — UL File E2702, Guide WOYR or E24354.

#### Canadian Standards

Many of the items included are also certified by the Canadian Standards Association under CSA Standard C22.2 No. 55, Special Use Snap Switches — CSA File LR9002 or 45995, Class 6241 10.

#### European Test Houses

Many of the switches in this catalog have approvals from European Test Houses such as VDE, BEAB and UTE. See product sections for file numbers.

## SWITCH TERMINOLOGY

SWITCH TERMINOLOGY					
<b>One Pole (1P) — Single Pole (SP):</b>	A switch device that opens, closes or changes connections in a single conductor of an electrical circuit.	<b>Normally Open (NO):</b>	A momentary type switch in which one or more circuits are open when the switch actuator is at its normal or rest position.	<b>Make-Before-Break:</b>	A shorting switch mechanism that closes or makes a connection in a conductor before opening or breaking a previous connection in another conductor.
<b>Two Pole (2P) — Double Pole (DP):</b>	A switch device that opens, closes or changes connections in both conductors of the same circuit.	<b>Normally Closed (NC):</b>	A momentary type switch in which one or more circuits are closed when the switch actuator is at its normal or rest position.	<b>Life Expectancy:</b>	The useful life cycle performance of a switch mechanism to open or close, make or break, an electrical circuit, based on statistical probability.
<b>Two Circuit (2 CIR.):</b>	A switch device that opens, closes or changes connections in a single conductor of two independent circuits.	<b>Actuator:</b>	A lever, pushbutton, slide, trigger or other means to which an external force is applied to operate a switch mechanism.	<b>Operating Force:</b>	The force that must be applied to the actuator to move it from the free position to the operating position.
<b>Single Throw (ST):</b>	A switch that opens, closes or completes a circuit at only one of the extreme positions of its actuator.	<b>Alternate Action (Double Action Push):</b>	Push to make, then push to break a circuit.	<b>Operate Position:</b>	The position of the actuator at which the circuit transfers.
<b>Double Throw (DT):</b>	A switch that opens, closes or completes a circuit at both extreme positions of its actuator.	<b>Break-Before-Make:</b>	A non-shorting switch mechanism that opens or breaks a connection in a conductor before closing or making a connection in another conductor.	<b>Release Force:</b>	In a momentary type switch, the value to which the force on the actuator must be reduced to allow the contacts to return to the normal or rest position.

## General Information (continued)

### POWER RATINGS FOR SWITCHES

A switch rating is the current handling capacity of the switch measured in amperes, horsepower, lamp load or combinations of these with applicable voltages.

### UL/CSA RATED SWITCHES

A UL/CSA marked rating in amperes indicates the switch meets or exceeds test house performance requirements of 6,000 make-and-break cycles at the rated current, preceded by 50 make-and-break cycles at 150% switch current rating. 125% is used when switch ratings exceed 10A.

A UL/CSA horsepower-only rated device meets min. test requirements of 50 make-and-break cycles at the appropriate locked rotor current, followed by 6,000 cycles at one-sixth the AC locked rotor current or one-tenth the DC locked rotor current.

AC ampere ratings are resistive or inductive, with the inductive rating tested at 75%-80% power factor.

AC horsepower ratings are inductive and tested at 40%-50% power factor.

#### "L" Rating:

Denotes ability of an AC only switch to handle the initial high inrush characteristics of a Tungsten Filament Lamp on AC voltage only.

#### "T" Rating:

Denotes ability of an AC/DC switch to handle the initial high inrush characteristics of a Tungsten Filament Lamp on either AC or DC voltage.

All DC ratings are 100% resistive only (noninductive).

Many AC only rated switches can be used in applications where less than 30V DC is required, provided current does not exceed full current rating of the switch.

Ampere rated switches will not automatically handle inrush characteristics of five to six times switch rating.

**Note:** A UL/CSA Recognized switch suitable for AC only usage is marked with voltage rating and the letters AC.

A UL/CSA Recognized switch suitable for AC and DC usage is usually marked with voltage only, without the letters AC and DC.

