Eaton IEC control product training

Powering Business Worldwide

IEC control offering

XT series
EMS series
XTSE series
New products

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XT purpose

The main purpose of the *XT* line is to control and protect motors in applications like:

Compressors

HVAC

Machine Tools

Conveyors

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XT advantage

- The *XT* line of IEC power control offers starting and protection solutions ideal for control panels
- Innovations in the design and development allow users to reduce material costs, reduce installation effort, and enhance panel safety and performance all in a compact design
- The *XT* line includes a large offering of power control components and accessories that cover a broad range of applications and ratings

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IEC & NEMA

The International Electro-Technical Commission

- Founded in 1906
- Standard in the rest of the world; increasing in the US
- Most standards require routine productions tests
- Specify mechanical lifespan
- Required for European compliance

Common factors

- Self-certified by manufacturer
- Do not conduct 3rd party compliance investigations
- Applications do not differ

The National Electrical Manufacturers Association

- Founded in 1926
- US, Canada and “US-influenced” regions
- No requirements for production quality control program
- No lifespan requirements

NEMA customers are transitioning to IEC to compete globally

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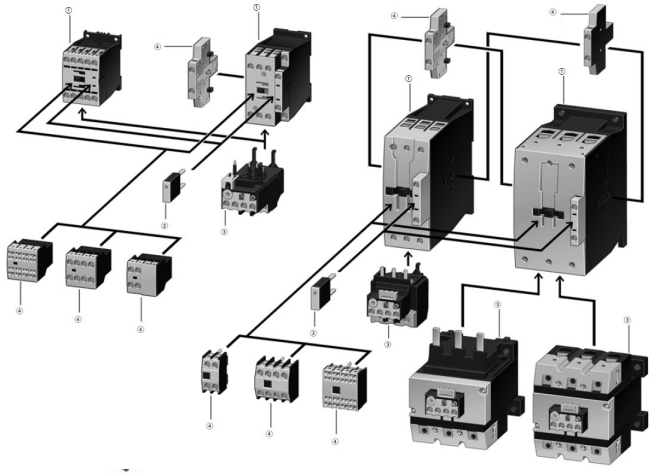
XT contactor overview

A	B	C	D	F-G	H	L	M	N	P	R
9A	15A	32A	72A	170A	225A	300A	570A	1000A	1400A	2600A

- To 2600A AC-3 and 3185A AC-1
- Double box terminals
- Smaller size – same for AC and DC
- Tool-less reversing and accessories
- Functional safety features in standard design
- Efficient coil design
- Integrated suppressor circuit
- Accessories



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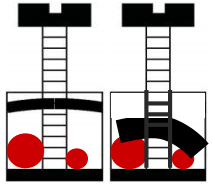
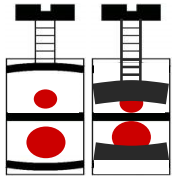
Reliable terminal connections

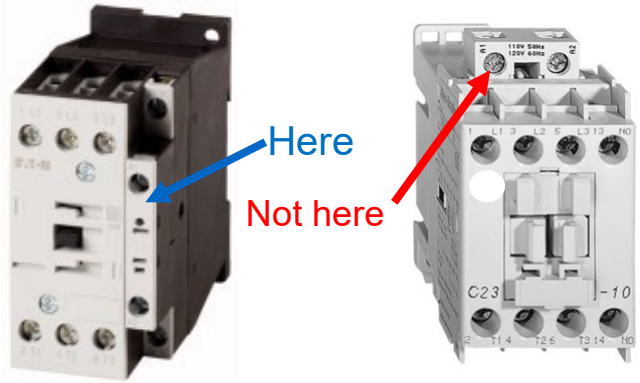
- All power screw terminals have double box design
- Allows termination of two dissimilar wires
- Auxiliary AND coil terminations on the front of the contactor



Traditional saddle clamp



Top/Bottom Chamber Terminal



- Avoid over-sizing wires
- Reduce labor involved with wiring/re-wiring coil
- Quickly and safely check voltage at coil

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Built-in surge suppression

- Built-in DC coil surge suppressor:
  - **Eliminates extra part numbers**
  - **Eliminates extra costs**
  - **Reduces overall depth**
- Eliminates voltage transients caused by the switching of a DC coil
- Protects sensitive equipment on 24VDC bus (PLC, OI, digital inputs…)

