



Options & Accessories

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Power Accessories

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ONE SOURCE

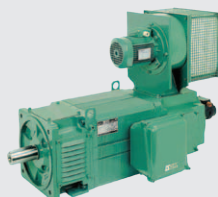
Motion & Motor Products

In addition to the options and accessories detailed in this brochure, Control Techniques can provide a wide range of drive system peripherals through its One Source program. Products offered include AC Motors, DC Motors, Servo Motors, Actuators and Reducers. These world class products are available when purchasing a matched Emerson drive.

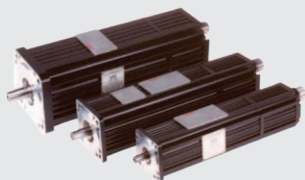
To view the latest offering please visit
www.controltechniques.com



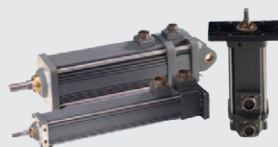
AC Motors



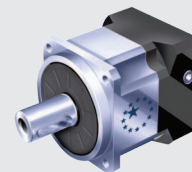
DC Motors



Servo Motors



Actuators



Reducers

Operator Interfaces

Remote-Mount Drive Keypads

The following operator interfaces can be remote mounted from the drive and provide full drive parameter access. The keypads can be mounted up to 100ft (30m) from the drive.

Order Code	Display Type	Drives
SY-KEYPAD-REMOTE	LED, NEMA12 (IP65)	Commander SK
SM-KEYPAD-PLUS	LCD, NEMA12 (IP54)	Commander SK, Unidrive SP, Digitax ST
MP-KEYPAD		Mentor MP, Quantum MP

SK-Keypad Remote

With a bright 7-digit, 7-segment LED display, the SK-Keypad Remote comes with standard drive control pushbuttons plus a multifunction button that can be used to control any drive bit parameter or PLC program register to create custom control functionality. The multifunction button also has the following presets: Forward/Reverse Toggle, Run Reverse, Jog and Hands-off-automatic.



SM-Keypad Plus and MP-Keypad

These keypads provide a back-lit LCD display with standard drive control pushbuttons plus a parameter help button.

Multiple languages are supported including Spanish and French. Customized text is possible with optional text editing software. A browsing filter is built in for rapid viewing of your choice of up to 50 parameters.



Operator Interfaces

CTVue — Graphical Human Machine Interface

Control Techniques offers a complete range of HMI (Human Machine Interface) display panels. CTVue Configurator software is FREE and makes programming these HMIs quick and intuitive. The CTVue Configurator software includes built-in communication drivers and predefined drive parameters to speed integration with all the Control Techniques drive lines. The broad hardware offering also ensures there is a CTVue HMI that balances price and functionality.

The 4.3-inch CTVue 304K is designed for applications in which available mounting space is at a premium. The smallest touchscreen in the CTVue family, just over 5 inches wide and 4 inches tall, the 304K boasts a bright TFT (thin film transistor) display with full 256-color support.

Additional small and economical displays are the 303L and 303M and offer a 3-inch monochrome graphical LCD display. The 303L is the low-cost choice with one RS485 port. The 303M is full featured with one Ethernet, one RS485 and two RS232 ports.

For medium-size displays, the 306M/A and 308A graphical touchscreens provide larger screens for enhanced display of graphics. The 306 and 308 versions include Ethernet, one RS485 and two RS232 ports and are available with color or monochrome graphical display.

For large displays, the 310C and 315C graphical color touchscreens provide the most graphical display area while offering all the connectivity and features of the 306 and 308 series plus a USB host port and option for an additional Ethernet port. Super-bright NEMA 4X outdoor versions are also available - 303S, 306MS and 310S.

All of the CTVue HMIs, except the CTVue 304K, have a Compact Flash port which allows for storage and transfer of data from a variety of external data sources using a standard Compact Flash card (not included).

Key Features

- Integrated Control Techniques drivers
- Remote web and FTP access (units with Ethernet ports)
- Powerful protocol converter
- USB programming port (except model 304K)
- Alarming and data logging
- Bright TFT color display offerings
- Free programming software
- Simple-to-use software
- Flexible Compact Flash slot (except model 304K)
- Security user levels/passwords
- Available front faceplate customization
- Large 2/4/8MB onboard flash memory
- For use in hazardous locations
- 24V operation

CTVUE-304K



- 4.3-inch graphical touchscreen
- TFT display, 480 x 272, 256 color
- RS485 and RS232 port
- 2MB onboard flash memory

CTVUE-303L/M/S



- 3-inch, 128 x 64, LCD display
- Ethernet (M), RS485, and RS232 (L) port, outdoor version available (S)
- 8 x customizable function keys
- Compact Flash slot
- 4MB non-volatile flash memory

CTVUE-306M/A/MS



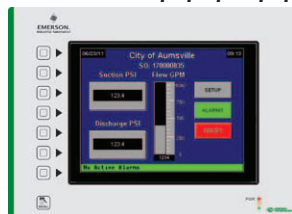
- 5.7-inch graphic touchscreen
- TFT (A) - 320 x 240, 256 color
- LCD (M) 320 x 240, monochrome
- Ethernet, RS485 and RS232 port
- Compact Flash slot
- 4/8MB onboard flash memory
- Four programmable soft keys

CTVUE-308A/E



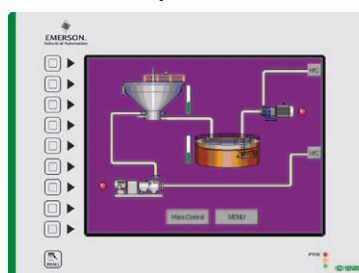
- 8.4-inch graphic touchscreen
- (1) Ethernet, (RS485), (isolated RS232 port)
- Compact Flash slot
- 8MB onboard flash memory
- Six programmable soft keys
- USB host port
- 640 x 480, TFT 32k color

CTVUE-310C/E/R/RE/S/SE



- 10.4in graphic color touchscreen
- 640 x 480, TFT 32k colors
- Compact Flash slot
- 8MB onboard flash memory
- Outdoor version available upon request
- USB host port
- (1) Ethernet port
- (2) RS232, isolated RS485 ports

CTVUE-315C/E



When mounted using the supplied gasket, all panels have a rating of IP66 or NEMA 4X.

- 15in graphic color touchscreen
- 1024 x 768, TFT 32k colors
- Ethernet, (2) isolated RS485, and (2) isolated RS232 ports
- Compact Flash slot
- 32MB onboard flash memory
- USB host port

CTVue Order Codes

Order Code	Description	Dimension (in) (HxWxD)
CTVUE-304K	4.3" TFT 256 color touchscreen 480 x 272 - RS232, RS485	5 x 4 x 1.5
CTVUE-303L	3" LCD monochrome 128 x 64 - 1 x RS485	5.85 x 7.45 x 2.1
CTVUE-303M	3" LCD monochrome 128 x 64 - Ethernet, RS485, RS232, Compact Flash	
CTVUE-303S	3" LCD monochrome 128 x 64 - Ethernet, RS485, RS232, Compact Flash (with UV protection for outdoor use)	
CTVUE-306M	5.7" LCD monochrome touchscreen 320 x 240 - Ethernet, RS485, RS232	7.08 x 8.83 x 2.3
CTVUE-306A	5.7" TFT 256 color touchscreen 320 x 240 - Ethernet, RS485, RS232	
CTVUE-306MS	5.7" LCD monochrome touchscreen 320 x 240 - Ethernet, RS485, RS232 (with UV protection)	
CTVUE-308A	8.4" TFT 256 color touchscreen 640 x 480 - (1) Ethernet, isolated comms RS485, RS232	8.18 x 10.32 x 2.2
CTVUE-308E	8.4" TFT 256 color touchscreen 640 x 480 - (2) Ethernet, isolated comms RS485, RS232	
CTVUE-310C	10.4" TFT 32k color touchscreen 640 x 480 - Ethernet, isolated comms RS485, RS232	
CTVUE-310S	10.4" TFT 32k color touchscreen 640 x 480 - (1) Ethernet, isolated comms RS485, RS232 (with UV protection)	9.5 x 12.83 x 2.2
CTVUE-310E	10.4" TFT 32k color touchscreen 800 x 600 - (2) Ethernet, isolated comms RS485, RS232	
CTVUE-310R	10.4" TFT 32k color touchscreen 800 x 600 - (1) Ethernet, isolated comms RS485, RS232	
CTVUE-310RE	10.4" TFT 32k color touchscreen 800 x 600 - (2) Ethernet, isolated comms RS485, RS232	
CTVUE-310SE	10.4" TFT 32k color touchscreen 640 x 480 - (2) Ethernet, isolated comms RS485, RS232 (with UV protection)	
CTVUE-315C	15" TFT 32k color touchscreen 1024 x 768 - (1) Ethernet, RS485, RS232	13 x 16 x 2.8
CTVUE-315E	15" TFT 32k color touchscreen 1024 x 768 - (2) Ethernet, RS485, RS232	
CTVUE-CF1000	1 GB industrial Compact Flash memory	
CTVUE-CONFIG-CD	FREE programming software CD	
CTVUE-USB	Programming cable PC to CTVue	
CTVUE-EP-485-xxx*	Cable from CTVue to Epsilon EP, Unidrive SP or Commander SK	
CTVUE-MME-485-xxx*	Cable from CTVue to EN, Epsilon and MDS	
CTVUE-DC-485-xxx*	Cable from CTVue to Mentor MP or Quantum MP	
CTVUE-MC-485-xxx*	Cable from CTVue to MC Series	
CTVUE-RS00	RS232 / RS485 communications option card	
CTVUE-CN00	CANOpen communications option card	
CTVUE-PBDP	Profibus-DP communications option card	
CTVUE-DN00	DeviceNet communications option card	
CTVUE-SYK	Y-cable for convenient programming and testing	
CTVUE-ADK-485	DB9-pin connector to RJ45 adaptor (for use with CTVUE-xx-485 cables, xx = EP or DC or MME)	
CTVUE-USB-232	USB to RS232 converter cable (6ft) includes CTVUE-SYK cable	

* Standard cable lengths are 5, 15, 25ft (-005) (-015) (-025)



Easily create your customized machine interface with the FREE CTVue configurator software.