### VDE RATED SWITCHES

Typical VDE Rating	
16	$I_r$ - Resistive Load Amperage
(4)	$I_m$ - Motor Load Amperage
A	Amperage
250V	Voltage
~	AC
T85	Max. Operating Temperature in Centigrade
$\mu$	Microgap (< 3 mm) Approved

#### Insulation Resistance/Dielectric Strength:

When 500V DC is applied for 1 min., switch shall have  $5\Omega$  min. insulation resistance. Switch shall withstand 2000V AC for 1 min. for ratings up to 380V, 2500V AC for ratings over 380V.

#### Normal Operation (Electrical Endurance):

Switches with resistive ( $I_r$ ) and motor ( $I_m$ ) ratings are tested at rated voltage; make  $6 \times I_m$  at 55-66% Power Factor. The switch contacts break the current equivalent to  $I_r$ . The number of ops. is as specified: 10,000 operations for normal use and 50,000, 100,000 or 200,000 ops. for higher switching frequency.

#### Breaking Capacity (Overload):

Motor ( $I_m$ ) and resistive ( $I_r$ ) rated switches:

- Make and break  $1.25 \times I_r$ ,  $1.1 \times V$  at 55-65% PF for 50 ops. (100 ops. if  $I_r$  rated only), 50% On, 50% Off.

- Make  $9 \times I_m$ ,  $1 \times V$  at 75-85% PF, carry for 50-100 milliseconds, and break 0 current for 50 ops.

- Make 0 current, apply  $6 \times I_m$ ,  $1 \times V$  at 55-65% PF, for 300-500 milliseconds, and breaks  $6 \times I_m$  for 50 ops.

- Allow 10 additional cycles opening the movable contacts slowly and, if possible, stopping in the hung position. No sustained arcing shall take place at  $6 \times I_m$ , or  $1.25 \times I_r$  if not  $I_m$  rated.

### VDE CLASSES

VDE requires that a switch have a min. creepage distance and contact air section of 3mm for direct mains connections. (A qualified exception is the microgap approval.) Three switch and equipment classes are defined by VDE.

**Class I** — Normal insulation.

**Class II** — Double or reinforced insulation.

**Class III** — Low voltage.

### VDE MICROGAP


If a switch contact air section (open position) is less than 3 mm, VDE grants a " $\mu$ " approval when all other requirements are met. This is a general application approval with a qualifier that another device, such as a cord and plug, must protect the equipment and user from the mains.

### VDE USE AUTHORIZATION

If a switch does not meet certain VDE requirements, a "Use Authorization" is granted. A file number is then placed within the symbol's triangle, instead of the letters "VDE". Specific applications for this switch are listed under that file.



# COMMERCIAL CONTROLS

APPROVAL MARKS <sup>1</sup>		
	<b>U.S.A.</b>	<b>UL (Recognized)</b> Listing Number: Switches – E24354 or File E1148, WOYR2 1609 Indicator – E70176, E2702
	<b>Canada</b>	<b>CSA – Canadian Standards Associations (Certified)</b> Listing Number: LR10538 or 45995, 9002 Class 6241
	<b>European Union</b>	<b>CE Mark</b> Low Voltage Directive 73/23/EEC
	<b>Germany</b>	<b>VDE – Verband Deutscher Elektrotechniker</b> Listing Number: 36088 or 6498-440
	<b>United Kingdom</b>	<b>BEAB – British Electrotechnical Approvals Board</b> Listing Number: CS0005
	<b>Sweden</b>	<b>SEMKO – Svenska Elektriska Materielkontrollanstalten AB</b> Listing Number: 8415051
	<b>Norway</b>	<b>NEMKO – Norges Elektriske Materielkontroll</b> Listing Number: 80790
	<b>Denmark</b>	<b>DEMKO – Danmarks Elektriske Materielkontroll</b> Listing Number: 47804
	<b>Netherlands</b>	<b>KEMA – N.V. Tot Keuring van Electrotechnische Materialen</b> Listing Number: LTI 84.8014
	<b>Finland</b>	<b>FEMKO – Sähkötekniikan tutkimuslaitos Ry Elektriska Inspektoratet RF</b> Listing Number: 072053-01/02
	<b>Switzerland</b>	<b>SEV Schweizerischer Electrotechnischer Verein</b>
	<b>Italy</b>	<b>IMQ – Istituto Italiano del Marchio di Qualità</b>

<sup>1</sup> See specific product specifications for applicable approvals.