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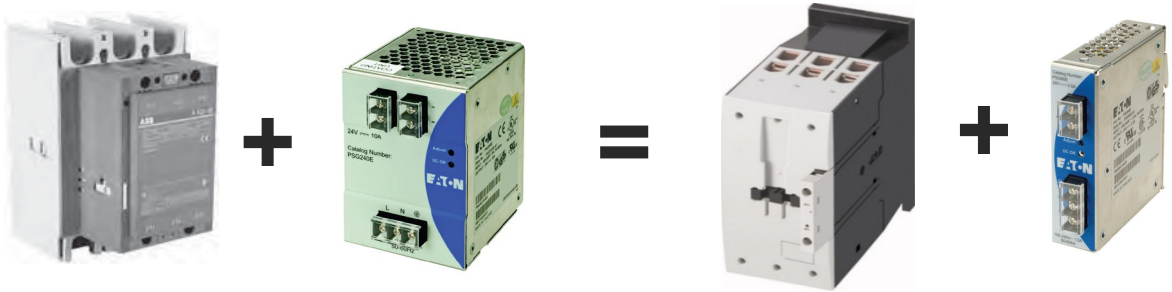
Efficient coil design



- Saves panel space and cost, increases efficiency
- Efficiency advantage comes from modern magnet design and electronic assistance
- Allows for reductions in CPT or power supply size
- Reduced size of DC coil (same size as AC)

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Tool-free assembly

- B frame MMP + C frame contactor = Combination Motor Controller
  - **No tools, 8.5 secs**
  - **Replaces 3 power wires**
  - **Mounts on single DIN rail**
- Connection link for MMP + C or D frame contactors
- B frame mechanically and electrically interlocked reversing contactor
  - **No tools, 17.8 secs**
  - **Replaces 6 power wires**
  - **Replaces 3 control wires**

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Mechanical interlock

XTCE007 – XTCE0015
XTRE

XTCEXMLB

XTCE017 – XTCE170

XTCEXML..

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Reversing wiring kits

XTCE007 – XTCE015

+

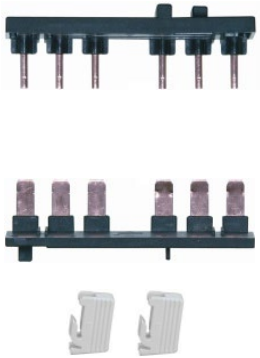
XTCEXRLB

=

XTCE018 – XTCE038

+

XTCEXRLC
XTCEXRLD



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Combination Motor Controller (CMC)

XTPR/XTPE(B frame)
XTPR/XTPE (D frame)

XTCE018 – XTCE032
XTCE040 – XTCE065

+

XTPAXLSA
XTPAXIP2X
XTPAXLSAD

XTPAXTPCC
XTPAXTPCD

=

XTSC/XTFCE/XTFC....

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Reversing CMC to 7.5Hp @480V, 12A

XTPR

XTCE007 – XTCE015

+

XTPAXTPCRB

=

XTSR012BB..

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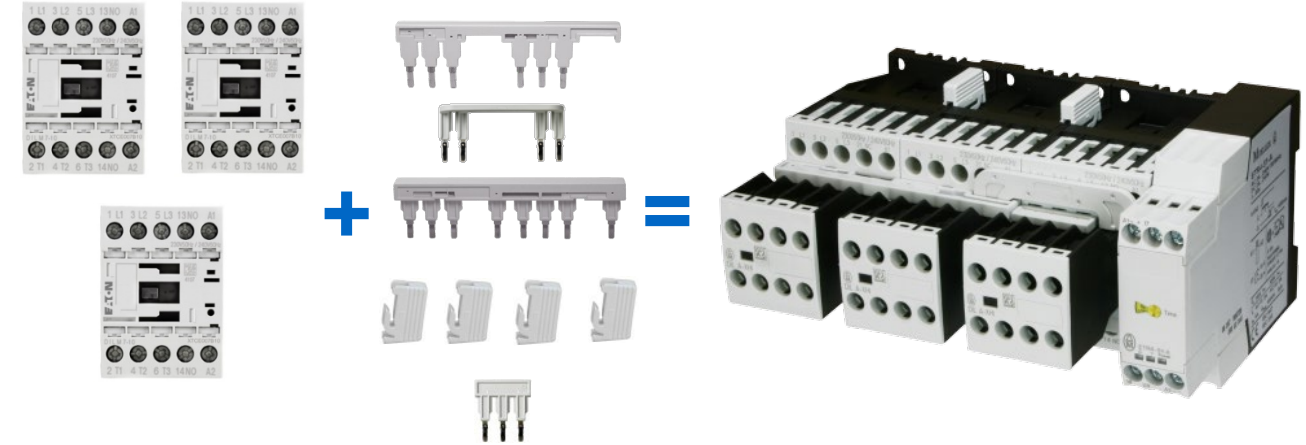
Star delta to 15A