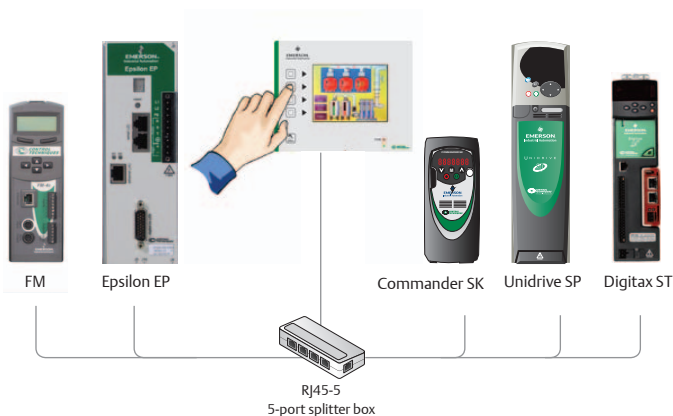
Operator Interfaces

CTVue Connectivity and Functionality

The CTVue touchscreens are easy to set up and connect to your application.

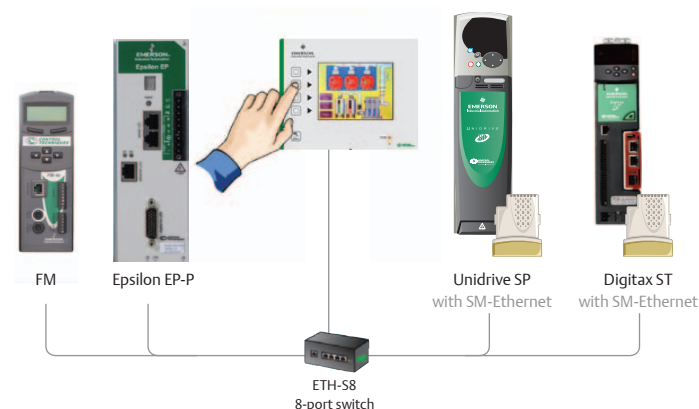
Connection to the Serial Port

The operator interface is connected directly to the RJ45 connection on the serial port. RS485 is a multi-drop protocol and may be connected to multiple drives if required.



Connecting via Ethernet

The Epsilon EP-P, FM-3/4E and SM-Ethernet Option Modules allow the operator interface to be connected to the drive using Modbus TCP/IP.



CTVue Specifications

Power Input	24Vdc
Temperature	32 to 122 °F (0 to 50 °C)
Environmental	IP66 / NEMA 4X
For use in hazardous locations:*	
Class I, Division 2, Groups A,B,C and D	
Class II, Division 2, Groups F and G	
Class III, Division 2	
Operating Humidity	80% relative maximum from 32 to 122 °F (0 to 50 °C)
* see website for individual data sheets	



Interconnect Components

Operator Interface Single-drop Cables



SK-Keypad Remote



SM-Keypad Plus



MP-Keypad



CTVUE-EP-485-xxx
RS485 cable; RJ45 to RJ45

CTVUE-MC-485-xxx
RS485 cable; Din8 to RJ45 connector

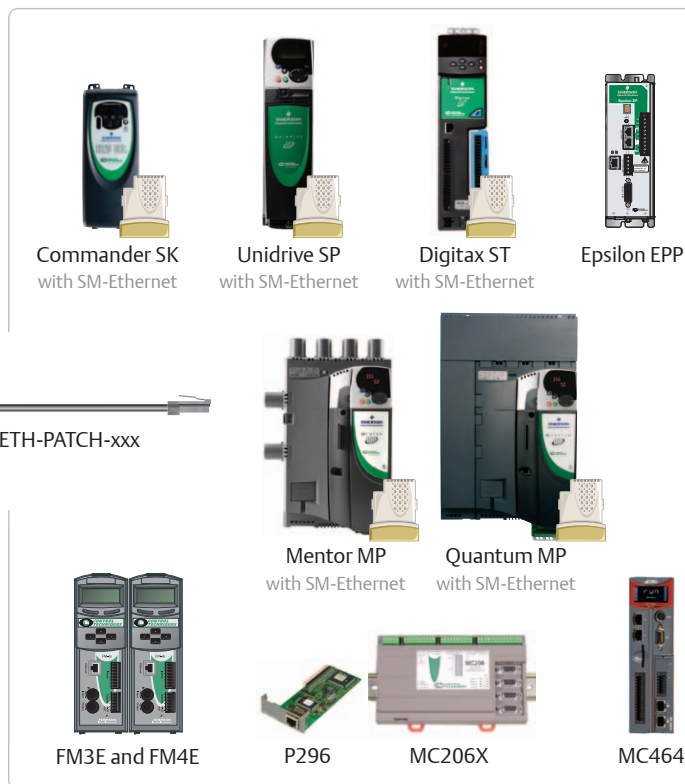
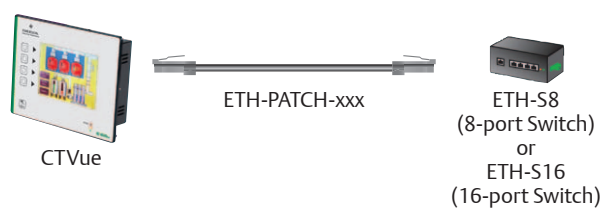
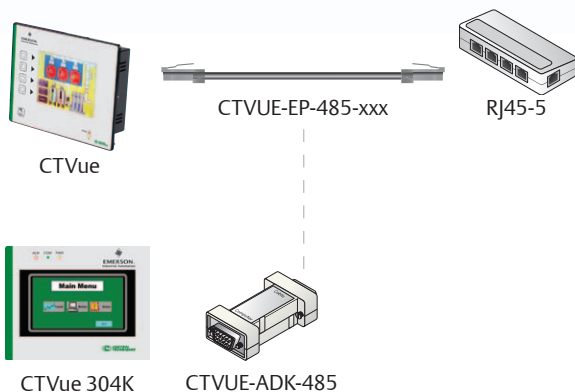
xxx = length in feet

CTVUE-ADK-485
RS485 DB9pin to RJ45 adaptor is used with the CTVUE-304K and appropriate drive RS485 cable

SP-LCD-485-xxx
RS485 cable with RJ45 connector on both ends for LCD Keypad and Unidrive SP

Interconnect Components

Operator Interface Multi-drop Cables



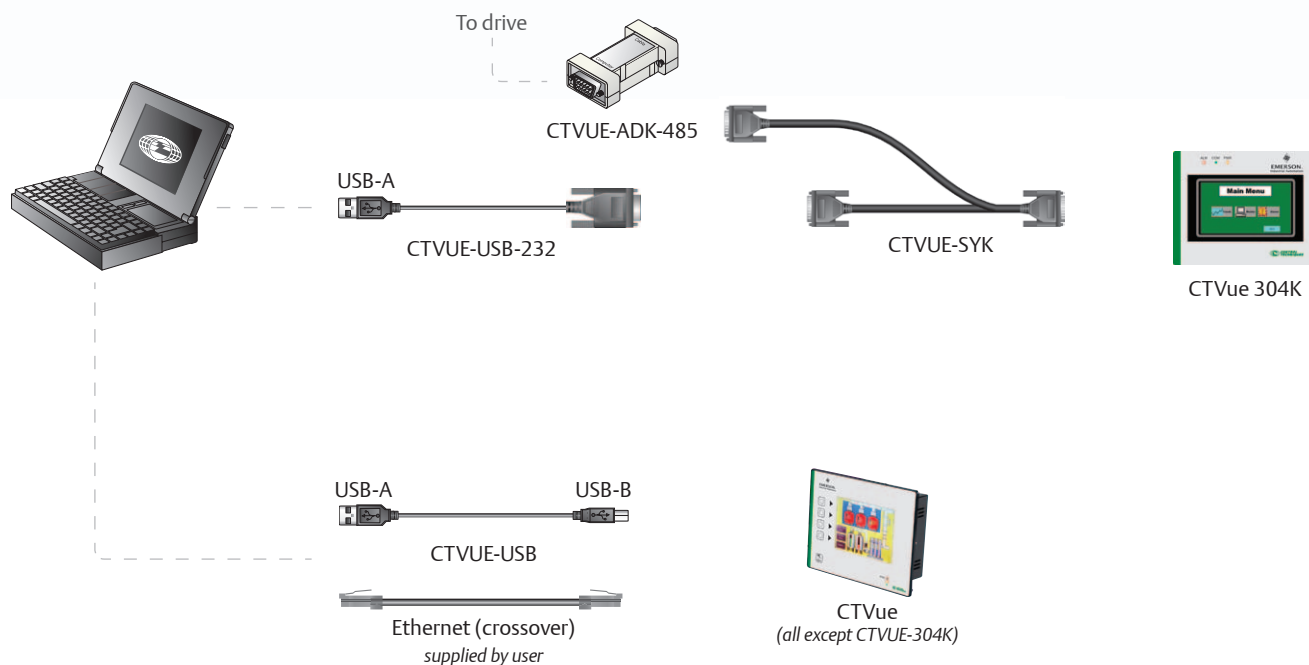
CTVUE-EP-485-xxx
RS485 cable; RJ45 to RJ45

SP-LCD-485-xxx
RS485 cable for multidrop; RJ45 connector on both ends

xxx = length in feet

ETH-PATCH-xxx
RS485 multidrop cable; wires dressed at both ends

Operator Interface Software Cables



CT-USB-CABLE

Connects the Modbus port on the drive (RS485) directly to the USB port on your PC; USB to RS485 conversion



CTVUE-USB

CTVue USB programming cable: USB Connectors on both ends; USB-A on drive side and USB-B on panel side