## Approvals Glossary<sup>1</sup>

**ANSI:** The American National Standards Institute is an organization composed of many special working groups that concentrate on particular technical areas. U.S. representation at the IEC is organized through ANSI.

**BEAB:** The British Electrical Approval Board tests switches and domestic appliance and sound and vision equipment in accordance with British standards or, if no applicable standards exist, in accordance with IEC publications.

**BSI:** The British Standards Institute is concerned with other electrical equipment including electrical office machines and power tools.

**CAGE:** The military code for manufacturing plants. The cage code for the Selma, N.C. plant is 55588. The cage code for the Arab, AL plant is 55459.

**CCQ:** The Contrôle Centralisé de Qualité is the system to insure the quality of electronic components in France.

**CEBEC:** Comité Electrotechnique Belge is the national testing authority in Belgium.

**CEE:** This is the International Commission on rules for the approval of Electrical Equipment. Its members are representatives from the European national testing agencies.

**CENELEC:** The Comité Européen de Normalisation Electronique (European Committee for Electrotechnical Standardization). This agency is headquartered in Brussels.

**Certification:** Certification is a term used to describe the results of testing by one of the national agencies. CSA certifies products once they have tested and found them to be satisfactory and consistent with their standards.

**CSA:** The Canadian Standards Association is headquartered

in Rexdale, ON, Canada, and is the Canadian testing agency.

**CSA 22.2 No. 55:** The CSA standard for switches.

**DIN:** Deutsche Institute for Normung (German Standardization Institute). It does not perform any testing.

**IEC:** The International Electrotechnical Commission, which is headquartered in Geneva, Switzerland, writes and distributes standards on electrical products and components. Standards include reference to safety and performance. The IEC does not perform any testing; this function is left to the national testing agencies. National standards are frequently based on IEC publications.

**IECQ:** A new international quality approval based on IEC Specifications. Started Nov., 1981 in Europe and Jan., 1982 in USA. Expected to take at least 10 years to become a significant factor.

**IEC 65:** This IEC publication is titled "Safety Requirements for Mains Operated Electronic and Related Apparatus for Household and Similar General Use."

**IEC 68-2-6:** IEC 68 concerns basic environmental testing procedures.

**IEC 131:** IEC 131 and supplements cover standards for switches.

**IEC 328:** IEC 328 covers switches for appliances.

**IEC 348:** IEC publication 348 is titled "Safety Requirements for Electronic Measuring Apparatus."

**IEC 435:** IEC publication 435 is titled "Safety of Data Processing Equipment."

**IEC 512:** IEC 512 concerns basic testing procedures for electronic components.

**IMQ:** The Istituto Italiano del Marchio di Qualità is the national testing/quality agency in Italy.

**JETL:** The Japan Electrical Testing Laboratory.

**KEMA:** KEMA is the national test agency of the Netherlands. Their test mark is "KEMA KEUR."

**NEMKO:** NEMKO is the national testing agency of Norway.

**SAA:** The Standards Authority of Australia writes standards for Australia. It does not perform any testing.

**SECV:** The State Electrical Commission of Victoria is one of the state testing agencies of Australia.

**SEMKO:** SEMKO is the national testing agency of Sweden.

**SEV:** Schweizerischer Elektrotechnischer Verein is the national testing agency of Switzerland.

**SEV 1005:** The SEV standard for switches.

**UL:** The Underwriters Laboratory is a third-party testing institution in the United States with headquarters at Northbrook, Illinois, and testing facilities at Chicago, IL; Santa Clara, CA; Melville, NY; and Tampa, FL.

**UL 1054:** The Underwriters Laboratory standard for switches.

**UTE:** The Union Technique L'Électricité is responsible for product specifications and standards in France.

*NFC 61-120:* The NFC standard for switches.

*NFC* is the approval granted in France.

**VDE:** The Verband Deutscher Elektrotechniker is the national safety and testing agency of West Germany. VDE is generally recognized as the most stringent of all safety/testing agencies.

**VDE 0630:** The VDE standard for switches.

<sup>1</sup> See page VI for a description of approval marks and their respective testing agencies.