XTCE007 – XTCE015

XTCEXSDLB



Star delta to 50 Hp

XTCE018 – XTCE38
XTCE040 – XTCE072

XTCEXSDLC
XTCEXSDLD

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XT overload relays

Frame:	A	B	C	D	F-G	L	M - R
Thermal:							
	12A	16A	32A	75A	175A	250A	630A
Electronic:							
		20A	45A	100A	175A	1600A	

- Overload relays monitor for a high temperature in the motor/pump and use a NC auxiliary to switch off the main contactor
- Adjustable
  - Thermal overloads have a 1:1.6 setting range
  - Electronic overloads have a 1:5 setting range
- Available as stand alone or direct contactor mount

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XT Manual Motor Protectors (MMP)

B Pushbutton Thermal 25A

B Rotary Thermal 32A

B Rotary Electronic 32A

D Rotary Thermal 65A

D Rotary Electronic 65A

- Manual Motor Protectors (MMP) provide overload and short circuit protection - specifically designed to provide all of the protection needed for a motor
- Pushbutton and rotary, thermal and electronic versions available
- **Lockable handle standard**
- Can be used to directly control a motor if remote operation is not needed
- Fun fact: Eaton (Moeller) designed the first MMP in 1926

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XT electronic MMP

- Electronic trip
  - Reduced heating
  - Increased accuracy
  - Wide range flexibility
- Selectable trip class
- Interchangeable trip units
- Common accessories with thermal MMP (XTPR)
- Read out current and trip information via SmartWire-DT

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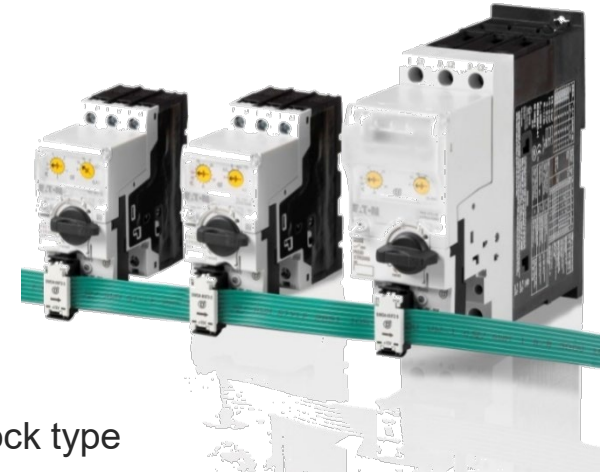
XT electronic MMP with SmartWire-DT

- Pumping applications
  - In combination with contactor, allows remote shut off before trip
- Features
  - Status information (ON/OFF)
  - Motor current of the highest phase [%]
  - Thermal image[%],
  - Phase currents (L1, L2, L3) [%]
  - Trip reasons (overload, short circuit)
  - Settings: short circuit, overload current, trip block type
  - Remote trip



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XT DC contactor advantage

- Industry leading life
  - 150k operations compared to leading competition at 25k electrical operations
  - Reduces cost of labor and contact replacement
  - Hybrid switch technology enables nearly arc-free switching, also runs cooler and reduces arc flash potential
- 1000Vdc 300A - 600A electronic coils
  - Control power input 24Vdc, 110-250AC, -350DC (one coil)
  - -40 °C to +70 °C

Standard

	B Frame	C Frame	D Frame	F Frame
AC Pick-Up Power	24 VA	52 VA	149 VA	310 VA/180 VA
DC Pick-Up Power	3 W/4.5 W	12 W	24 W	90 W/149 W
AC Sealing Consumption	3.4 VA 1.2 W	7.1 VA 2.1 W	16 VA 4.3 W	26 VA/3.1 VA 5.8 W/2.1 W
DC Sealing Consumption	3 W/4.5 W	0.5 W	0.5 W	1.3 W/2.1 W