SP-LCD-485-xxx

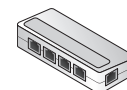
RS485 cable for multidrop: RJ45 connector on both ends



xxx = length in feet

RJ45-5

RJ45 Splitter; accepts one RJ45 connector of input and 4 RJ45 connectors for output



CTVUE-USB-232

USB to RS232 converter for programming CTVUE-304K; this order code includes CTVUE-SYK cable



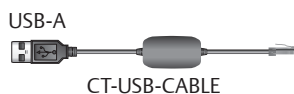
CTVUE-SYK

Serial port "Y" cable for convenient connection to CTVUE-304K, PC and drive when programming; not required for system installation



Interconnect Components

Software Interface Single-drop Cables



Commander SX
SXSoft



Commander SK
CTSoft
CTScope



Epsilon EP
PowerTools Pro



Unidrive SP
CTSoft
CTScope
SyPTLite
SyPTPro



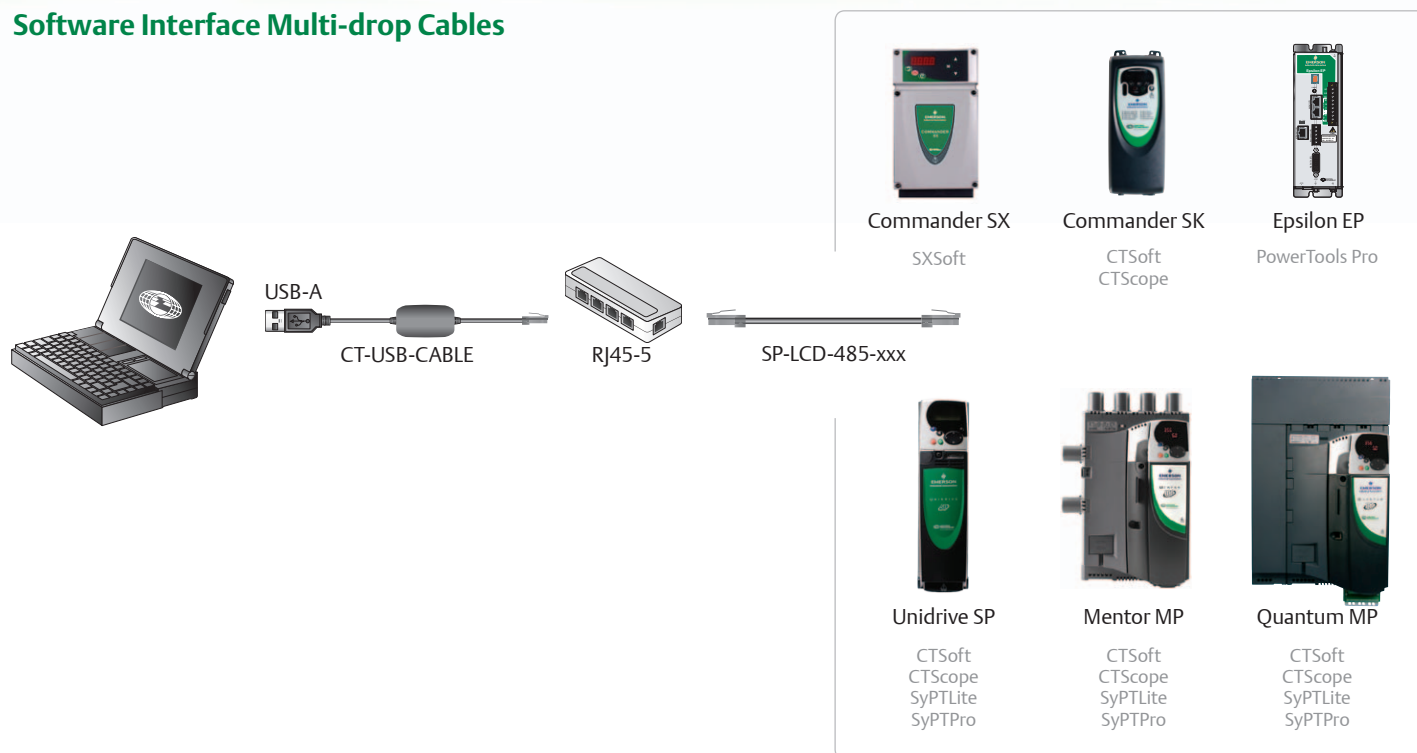
Mentor MP
CTSoft
CTScope
SyPTLite
SyPTPro



Quantum MP
CTSoft
CTScope
SyPTLite
SyPTPro



Software Interface Multi-drop Cables



Drive Integration with CTNet

Deterministic Distributed Control

Control Techniques' CTNet interface enables users to leverage the capabilities of the Unidrive SP, Digitax ST-P, Mentor MP and Quantum MP applications coprocessor modules, for real-time decentralized control. CTNet was developed specifically for highly dynamic applications, over trunk lengths generally exceeding 300ft, using proven Token Ring data link technology. CTNet is a "decentralized peer-to-peer" system (requiring no master PLC controller) with each intelligent node taking its turn to control the network and communicate directly, and in real-time, with other network nodes at data transfer rates of up to 5Mbits/sec. CTNet supports up to 255 nodes and provides an intelligent drive-oriented approach to systems integration based on decentralized control, universal communications and graphical software.

The Unidrive SP, Mentor MP, Quantum MP and Digitax ST-P drives provide a gateway to industrial networks such as Profibus-DP, Interbus-S, DeviceNet, Ethernet (EtherNet/IP, PROFINET, EtherCAT) and SERCOS using CTNet.

Drive	Option Modules	
Unidrive SP	SM-Application Plus	SM-Register
Mentor MP		
Quantum MP		
Digitax ST-P	Integrated	

Decentralized Drives Control Solution

CTNet is a comprehensive line of equipment enabling the design engineer to create high-performance and cost-effective decentralized drives control solutions.

CTNet fieldbus is a 5Mbit Token Ring network that supports peer-to-peer communications. Utilizing the field-proven ANSI/ATA 878.1 ARCNET standard as a foundation, CTNet includes a custom protocol stack that supports cyclic data and non-cyclic "one-shot" transactions. The CTNet fieldbus employs a transformer-isolated physical layer to allow use of a convenient, easy-to-install, two-wire shielded, non-polarized cable.

Cyclic data exchanges are pre-programmed block transfers (20 x 32bit registers max.) between coprocessors.

Non-cyclic exchanges are asynchronous transfers initiated by application programs, SCADA / HMI devices and PCs using an OPC server.

CTNet networks are configured using SyPTPro software. Simple networks can be configured via the drive keypad or with CTSOFT drive configuration software.

CTNet Integration At-a-Glance



Function	Description	Order Code
Application Coprocessor Modules	Includes CTNet fieldbus connections and coprocessor	SM-APPS-PLUS SM-REGISTER
Network Accessories	3-port hub, provides connectivity to 3 CTNet segments	CTNET-HUB-REVD
	Fiber optic repeater	CTNET-FIB-REVD
	3-port hybrid hub, for connectivity between current and previous CTNet versions	CTNET-HYBRID-HUB
	CTNet bulk cable	CTNET-xxx*
PC Network Card	USB22-CTNet — computer USB port to CTNet communications interface	4500-0100
CTNet I/O	Bus coupler	SSP7200-REVD
Application Programming Software	Systems programming toolkit	SYPTPRO

* Cable available in standard lengths of 100m, 200m or custom lengths up to 200m.

Application Coprocessor Platforms

SM-Applications Plus / SM-Register Option Modules

SM-Applications Plus and SM-Register snap-in coprocessors include CTNet high-speed peer-to-peer fieldbus connectivity.

These CTNet-equipped coprocessors are based on a high-performance microprocessor with up to 384KB of program storage and 80KB of variable storage for user applications. In addition to the CTNet fieldbus, serial ports are available for RS485 communications. The coprocessors also include a built-in counter-timer unit and position controller capability.

The Digitax ST-P Servo drive includes a built-in coprocessor with the same functionality as the SM-Application Plus Option Module.



SM-Applications Plus
Unidrive SP, Mentor MP, Quantum MP



SM-Register
Unidrive SP, Mentor MP, Quantum MP



Digitax ST-P Servo drive
Includes built-in SM-Applications Plus functionality

Network Accessories

Repeaters

For extending CTNet cable segments and creating star topologies, there are three types of repeaters available (see At-a-Glance table on previous page).



CTNet Cable

Control Techniques stocks a high-quality shielded twisted-pair cable suitable for high-speed data transmission.



PC Network Interface Card

For desktop and laptop computers, use the USB22-CTNet network card. This interface card provides direct access to all of the drive and I/O modes in a system.



CTNet I/O

A high-quality modular I/O system is available for CTNet systems. Remote systems for CTNet include a bus coupler and a large variety of snap-on terminal blocks allowing up to 256 digital inputs or outputs and up to 100 analog inputs and outputs per bus coupler. Up to 64 remote I/O systems can be attached to a CTNet network. I/O points can be easily read or written.



The range of CTNet I/O options include:

- Digital input terminals in 5, 24, and 48Vdc, 120Vac
- Digital output terminals 5 and 24Vdc, Relay Output (115-400Vac)
- Analog input and output terminals for a wide array of applications. All standard voltages, mA, RTD, thermocouple, etc.