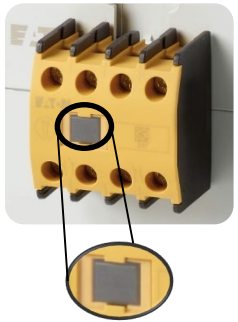
Powering Business Worldwide

XT safety contactors

- Safe status monitoring window
- Yellow (RAL1004) safety auxiliary contact
- Mirror and interlocking opposing contacts in line with IEC 60947-5-1 Annex L and IEC 60947-4-1 Annex F
- SUVA Certified
- Rated for highest safety circuits (Cat 4, PL e, SIL 3)
- Integrated contactor & auxiliary contact design
- Compatible with standard XT accessories

Certifications

XT safety contactors



Clear inspection window

Prevents manual activation & provides safe status monitoring

Safety characteristics	Level				
Cat	B	1	2	3	4
PL	a	b	c	d	e
SIL	1	2	3		

Type	(switching cycles)	(switching cycles)
XTSE007B-012B	1,782,229	1,336,672
XTSE018C-032C	966,617	724,963
XTSE040D-065D	1,341,161	1,005,871
XTSE080F-095F	1,058,707	772,856
XTSE115G-150G	1,705,268	1,278,856

Rated for highest safety characteristics

> Up to category 4, PL e, SIL 3

> IEC 60947-5-1, Annex L – Interlocking opposing contacts

>IEC 60947-4-1, Annex F – Mirror contacts

suva

SUVA certified

Third-party safety agency approval

Integrated front-mounted auxiliary contacts

All-in-one encompassing design

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XT safety contactors

Offering scope:

Frame size: B to G

AC-3 current rating: 7 to 150A

Horsepower:

3 to 125hp

Aux contact options:

- A (110V50Hz, 120V60Hz)
- TD (24VDC)

B Frame

7A to 12A

C Frame

18A to 32A

D Frame

40A to 65A

F&G Frame

80A to 150A

Powering Business Worldwide

EMS Electronic Motor Starters

- Compact and efficient
  - 30mm wide supports; direct, reversing, & SIL 3 E-stop functionality
  - Push in terminals reduce install time
- Ideal for small loads
  - 0.5 – 3Hp, 5Hp(SWD), @480V, 0.18 – 9A
  - 24Vdc control power or SWD
  - Conveyor, packaging, etc
- Pro-active monitoring reduces failures
  - Real-time diagnostics/control (SmartWire-DT)
  - Advanced warnings
  - Easy troubleshooting

Replaced by EMS2
Will retire mid 2021

Powering Business Worldwide

EMS2 Electronic Motor Starters

New product

Provides connectivity and reduced installation costs combined with integrated functions:

- 100% compatible with existing systems
  - Smaller footprint of 22.5mm
- IoT ready data transparency
  - With SmartWire-DT communication version
- Integrated motor protection
  - With thermal motor memory
- Enhanced features
  - Integrated fuses version and direct connector for Feeder System (MSFS)
- Improved handling
  - Flexibility using push-in or screw

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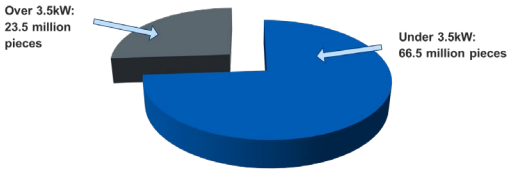
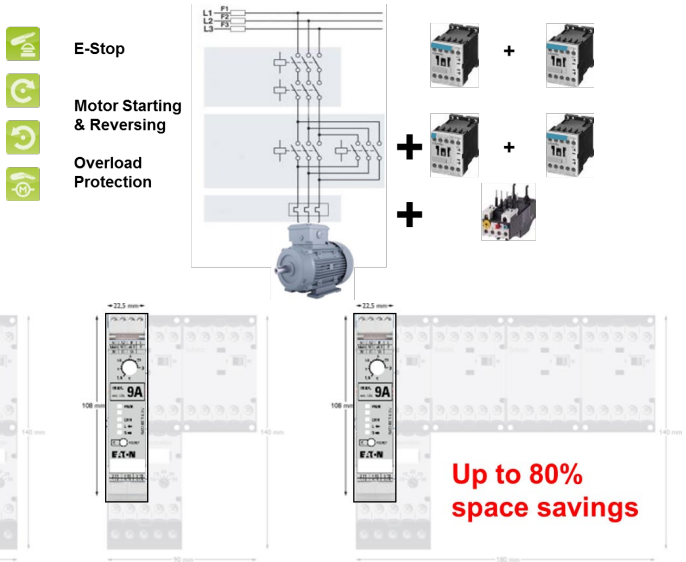
EMS advantages and story

Small motors rule the volume



- 90 million new asynchronous motors per year world wide
- 75% fall into the size that can be handled by the EMS

Space in the panel is at a premium



- Replace up to 4 devices with 1
- 22.5 mm wide

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EMS2 Electronic Motor Starters

New product

Target customer segment

- Machine builder: production machines, tooling machines, packaging machines
- Logistics, conveyor control
- Applications: high switching frequency, high amount of reversing starters, small cabinet dimensions
- Assemblies: usage as decentralized enclosed motor starter
- EWS, panel builder

Identified & quantified benefits

- Time effort for installation and wiring is shortened by up to 80% (push-in terminals, substitution of switchgear assemblies, substitution of control wiring)
- Up to 80% reduction of hardware components and elimination of two digital inputs and two digital outputs
- Less replacement cost due to high life span with 30 million switching cycles, 10 times higher life span than electro-mechanical contactors

EMS2

- **EMS2:** electronic motor starter, direct and reverse control, motor protection, emergency stop option
- **EMS2-SWD:** control and transfer process and relevant data via SmartWire-DT
- **EMS2-ROSF: i**ntegrated fuses, direct contection to Feeder System (MSFS)

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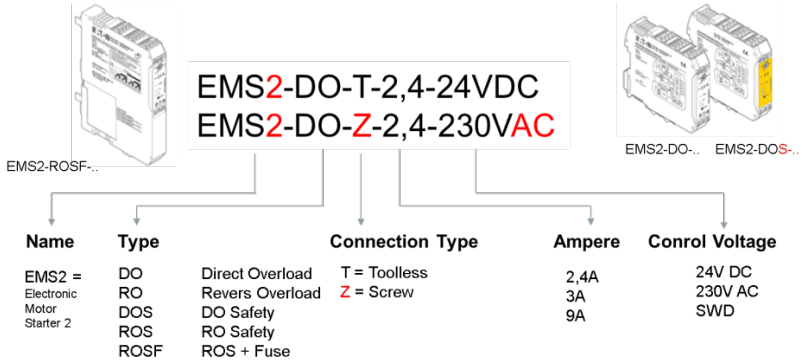
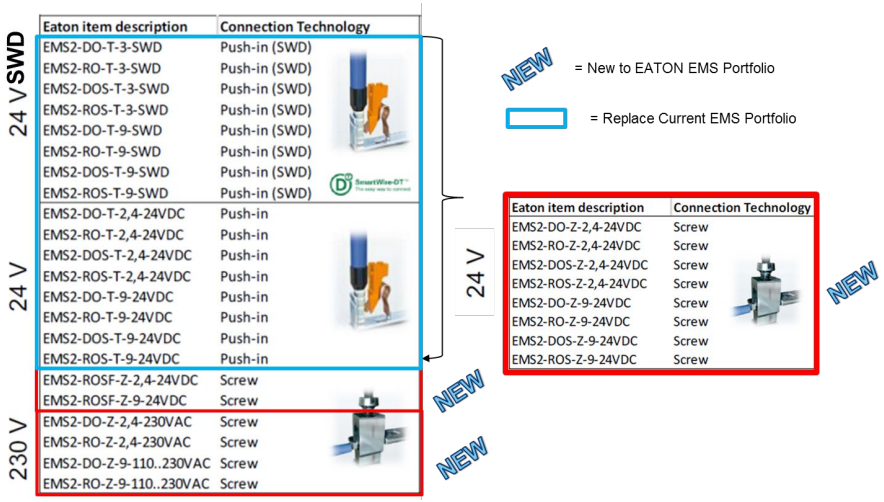
EMS2 offering



- All current EMS catalog in EMS2 offering
- New to EMS2:
  - Screw terminal option
  - AC version
  - Fuse version
  - 3A version



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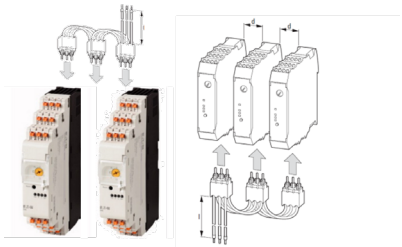
Key differences between EMS and EMS2