CTNet

CTNet Software

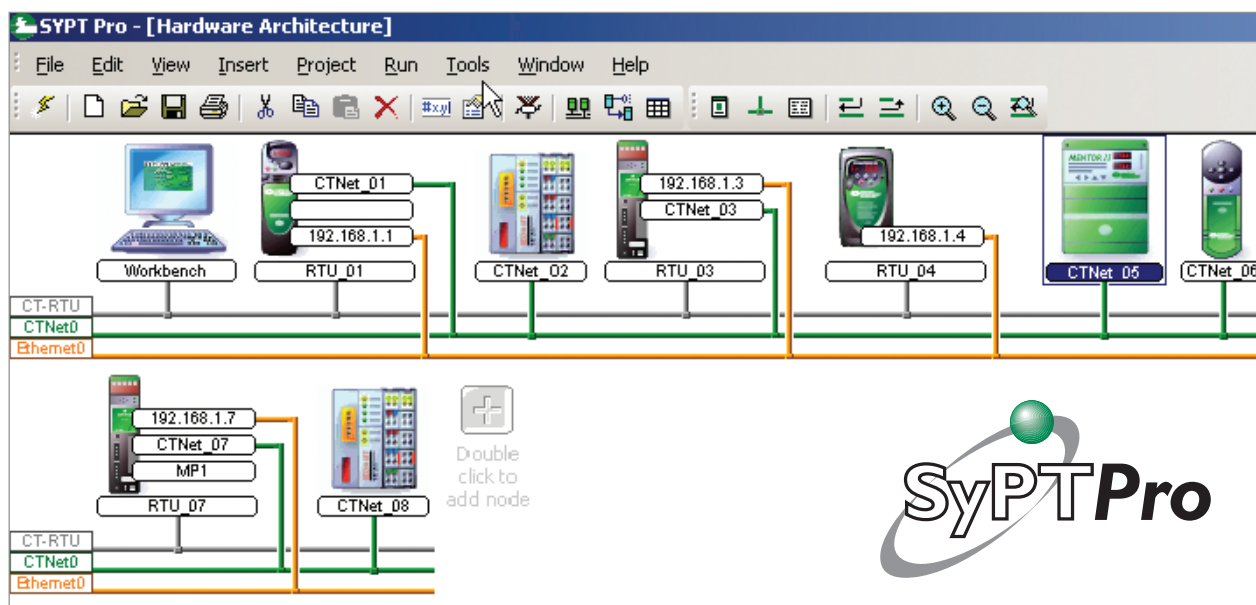
Order Code	Description
SYTPRO	Coprocessor module programming and CTNet system configuration tool; software registration required
CTNET API	CTNet software driver for Windows® DLL (included with SYTPPro)
CTNET OPC	CTNet software driver for Microsoft® OPC

CTNet Hardware

Order Code	Description
PS5R-B24	24Vdc power supply, 600mA max output current, 100 to 240Vac input power
CTNET-100	CTNet bulk cable, 325ft (100m) length
CTNET-200	CTNet bulk cable, 650ft (200m) length
CTNET-xxx	CTNet bulk cable, custom length in 10ft increments (max 650ft)

CTNet Hardware

Order Code	Description
4500-0100	USB22-CTNet; computer USB port to CTNet communications interface
CTNET-FIB-REVD	Twisted-pair to fiber optic repeater for CTNet cable requirements greater than 200m
CTNET-HUB-REVD	CTNet 3-port hub, provides connectivity up to 3 CTNet segments (current CTNet version only)
CTNET-PCI-REVD	CTNet interface card with PCI bus for desktop PC's; RoHS



CTNet I/O

CTNet I/O Bus Couplers

Order Code	Description
SSP7200-REVD	CTNet I/O bus coupler, CTNet revision D hardware
SSP9010	Bus-end terminal for termination on CTNet I/O assembly



CTNet I/O Digital Input Terminals

Order Code	Description
SSP1002	2-Digital input terminal, 24Vdc, 3.0ms input filter
SSP1012	2-Digital input terminal, 24Vdc, 0.2ms input filter
SSP1032	2-Digital input terminal, 48Vdc, 3.0ms input filter
SSP1052	2-Digital input terminal, 24Vdc, positive or negative switching, 3.0ms input filter
SSP1104	4-Digital input terminal, 24Vdc, 3.0ms input filter
SSP1114	4-Digital input terminal, 24Vdc, 0.2ms input filter
SSP1124	4-Digital input terminal, 5Vdc, 0.2ms input filter
SSP1154	4-Digital input terminal, 24Vdc, positive or negative switching, 3.0ms input filter
SSP1164	4-Digital input terminal, 24Vdc, positive or negative switching, 0.2ms input filter
SSP1184	4-Digital input terminal, 24Vdc, negative switching, 3ms input filter
SSP1408	8-Digital input terminal, 24Vdc, 3.0ms input filter, single conductor
SSP1702	2-Digital input terminal, 120/230Vac
SSP1722	2-Digital input terminal, 120/230Vac w/o power contacts
SSM1002-0004	16-Digital input terminal, 24Vdc
SSM1004-0004	32-Digital input terminal, 24Vdc
SSM1008-0004	64-Digital input terminal, 24Vdc

CTNet I/O Digital Output Terminals

Order Code	Description
SSP2012	2-Digital output terminal, 24Vdc, 0.5A output
SSP2032	2-Digital output terminal, 24Vdc, 0.5A output, Reverse Polarity Protection
SSP2022	2-Digital output terminal, 24Vdc, 2.0A output
SSP2114	4-Digital output terminal, 24Vdc, 0.5A output
SSP2134	4-Digital output terminal, 24Vdc, 0.5A output, reverse polarity protection
SSP2184	4-Digital output terminal, 24Vdc, 4 negative switching outputs, 0.5A output
SSP2408	8-Digital output terminal, 24Vdc, total current 3A output, single-conductor connection
SSP2124	4-Digital output terminal, 5Vdc, 20mA output
SSP2702	2-Solid state outputs, normally open, 230Vac, 0.3A output
SSP2612	2-Relay outputs, isolated changeover contacts, 125Vac, 2.0A
SSP2622	2-Relay outputs, isolated normally open, 230Vac, 2.0A
SSP2602	2-Relay outputs, normally open to common power contacts, 230Vac, 2.0A
SSP2631	1-Relay output, normally open to power contact, 400Vac, 3.75A
SSM2002-0004	16-Digital output terminal, 24Vdc

CTNet I/O

CTNet I/O Analog Input Terminals

Order Code	Description
SSP3002	2-Channel analog input terminal, -10V to +10V, 12 bit
SSP3102	2-Channel analog input terminal, -10V to +10V, 16 bit
SSP3408	8-Channel analog input terminal, -10V to +10V differential, 12 bit
SSP3062	2-Channel analog input terminal, 0 to 10V single ended, 12 bit, power supply via the K-Bus
SSP3064	4-Channel analog input terminal, 0 to 10V single ended, 12 bit, power supply via the K-Bus
SSP3468	8-Channel analog input terminal, 0 to 10V single ended, 12 bit
SSP3012	2-Channel analog input terminal, 0 to 20mA, 12 bit
SSP3448	8-Channel analog input terminal, 0 to 20mA differential, 12 bit
SSP3112	2-Channel analog input terminal, 0 to 20mA, 16 bit
SSP3042	2-Channel loop-powered input terminal, 0 to 20mA, 12 bit, 24Vdc power supply via the power contacts
SSP3022	2-Channel analog input terminal, 4 to 20mA, 12 bit
SSP3052	2-Channel loop-powered input terminal, 4 to 20mA, 12 bit, 24Vdc power supply via the power contacts
SSP3458	8-Channel analog input terminal, 4 to 20mA differential, 12 bit
SSP3202	2-Channel PT100 (RTD) input terminal, 16 bit, preset to PT100, power supply via K-Bus
SSP3312	2-Channel thermocouple input terminal, 16 bit, preset to type K, open-circuit recognition

CTNet I/O Analog Output Terminals

Order Code	Description
SSP4002	2-Channel analog output terminal, 0 to 10V, 12 bit
SSP4408	8-Channel analog output terminal, 0 to 10V, 12 bit
SSP4032	2-Channel analog output terminal, -10V to +10V, 12 bit
SSP4132	2-Channel analog output terminal, -10V to +10V, 16 bit
SSP4438	8-Channel analog output terminal, -10V to +10V, 12 bit
SSP4012	2-Channel analog output terminal, 0 to 20mA, 12 bit, 24Vdc via the power contacts
SSP4112	2-Channel analog output terminal, 0 to 20mA, 16 bit
SSP4418	8-Channel analog output terminal, 0 to 20mA, 12 bit
SSP4022	2-Channel analog output terminal, 4 to 20mA, 12 bit, 24Vdc via the power contacts
SSP4428	8-Channel analog output terminal, 4 to 20mA, 12 bit

CTNet I/O

CTNet System Terminals

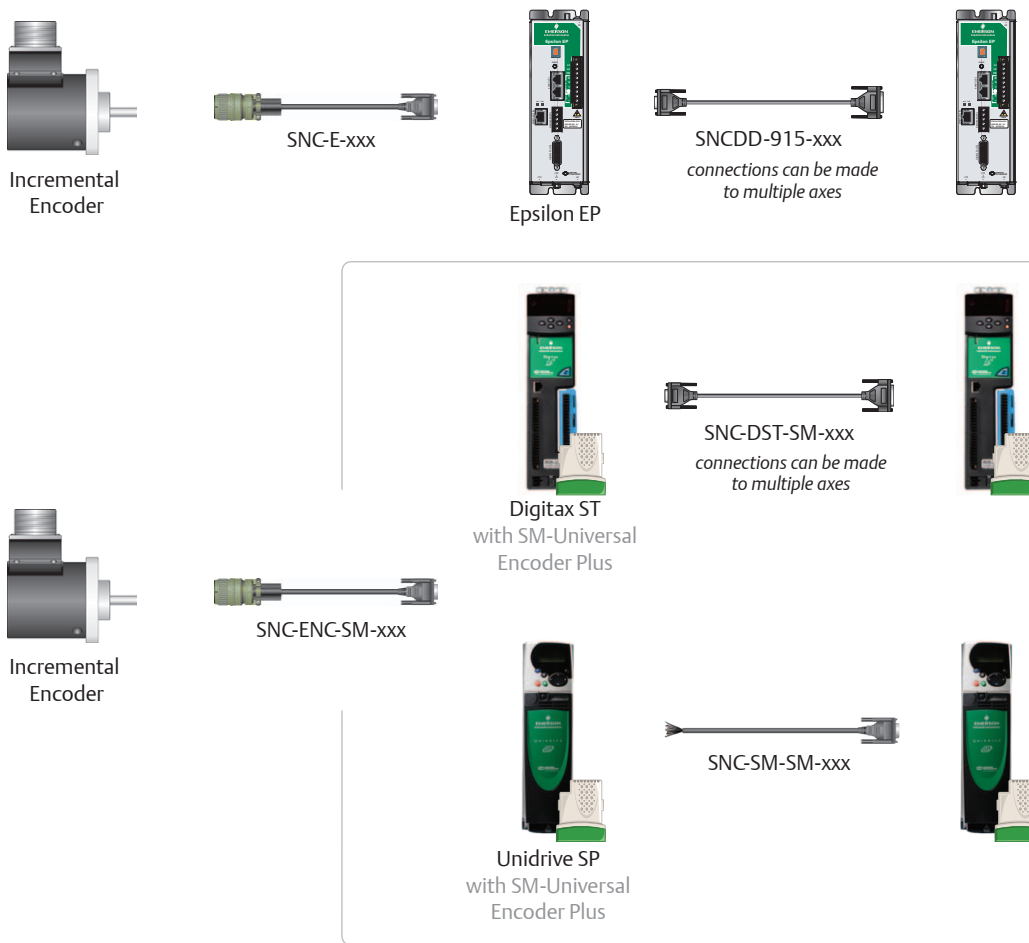
Order Code	Description
SSP9080	Isolation terminal
SSP9100	Power supply terminal, 24Vdc
SSP9110	Power supply terminal with diagnostics, 24Vdc
SSP9150	Power supply terminal, 230Vac
SSP9160	Power supply terminal with diagnostics, 230Vac
SSP9180	Potential distribution terminal with 2 clamps per power contact
SSP9185	Potential distribution terminal with 4 clamps per power contact
SSP9190	Power supply terminal
SSP9195	Shield terminal, potential distribution terminal with connection to earth
SSP9200	Power supply terminal, 24Vdc with fuse
SSP9210	Voltage supply terminal, 24Vdc with fuse and diagnostics
SSP9250	Voltage supply terminal, 230Vac with fuse
SSP9260	Voltage supply terminal, 230Vac with fuse and diagnostics
SSP9400	Power supply unit terminal for the K-Bus, 24Vdc, 2A for the K-bus supply
SSP9505	Power supply unit terminal, 24Vdc input, 5Vdc - 1A output
SSP9510	Power supply unit terminal, 24Vdc input, 10Vdc - 0.5A output
SSP9515	Power supply unit terminal, 24Vdc input, 15Vdc - 0.5A output



Motion Synchronization Components

Control Techniques provides hardware for easy configuration of motion synchronization. Pre-configured cables are available for connection from a master synchronization encoder to drive connections. Each servo drive family is equipped with a buffered encoder output connection. The Epsilon EP drive comes standard with incremental encoder synchronization input and output connections. The Digitax ST and Unidrive SP use the SM-Universal Encoder Plus Option Module which allows the use of several compatible feedback devices.

Using the preconfigured cables, 1.5-axis synchronization is easily achieved.



SNCE-xxx -015, -025, -050
Sync cable to SNCI, Encoder connector to D9P connector
SCSLD to SNCI, or Epsilon EP Sync In

SNCDD-915-xxx -001, -005, -010, -025
Drive Sync Out to Drive Sync In cable
Epsilon EP to Epsilon EP

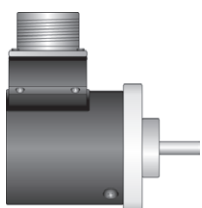
SNC-ENC-SM -010, -025, -050
Sync cable to SM Universal Encoder Plus, Encoder connector to D15P connector
SCSLD to SM Universal Encoder Plus

SNC-DST-SM-xxx -002, -005, -010
Drive Encoder Output to SM Encoder Plus Input
Digitax ST

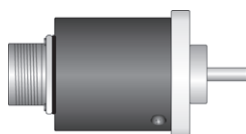
xxx = length in feet

Encoder Order Codes

Description	Side Connection Order Code	End Connection Order Code
Synchronization Encoder 3000 Line (12000 ppr Quadrature)	SCSLD-4R	SCSLD-4
Synchronization Encoder 2500 Line (10000 ppr Quadrature)	SCSLD-3R	SCSLD-3
Synchronization Encoder 1000 Line (4000 ppr Quadrature)	SCSLD-2R	SCSLD-2



Side Connector



End Connector

Encoder Specifications

Supply Voltage	+5Vdc
Current	Line drives with ZR=+5Vdc @ 5mA
Frequency	Up to 200kHz
Outputs	Analog - differential peak-to-peak amplitude of 2.5Vdc
Operating Temp.	32 to 158 °F (0 to 70 °C)

Encoder Breakout Boards

STI-ENC

Encoder feedback connector (J6) breakout board (HD-DB15)

Epsilon EP

SM-ETC

Encoder feedback connector breakout board (DB15)

Digitax ST - B, Z, P, I

Unidrive SP

Additional Cables for Alternative Connections

SNCFLL-xxx  -005, -010, -015, -025

Drive Sync In cable

Epsilon EP, STI-SNCOA Breakout Board

SNCFLOA-xxx  -005, -010, -015, -025, -050

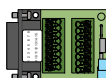
Drive Sync Out cable to Flying Leads

Epsilon EP

STI-SNCOA

Drive Sync Out and Analog In/Out Breakout Board; DB15

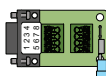
Epsilon EP



STI-SNCI

Drive Sync In Breakout Board; DB9S

Epsilon EP



xxx = length in feet

Logic and I/O Power Supplies

MLP-002-00

2.1 Amp, +24 Vdc, universal input

90 to 264Vac

Epsilon, MDS

MLP-005-00

5 Amp, +24Vdc, universal input

90 to 264Vac

Epsilon, MDS, Unidrive SP size 6, Commander SK size 6

MLP-010-00

10 Amp, +24Vdc, universal input 90 to 264Vac

Epsilon, MDS, Unidrive SP size 6



Line and Load Reactors

Line and Load Reactors

Line reactors (sometimes called “line chokes”) are a common power accessory for electronic variable speed drives. These components add an extra margin of protection for AC and DC drives from supply transients.

Line reactors are strongly recommended for installation with AC drives that do not have built-in inductors. Refer to the built-in inductor columns in the following tables.

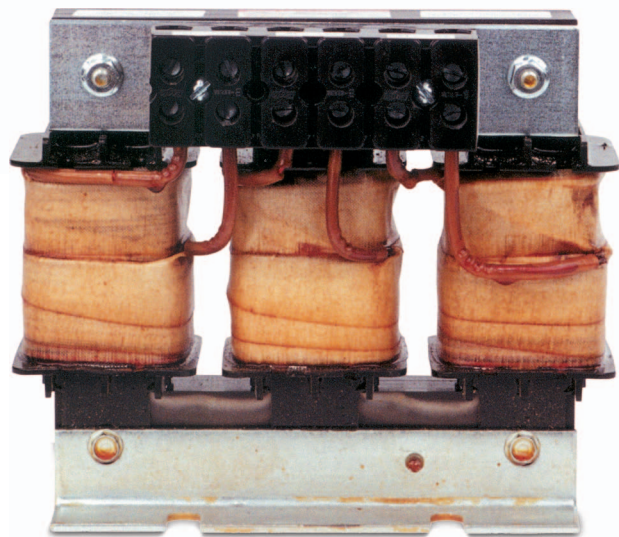
Load reactors are used on the output of AC drives to reduce the effects of high motor wiring capacitance and to “soften” the dV/dt (rate of change of voltage) applied to the motor windings.

Reactors in AC drive applications:

- Help reduce harmonic distortion of the input line current
- Improve input line current balance
- Reduce nuisance drive over-voltage trips caused by transient voltage spikes and power line notches
- Protect input rectifiers from in-rush current caused by sudden power line surges and sags
- Extend the life of the DC bus capacitor bank by reducing the internal heating caused by ripple current
- Protect motor windings from long lead effects when used on the drive output

Line Reactors in DC drive applications:

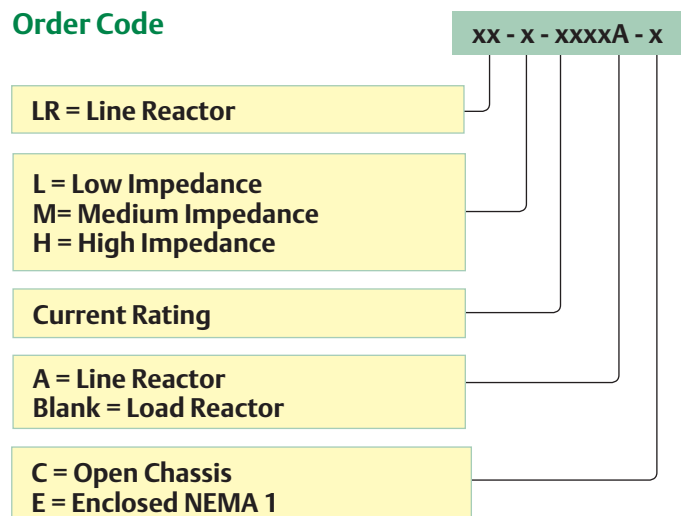
- Minimize crosstalk between multiple SCR drives by reducing line notching and subsequent dV/dt misfiring and/or bridge failures
- Eliminate SCR failures caused by high dV/dt levels associated with stiff or power factor corrected power lines
- Protect other line-powered sensitive electronic equipment by filtering electrical noise and/or interference caused by drives on the power line



Specifications

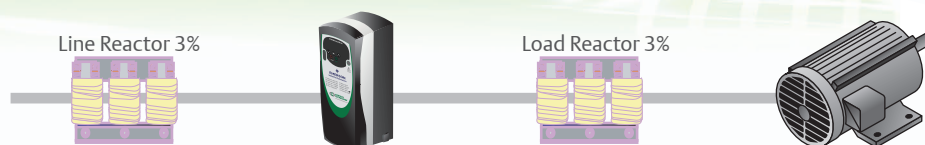
Voltage	690Vac maximum
Ambient Temperature	104 °F (40 °C)
Overload	200% for 10 seconds 150% for 1 minute
Approvals	CE UL508 CSA C22.2