Smaller Footprint

- Current EMS 30 mm wide
- EMS2 22.5 mm wide
- Current EMS 147 mm tall
- EMS2 108 mm tall
- More compact

Terminal Layout



- Current EMS in feed on top
- EMS2 in feed on bottom
- Current EMS SWD port on front
- EMS2 SWD port on top

On-Board Fuse Option

- Ultrafast acting fuses integrated
- Increased system availability
- Quick restart after short-circuit

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B frame to B frame CMC link module

New product

Current solution

EMEA Cat: PKZM0-XDM12

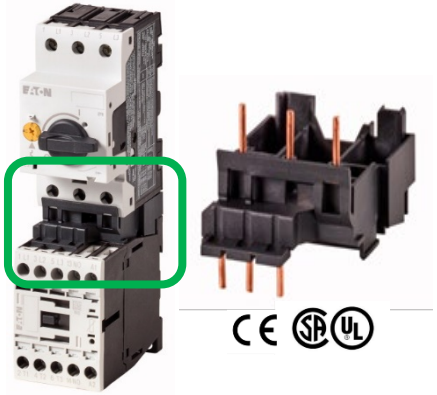
US Cat: XTPAXTPCB

Style: MSAC283149

- Pluggable, tool-free
- Multi-part
- Separate electrical and mechanical connections
- Screw and spring terminal compatible

Continuous Offering

New solution



EMEA Cat: PKZM0-XDM-15ME

US Cat: XTPAXEMCB

Style: MSAA179646

- Compact
- Single part electro-mechanical connection
- Screw terminal only

Powering Business Worldwide

B frame to C frame CMC link module

New product

Current solution

EMEA Cat: PKZM0-XDM32DE

US Cat: XTPAXTPCC

Style: MSAA283153

- Multi-part
- Separate electrical and mechanical connections
- Screw and spring terminal compatible

Kit Will Retire
Date: TBD

New solution

EMEA Cat: PKZM0-XDM32ME

US Cat: XTPAXEMCC

Style: MSAA190312

- Compact
- Single part electro-mechanical connection
- Screw terminal only

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IEC utilization categories & applications

A combination of specified requirements relating to the condition in which the switching device or fuse fulfills its purpose and selected to represent a characteristic group of applications.

- AC-1: Non-inductive or slightly inductive loads, resistance furnaces
- AC-3: Squirrel cage motors: starting, switching off motors during running
- DC-1: Non-inductive or slightly inductive loads, resistance furnaces
- DC-3: Shunt-motors: starting, plugging, inching, dynamic breaking of motors

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XT product label

EMEA Catalog – how the world buys

US Catalog – how the US buys & markets

US Style Number – how the US stocks

Product selection – contactors, starters

XT CE C 007 B 01 AD P16

Designation
XT = XT line of IEC control

Type
CE = Three-pole FVNR IEC contactor
CS = Three-pole FVNR S Series IEC contactor
CF = Four-pole FVNR IEC contactor
CR = Three-pole FVR IEC contactor
CC = IEC capacitor contactor
AE = FVNR IEC starter
AS = FVNR S-Series IEC starter
AR = FVR IEC starter

Terminations
Blank = Screw terminals (6–65A); 5 mm (80–150A); no lugs (185–2000A)
C = Spring cage terminals consult local sales office for availability

Current Ratings, AC-3

007 = 7A	080 = 80A	570 = 570A
009 = 9A	095 = 95A	580 = 580A
012 = 12A	115= 115A	650 = 650A
015 = 15A	150 = 150A	750 = 750A
018 = 18A	170 = 170A	820 = 820A
025 = 25A	185 = 185A	C10 = 1000A
032 = 32A	225 = 225A	C14 = 1400A, AC-1
040 = 40A	250 = 250A	C16 = 1600A, AC-3
050 = 50A	300 = 300A	C20 = 2000A, AC-1
065 = 65A	400 = 400A	
072 = 72A	500 = 500A	

Frame Size Designation

B = 45 mm	L = 140 mm
C = 45 mm	M = 160 mm
D = 55 mm	N = 250 mm
F = 90 mm	P = 260 mm
G = 90 mm	R = 515 mm
H = 140 mm	

Built-In Auxiliary Contact
01 = 1NC
10 = 1NO
00 = 0NO–0NC
S1 = 1NO–1NC side-mount auxiliary
11 = 1NO–1NC top-mount auxiliary
22 = 2NO–2NC

Coil Codes
See Page V5-T1-53.