Order Code



AC Drive Line and Load Reactors

230Vac

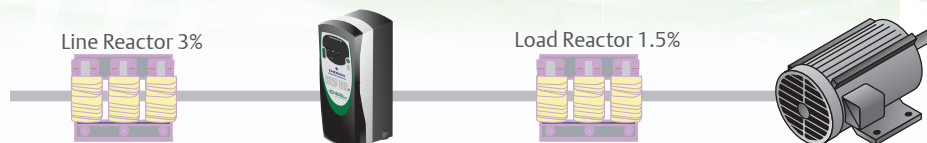


Motor Power (hp)	Order Code	Built-in Inductor	Input Line Reactor Order Code	Current (A)	Output Load Reactor Order Code	Current (A)
115Vac 1Ø Supply, 230Vac 3Ø Output						
0.33	SKA1100025	No	Consult Factory		LRL0002-X	2
0.5	SKA1100037	No			LRL0004-X	4
1	SKB1100075	No			LRL0004-X	4
1.5	SKB1100110	No			LRL0008-X	8
230Vac 1Ø Supply, 230Vac 3Ø Output						
0.33	SKA1200025	No	4402-0224	6.5	LRL0002-X	2
0.5	SKA1200037	No	4402-0224	6.5	LRL0004-X	4
0.75	SKA1200055	No	4402-0225	15.1	LRL0004-X	4
1	SKA1200075	No	4402-0225	15.1	LRL0004-X	4
1.5	SKBD200110	No	4402-0225	15.1	LRL0008-X	8
2	SKBD200150	No	4402-0226	26.2	LRL0008-X	8
3	SKCD200220	No	4402-0226	26.2	LRL0012-X	12
3	SKDD200300	Yes	4402-0226	26.2	LRL0018-X	18
0.5	SP0201	No	4402-0224	6.5	LRL0004-X	4
0.75	SP0202	No	4402-0225	15.1	LRL0004-X	4
1	SP0203	No	4402-0225	15.1	LRL0004-X	4
1.5	SP0204	No	4402-0225	15.1	LRL0008-X	8
2	SP0205	No	4402-0226	26.2	LRL0008-X	8
230Vac 3Ø Supply and Output						
1.5	SKBD200110	No	LRL007A6-X	7.6	LRL0008-X	8
2	SKBD200150	No	LRL0011A-X	11	LRL0008-X	8
3	SKCD200220	No	LRL0014A-X	14	LRL0012-X	12
3	SKDD200300	Yes	LRL0014A-X	14	LRL0018-X	18
5	SKD3200400	Yes	LRL0021A-X	21	LRL0018-X	18
0.5	SP0201	No	LRL003A4-X	3.4	LRL0004-X	4
0.75	SP0202	No	LRL004A8-X	4.8	LRL0004-X	4
1	SP0203	No	LRL007A6-X	7.6	LRL0004-X	4
1.5	SP0204	No	LRL0011A-X	11	LRL0008-X	8
2	SP0205	No	LRL0011A-X	11	LRL0008-X	8
1.5	SP1201	No	LRL007A6-X	7.6	LRL0008-X	8
2	SP1202	No	LRL0011A-X	11	LRL0008-X	8
3	SP1203	No	LRL0014A-X	14	LRL0012-X	12
3	SP1204	No	LRL0021A-X	21	LRL0012-X	12
5	y2201	Yes	LRL0014A-X	14	LRL0018-X	18
7.5	y2202	Yes	LRL0021A-X	21	LRL0025-X	18
10	y2203	Yes	LRL0028A-X	28	LRL0035-X	18
15	y3201	Yes	LRL0046A-X	46	LRL0045-X	18
20	y3202	Yes	LRL0055A-X	55	LRL0055-X	18
25	y4201	Yes	LRL0065A-X	65	LRL0080-X	18
30	y4202	Yes	LRL0083A-X	83	LRL0100-X	18
40	y4203	Yes	LRL0104A-X	104	LRL0130-X	18
50	SP5201	Yes	LRL0130A-X	130	LRL0160-X	18
60	SP5202	Yes	LRL0160A-X	160	LRL0160-X	18

y = SK for Commander SK , or SP for Unidrive

AC Drive Line and Load Reactors

460Vac

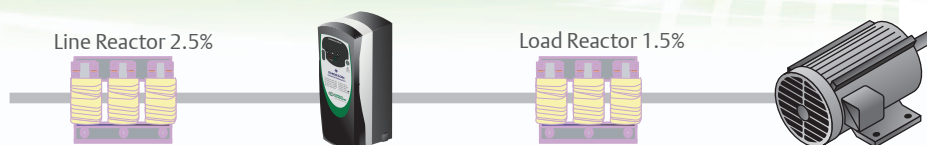


Motor Power (hp)	Order Code	Built-in Inductor	Input Line Reactor Order Code	Current (A)	Output Load Reactor Order Code	Current (A)
460Vac 3Ø						
0.5	SKB3400037	No	LRM002A1-X	2.1	LRL0002-X	2
0.75	SKB3400055	No	LRM003A4-X	3.4	LRL0002-X	2
1	SKB3400075	No	LRM003A4-X	3.4	LRM0004-X	4
1.5	SKB3400110	No	LRM004A8-X	4.8	LRL0004-X	4
2	SKB3400150	No	LRM007A6-X	7.6	LRL0004-X	4
3	SKC3400220	No	LRM0011A-X	11	LRM0008-X	8
3	SKC3400300	No	LRM0011A-X	11	LRM0008-X	8
5	SKC3400400	No	LRM0014A-X	14	LRL0012-X	12
7.5	SKD3400550	Yes	LRM0014A-X	14	LRL0018-X	18
10	SKD3400750	Yes	LRM0021A-X	21	LRL0018-X	18
0.5	SP0401	No	LRM002A1-X	21	LRL0002-X	2
0.75	SP0402	No	LRM003A4-X	3.4	LRL0002-X	2
1	SP0403	No	LRM003A4-X	3.4	LRM0004-X	4
1.5	SP0404	No	LRM004A8-X	4.8	LRL0004-X	4
2	SP0405	No	LRM007A6-X	7.6	LRM0008-X	8
1.5	SP1401	No	LRM004A8-X	4.8	LRL0004-X	4
2	SP1402	No	LRM007A6-X	7.6	LRL0004-X	4
3	SP1403	No	LRM007A6-X	7.6	LRM0008-X	8
5	SP1404	No	LRM0011A-X	11	LRL0008-X	8
5	SP1405	Yes	LRM0011A-X	11	LRL0012-X	12
7.5	SP1406	Yes	LRM0014A-X	14	LRL0012-X	12
10	y2401	Yes	LRM0021A-X	21	LRL0018-X	18
15	y2402	Yes	LRM0021A-X	21	LRL0025-X	25
20	y2403	Yes	LRM0035A-X	35	LRL0035-X	35
20	y2404	Yes	LRM0035A-X	35	LRL0035-X	35
25	y3401	Yes	LRM0035A-X	35	LRL0035-X	35
30	y3402	Yes	LRM0046A-X	46	LRL0045-X	45
40	y3403	Yes	LRM0055A-X	55	LRL0080-X	80
50	y4401	Yes	LRM0065A-X	65	LRL0080-X	80
60	y4402	Yes	LRM0083A-X	83	LRL0100-X	100
75	y4403	Yes	LRM0104A-X	104	LRL0130-X	130
100	y5401	Yes	LRM0130A-X	130	LRL0160-X	160
150	y5402	Yes	LRM0160A-X	160	LRL0200-X	200
150	y6401	Yes	LRM0250A-X	250	LRL0250-X	250
200	y6402	Yes	LRM0250A-X	250	LRL0250-X	250

y = SK for Commander SK, or SP for Unidrive SP

AC Drive Line and Load Reactors

575/690Vac



Motor Power (hp)	Order Code	Built-in Inductor	Input Line Reactor Order Code	Current (A)	Output Load Reactor Order Code	Current (A)
575Vac 3Ø						
5	y3501	Yes	LRH007A6-X	7.6	LRM0008-X	8
5	y3502	Yes	LRH007A6-X	7.6	LRM0008-X	8
7.5	y3503	Yes	LRH0011A-X	11	LRL0012-X	12
10	y3504	Yes	LRH0011A-X	11	LRL0012-X	12
15	y3505	Yes	LRH0021A-X	21	LRL0018-X	18
20	y3506	Yes	LRH0028A-X	28	LRL0025-X	25
25	y3507	Yes	LRM0028A-X	28	LRL0035-X	35
30	y4603	Yes	LRM0035A-X	35	LRL0045-X	45
40	y4604	Yes	LRM0046A-X	46	LRL0045-X	45
50	y4605	Yes	LRM0055A-X	55	LRL0055-X	55
60	y4606	Yes	LRM0065A-X	65	LRL0080-X	80
75	y5601	Yes	LRM0083A-X	83	LRL0100-X	100
100	y5602	Yes	LRM0104A-X	104	LRL0100-X	100
125	y6601	Yes	LRM0130A-X	130	LRL0130-X	130
150	y6602	Yes	LRM0160A-X	160	LRL0160-X	160
690Vac 3Ø						
25	y4601	Yes	LRH0028A-X	28	LRM0025-X	25
30	y4602	Yes	LRH0028A-X	28	LRM0035-X	35
40	y4603	Yes	LRM0035A-X	35	LRM0045-X	45
50	y4604	Yes	LRM0046A-X	46	LRL0045-X	45
60	y4605	Yes	LRM0055A-X	55	LRL0055-X	55
75	y4606	Yes	LRM0065A-X	65	LRL0080-X	80
100	y5601	Yes	LRM0083A-X	83	LRL0100-X	100
125	y5602	Yes	LRM0104A-X	104	LRL0100-X	100
150	y6601	Yes	LRM0130A-X	130	LRL0130-X	130
175	y6602	Yes	LRM0160A-X	160	LRM0160-X	160

y = SK for Commander SK , or SP for Unidrive

NOTE: Average % impedance is indicated in the graphics for each voltage rating. Consult factory for different % impedance requirements and NEMA 3R outdoor enclosure option.

DC Drive Line Reactors

DC Reactors

Line Reactor 3%



Drive Order Code	Input Line Reactor Order Code	Current (A)	Input Line Reactor Order Code	Current (A)
	230Vac		460Vac	
MP25A4(R)	LRL0021A-X	21	LRM0028A-X	21
QMP/MP45A4(R)	LRL0046A-X	46	LRM0046A-X	46
QMP/MP75A4(R)	LRL0083A-X	83	LRM0083A-X	83
MP105A4(R)	LRL0104A-X	104	LRM0104A-X	104
QMP/MP155A4(R)	LRL0160A-X	160	LRM0160A-X	160
QMP/MP210A4(R)	LRL0200A-X	200	LRM0200A-X	200
QMP/MP350A4(R)	LRL0322A-X	322	LRM0322A-X	322
QMP400A4(R)/MP420A4(R)	LRL0414A-X	414	LRM0414A-X	414
QMP/MP550A4(R)	LRL0515A-X	515	LRM0515A-X	515
QMP/MP700A4(R)	LRL0600A-X	600	LRM0600A-X	600
MP825A4(R)	LRL0750A-X	750	LRM0750A-X	750
MP900A4(R)	LRL0850-X	850	LRM0850-X	850
MP1200A4(R)	LRL1200-X	1200	LRM1200-X	1200
MP1850A4(R)	Consult Factory			
	575Vac		690Vac	
MP25A5(R)	LRH0028A-X	21		
MP45A5(R)	LRM0046A-X	46		
MP75A5(R)	LRM0065A-X	65		
MP105A5(R)	LRM0104A-X	104		
MP155A5(R)	LRM0160A-X	160		
MP210A5(R)	LRM0200A-X	200		
MP350Ay(R)	LRM0322A-X	322	LRM0322A-X	322
MP470Ay(R)	LRM0414A-X	414	LRM0414A-X	414
MP700Ay(R)	LRM0750A-X	750	LRM0750A-X	750
MP825Ay(R)	LRM0750A-X	750	LRM0750A-X	750
MP1200Ay(R)	LRH1200-X	1200	LRH1200-X	1200
MP1850Ay(R)	Consult Factory			

y = 5 for 575Vac or 6 for 690Vac



Isolation Transformers

Drive isolation transformers add an extra margin of protection for AC and DC drives. They are sized to the drive kVA requirements and are designed to withstand the mechanical stress of current reversals and short circuits associated with power semiconductor type AC and DC drives.

- Three-coil, delta-wye configuration with fully rated NEMA 1 enclosure
- $\pm 5\%$ fully rated taps on primary winding
- Ambient temperature: 104 °F (40 °C)
- Standards: ANSI C89.2, NEMA ST-20, UL506, UL1561

Features:

- Provide electrical isolation between the incoming line and the drive electronics
- Convert input line voltage to standard drive input voltages
- Minimize line disturbances caused by SCR power converters
- Reduce power line harmonics caused by drives
- Protect the motor controller by reducing available short circuit potential. This may be a UL requirement in installations with high levels of short circuit potential



hp	kVA	Primary Voltage	Secondary Voltage		Wt. (lbs.)	Size	
			230Vac	460Vac			
5	7.5	230	8812-0007-1	8812-0007-2	150	A	
		460	8812-0007-3	8812-0007-4			
7.5	11	230	8812-0011-1	8812-0011-2	160		A
		460	8812-0011-3	8812-0011-4			
10	14	230	8812-0014-1	8812-0014-2	170	A	
		460	8812-0014-3	8812-0014-4			
15	20	230	8812-0020-1	8812-0020-2	240		B
		460	8812-0020-3	8812-0020-4			
20	27	230	8812-0027-1	8812-0027-2	300	B	
		460	8812-0027-3	8812-0027-4			
25	34	230	8812-0034-1	8812-0034-2	330		B
		460	8812-0034-3	8812-0034-4			
30	40	230	8812-0040-1	8812-0040-2	350	B	
		460	8812-0040-3	8812-0040-4			
40	51	230	8812-0051-1	8812-0051-2	430		C
		460	8812-0051-3	8812-0051-4			
50	63	230	8812-0063-1	8812-0063-2	530	C	
		460	8812-0063-3	8812-0063-4			
60	75	230	8812-0075-1	8812-0075-2	580		C
		460	8812-0075-3	8812-0075-4			
75	93	230	8812-0093-1	8812-0093-2	630	C	
		460	8812-0093-3	8812-0093-2			
100	118	230	8812-0118-1	8812-0118-2	730		D
		460	8812-0118-3	8812-0118-4			
125	145	230	8812-0145-1	8812-0145-2	830	D	
		460	8812-0145-3	8812-0145-4			
150	175	230	8812-0175-1	8812-0175-2	930		D
		460	8812-0175-3	8812-0175-4			
200	220	230	8812-0220-1	8812-0220-2	1350	E	
		460	8812-0220-3	8812-0220-4			
250	275	230	8812-0275-1	8812-0275-2	1500		E
		460	8812-0275-3	8812-0275-4			
300	330	230	8812-0330-1	8812-0330-2	1700	F	
		460	8812-0330-3	8812-0330-4			
400	440	460		8812-0440-4	2100		F
500	550	460		8812-0550-4	2350		

Order Code

8812 - 0007 - 1

Isolation Transformer

kVA Rating

Pri / Sec Voltage Rating (Vac)

Size	Dims. (in.) H x W x D
A	21.5 x 19.4 x 20.2
B	28.8 x 23.9 x 25
C	38 x 26 x 25
D	41 x 32 x 29.5
E	51.5 x 39.5 x 34
F	59 x 48.5 x 38.4

Drive EMC Filters

Electromagnetic Compatibility Filters

EMC filters are used to minimize high-frequency power supply line disturbances caused by drives that may interfere with proper operation of sensitive electronic equipment. These specific filters have been assessed for conformance with the EMC directive by testing with the appropriate Control Techniques drives.

EMC data sheets are available for digital drive products. These data sheets list the applicable harmonic standards and give recommended installation techniques and further information on EMC behavior in typical situations.

All Control Techniques AC and DC drives include internal EMC filters. The filters listed in the following tables are used in addition to the standard onboard filter to provide

additional interference reduction. Refer to the specific drive EMC data sheets for details of levels of compliance with IEC standards.

Filter Types

- **Low Leakage:** low leakage filters limit the leakage current to ground. The length of the motor cable is severely restricted when these filters are applied.
- **Standard:** standard filters are designed for use in industrial or residential applications with longer motor lead lengths.



AC Drive EMC Filters

460Vac

Drive Order Code	Standard RFI Filter				Low Leakage RFI Filter			
	Order Code	Current (A)	Dims. (in.) H x W x D	Weight (lbs.)	Order Code	Current (A)	Dims. (in.) H x W x D	Weight (lbs.)
460Vac, 3Ø								
SKB3400037	4200-6213	10	10.2 x 3.2 x 1.6	1.4	4200-6215	10	10.2 x 3.2 x 1.6	1.4
SKB3400055								
SKB3400075								
SKB3400110								
SKB3400150								
SKC3400220	4200-6311	14	12.2 x 3.7 x 1.8	1.7	4200-6217	14	12.2 x 3.7 x 1.8	1.6
SKC3400300								
SKC3400400								
SKD3400550	4200-6411	24	16.4 x 4.5 x 2.0	3.4	4200-6412	24	16.4 x 4.5 x 2.0	3.4
SKD3400750								
	Standard RFI Filter				Alternative Standard RFI Filter			
SP0401-SP0405	4200-6002	11	14.1 x 2.4 x 1.1	2.6				
SP1401	4200-6118	10	17.4 x 4 x 1.8	3.1	4200-6121	10	17.7 x 3.9 x 1.8	4.6
SP1402								
SP1403								
SP1404								
SP1405	4200-6119	16	17.4 x 4 x 1.8	3.1	4200-6120	16	17.4 x 3.9 X 1.8	4.6
SP1406								
y2401	4200-6210	32	17 x 6.1 x 2.2	4.4	4200-6211	32	17 x 6.1 x 2.2	7.3
y2402								
y2403								
y2404								
y3401	4200-6305	62	16.3 x 10 x 2.4	7.7	4200-6306	75	16.7 x 9.8 x 2.4	11.2
y3402								
y3403								
y4401								
y4402	4200-6406	101	11.8 x 9 x 4	8.8	4200-6405	101	11.8 x 8.1 x 3.5	17.2
y4403								
y5401								
y5402	4200-6503	164	11.8 x 9.8 x 4.8	15	4200-6501	165	11.8 x 9.8 x 4.8	26.5
y6401								
y6411	4200-6603	260	11.6 x 9 x 5.4	11.6	4200-6601	260	14.3 x 9 x 5.8	19
y6402								
y6412								