XTAE, XTAS and XTAR Starters Only—Maximum Overload Relay

XTOB Maximum Overload Rating

Frame B		Frame D	
P16	= 0.1–0.16A	010	= 6–10A
P24	= 0.16–0.24A	016	= 10–16A
P40	= 0.24–0.4A	024	= 16–24A
P60	= 0.4–0.6A	040	= 24–40A
001	= 0.6–1A	057	= 40–57A
1P6	= 1.0–1.6A	065	= 50–65A
2P4	= 1.6–2.4A	075	= 65–75A
004	= 2.4–4A		
006	= 4–6A	Frame F	
010	= 6–10A	035	= 25–35A
012	= 9–12A	050	= 35–50A
016	= 12–16A	070	= 50–70A
		100	= 70–100A
Frame C			
P16	= 0.1–0.16A	Frame G	
P24	= 0.16–0.24A	035	= 25–35A
P40	= 0.24–0.4A	050	= 35–50A
P60	= 0.4–0.6A	070	= 50–70A
001	= 0.6–1A	100	= 70–100A
1P6	= 1.0–1.6A	125	= 95–125A
2P4	= 1.6–2.4A	150	= 120–150A
004	= 2.4–4A	175	= 145–175A
006	= 4–6A		
010	= 6–10A	Frame L	
016	= 10–16A	070	= 50–70A
024	= 16–24A	100	= 70–100A
032	= 24–32A	125	= 95–125A
		160	= 120–160A
		220	= 160–220A
		250	= 200–250A

XTOE Maximum Overload Rating

	Standard Type Suffix	Ground Fault Type Suffix
Frame B		
0.33–1.65A	5E1P6	5G1P6
1–5A	5E005	5G005
4–20A	5E020	5G020
Frame C		
0.33–1.65A	5E1P6	5G1P6
1–5A	5E005	5G005
4–20A	5E020	5G020
9–45A	5E045	5G045
Frame D		
9–45A	5E045	5G045
20–100A	5E100	5G100
Frame F, G		
20–100A	5E100	5G100
Frame G, H		
35–175A	5E175	5G175

Magnet Coil Suffix

Coil Voltage	Suffix Code
Frames A–B	
110V 50 Hz, 120V 60 Hz	A
220V 50 Hz, 240V 60 Hz	B
230V 50 Hz	F
24V 50/60 Hz	T
24 Vdc	TD
415V 50 Hz, 480V 60 Hz	C
600V 60 Hz	D
208V 60 Hz	E
190V 50 Hz, 220V 60 Hz	G
240V 50 Hz, 277V 60 Hz	H
380V 50 Hz, 440V 60 Hz	L
400V 50 Hz	N
380V 60 Hz	P
12V 50/60 Hz	R
42V 50 Hz, 48V 60 Hz	W
48V 50 Hz	Y
120 Vdc	AD
220 Vdc	BD
12 Vdc	RD
48 Vdc	WD

Coil Voltage	Suffix Code
Frames C–F	
110V 50 Hz, 120V 60 Hz	A
220V 50 Hz, 240V 60 Hz	B
230V 50 Hz	F
24V 50/60 Hz	T
24–27 Vdc	TD
415V 50 Hz, 480V 60 Hz	C
600V 60 Hz	D
208V 60 Hz	E
190V 50 Hz, 220V 60 Hz	G
240V 50 Hz, 277V 60 Hz	H
380V 50 Hz, 440V 60 Hz	L
400V 50 Hz	N
380V 60 Hz	P
12V 50/60 Hz	R
42V 50 Hz, 48V 60 Hz	W
48V 50 Hz	Y
110–130 Vdc	AD
200–240 Vdc	BD
48–60 Vdc	WD

Coil Voltage	Suffix Code
Frame G	
100–120V 50/60 Hz	A
190–240V 50/60 Hz	B
24V 50/60 Hz	T
24–27 Vdc	TD
480–500V 50/60 Hz	C
380–440V 50/60 Hz	L
42–48V 50/60 Hz	W
110–130 Vdc	AD
200–240 Vdc	BD
48–60 Vdc	WD
Frame H	
100–120V 50/60 Hz	A
190–240V 50/60 Hz	B
480–500V 50/60 Hz	C
380–440V 50/60 Hz	L
24V 50/60Hz	T
42–48V 50/60Hz	W
110–130 Vdc	AD
200–240 Vdc	BD
24–27 Vdc	TD
48–60 Vdc	WD

Coil Voltage	Suffix Code
Frames L–N	
110–250 Vdc 40–60 Hz	A
250–500V 40–60 Hz	C
48–110 Vdc 40–60 Hz	Y
24–48 Vdc	TD ④
Frames L–M, S-Series	
110–120V 50/60 Hz	A
220–240V 50/60 Hz	B
Frames P–R	
230–250 Vdc 50–60 Hz	B

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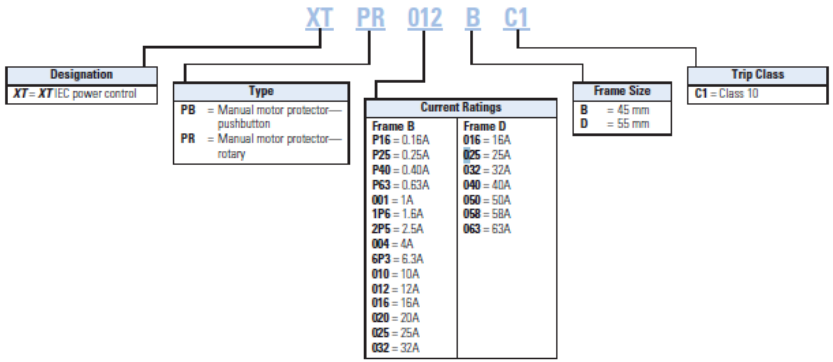
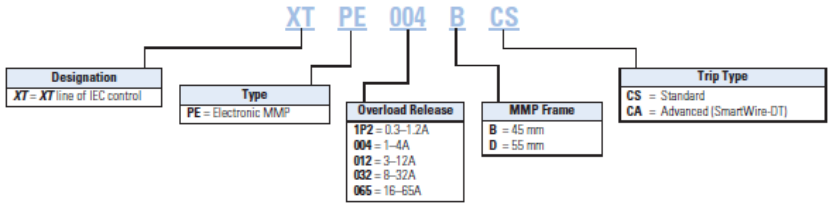
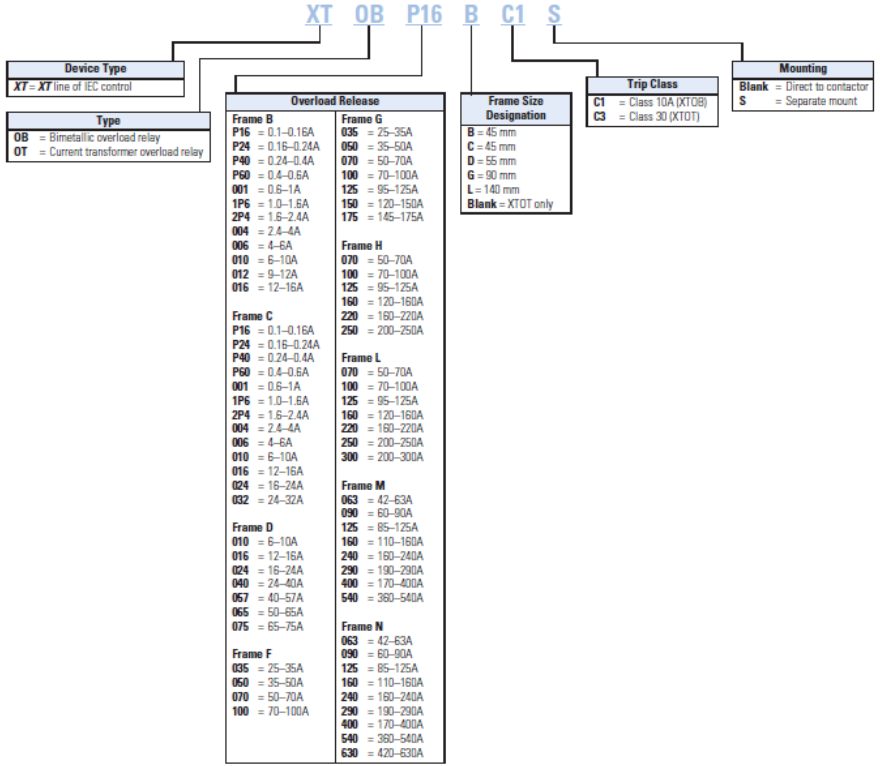
Product selection – MMP, overload







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