575/690Vac

Drive Order Code	Standard RFI Filter				Low Leakage RFI Filter			
	Order Code	Current (A)	Dims. (in.) H x W x D	Weight (lbs.)	Order Code	Current (A)	Dims. (in.) H x W x D	Weight (lbs.)
575Vac/690Vac, 3Ø								
y3501 - y3507	4200-6309	30	16.3 x 10 x 2.4	7.7	4200-6308	30	16.8 x 9.9 x 2.4	11.2
y4601 - y4606	4200-6408	58	11.8 x 9 x 4	8.4	4200-6407	58	11.8 x 8.1 x 3.6	17.6
y5601 - y5602	4200-6504	95	11.8 x 9 x 4	9.7	4200-6502	95	11.8 x 9.8 x 4.8	22
y6601 - y6602	4200-6604	160	14 x 9 x 5.4	11.6	4200-6602	160	14.3 x 9 x 5.8	19

y = SK for Commander SK , or SP for Unidrive SP

AC Drive EMC Filters

115/230Vac

Drive Order Code	Standard RFI Filter				Low Leakage RFI Filter			
	Order Code	Current (A)	Dims. (in.) H x W x D	Weight (lbs.)	Order Code	Current (A)	Dims. (in.) H x W x D	Weight (lbs.)
115Vac, 1Ø								
SKA1100025	4200-6122	12	8 x 3 x 1.6	0.9	4200-6123	12	8 x 3 x 1.6	0.9
SKA1100037								
SKB1100075	4200-6216	27	10.2 x 3.2 x 1.6	1.5				
SKB1100110								
230Vac, 1Ø								
SKA1200025	4200-6122	12	8 x 3 x 1.6	0.9	4200-6123	12	8 x 3 x 1.6	1
SKA1200037								
SKA1200055								
SKA1200075								
SKBD200110	4200-6212	20	8 x 3 x 1.6	1.3	4200-6214	20	8 x 3 x 1.6	1.4
SKBD200150								
SKCD200220	4200-6310	24	12.2 x 3.7 x 1.8	1.9	4200-6312	24	12.2 x 3.7 x 1.8	2
SKDD200300	4200-6409	24	16.4 x 4.5 x 2.0	3.6	4200-6410	24	16.4 x 4.5 x 2.0	3.6
SP0201-SP0205	4200-6000	19	14.1 x 2.4 x 1.1	2.6				
230Vac, 3Ø								
SKBD200110	4200-6213	10	10.2 x 3.2 x 1.6	1.4	4200-6215	10	10.2 x 3.2 x 1.6	1.4
SKBD200150								
SKCD200220	4200-6311	14	12.2 x 3.7 x 1.8	1.7	4200-6217	14	12.2 x 3.7 x 1.8	1.6
SKD3200400	4200-6411	24	16.4 x 4.5 x 2.0	3.4	4200-6412	24	16.4 x 4.5 x 2.0	3.4
SKDD200300								
	Standard RFI Filter				Alternative Standard RFI Filter			
SP0201-SP0205	4200-6001	17	14.1 x 2.4 x 1.1	2.6				
SP1201	4200-6118	10	17.4 x 4 x 1.8	3.1	4200-6121	10	17.7 x 4 x 1.8	4.6
SP1202								
SP1203	4200-6119	16	17.4 x 4 x 1.8	3.1	4200-6120	16	17.7 x 4 x 1.8	4.6
SP1204								
y2201	4200-6210	32	17 x 6.1 x 2.2	4.4	4200-6211	32	17 x 6.1 x 2.2	7.3
y2202								
y2203								
y3201	4200-6307	75	16.3 x 10 x 2.4	7.7	4200-6306	75	16.8 x 10 x 2.4	11.2
y3202								
y4201	4200-6406	101	11.8 x 9 x 4	8.8	4200-6405	101	11.8 x 8.2 x 3.6	17.2
y4202								
y4203								
SP5201	4200-6503	164	11.8 x 9.8 x 4.7	15	4200-6501	165	11.8 x 9.8 x 4.7	17.6
SP5202								

y = SK for Commander SK, or SP for Unidrive SP

DC and Servo Drive EMC Filters

DC Drives

Drive Order Code	Armature Supply Filter			Field Supply Filter		
	Order Code	Dims. (in.) H x W x D	Weight (lbs.)	Order Code	Dims. (in.) H x W x D	Weight (lbs.)
230Vac/460Vac, 1Ø						
MP25A4	FN3258-75-52	10.6 x 3.1 x 5.3	6	FN3280H-8-29	5.6 x 5.6 x 3.1	1.8
QMP/MP45A4						
QMP/MP75A4						
MP105A4	FN3258H-180-40	15 x 4.7 x 6.7	13.2			
QMP/MP155A4						
QMP/MP210A4						
QMP/MP350A4	FN3359-800-99	20.1 x 11 x 7	39.7	FN3280H-25-33	7.1 x 6 x 4.5	2.9
QMP400A4/MP420A4						
QMP/MP550A4						
QMP/MP700A4						
MP825A4						
MP900A4	FN3359-1600-99	23.1 x 11.8 x 6.3	59.5			
MP1200A4						
MP1850A4						

Servo Drives

Drive Order Code	Filter Order Code	Current (A)	Dims. (in.) H x W x D	Weight (lbs.)
240Vac, 1Ø				
DST1201-4	4200-6000	19	14.1 x 2.4 x 1.14	2.6
EP202, EP204	960307-01	10	6.14 x 2.26 x 1.79	3.0
EP206	960305-01	16	3.36 x 4.68 x 2.26	2.5
EP209	960308-01	20	2.07 x 6.03 x 2.28	3.0
240Vac, 3Ø				
DST1201-4	4200-6001	17	14.1 x 2.4 x 1.14	2.6
EP216	960310-01	16	9.84 x 1.77 x 2.76	1.8
480Vac, 3Ø				
DST1401-5	4200-6002	11	14.1 x 2.4 x 1.14	2.6
MP-1250	MF-1250-20	20	7.28 x 2.75 x 12.67	6.0
MP-2500	MF-2500-35	35	7.28 x 2.75 x 11.81	5.0
MP-5000	MF-5000-65	65	8.66 x 3.74 x 11.81	11.5

Dynamic Braking Resistors

Dynamic Braking (DB)

The DC bus voltage level of an AC drive increases while the motor is re-generating (i.e. ramping to a stop). Dynamic braking resistors provide a means of rapidly stopping a rotating motor and load while maintaining an acceptable bus voltage level. The kinetic energy stored in the spinning mass is converted into electrical energy and quickly dissipated as heat through a resistor. Control Techniques offers resistor kits available for both AC and DC drives.

Dynamic Braking for DC Drives

DC drives provide an exponential stopping profile when a dynamic brake resistor is applied across the motor's armature circuit (when the motor acts as a DC generator). This type of braking can occur only when the drive is configured for coast stop and power has been removed from the motor (stop commanded). To apply a dynamic brake resistor to a DC drive, a motor contactor with a DB pole is required. This motor contactor is standard on Quantum MP drives up through 225hp (400A).

Control Techniques Mentor MP and Quantum MP DC drives are available in regenerative models as an energy efficient alternative to dynamic braking. See the Mentor MP/Quantum MP DC drive brochure for details.



Galvanized NEMA1 with
normally closed thermostat

Dynamic Braking for AC Drives

AC drives provide a constant torque stopping profile when a dynamic brake resistor is applied across the DC bus circuit. Dynamic braking can be employed under a stop command or anytime a decrease in motor speed is commanded, provided the AC drive is enabled and programmed for ramp stop (fast ramp mode).

Control Techniques offers two types of dynamic braking kits for AC Drives. The E-stop duty kits are rated for light start/stop or deceleration duty cycles.

The cyclic duty kits are intended for heavy duty applications that need the capability to dissipate regenerated energy on a more continuous or repetitive basis such as downhill conveyors, hoists, feeders and dynamometers.

E-Stop Duty

E-stop duty DB resistors are designed for absorbing energy generated by infrequent motor stops or deceleration.

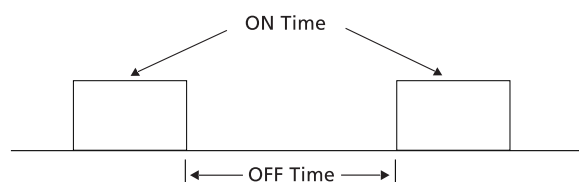
These kits are designed to meet or exceed NEMA standard 7-15-1970, which states "DB resistors will not exceed their rated temperature rise when the drive is braked from maximum speed to standstill three times in rapid succession with a load inertia equal to or less than the motor inertia." They are designed to provide 150% braking torque (peak at max speed for DC drives, constant for AC drives) for 1800rpm base speed motors.

Cyclic Duty

The standard packages listed below are NEMA 1 rated and include built-in junction box, terminal strip, normally closed thermal contact (klixon switch) and resistors pre-wired with high-temperature Teflon wire.

These heavy-duty kits have been designed to provide dynamic braking for cyclic and continuous braking applications. There are three levels available: 10%, 25% and 50%. These levels refer to the continuous allowable braking level (i.e. 25% refers to 25% of rated motor braking torque) or the maximum allowable duty cycle rates with maximum specified "on-time" limitations (refer to illustration below).

$$\text{Duty Cycle} = \frac{\text{On Time } (\leq \text{max "on" time})}{\text{On Time} + \text{Off Time}}$$



Dynamic Braking Resistors for AC Drives

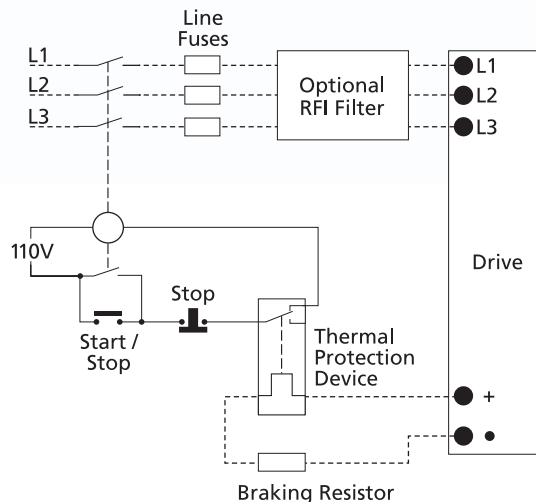
DB Resistors for AC Drives

The Commander SK and Unidrive SP drives are equipped with built-in dynamic braking transistors. Simply select the proper braking resistor needed for the size of drive and duty cycle.

Other mounting arrangements and enclosures are available on request.

The brake circuit must include an external thermal protection device connected (as shown in the circuit diagram) unless the resistor has built-in protection.

Overload Protection



230Vac

Drive Order Code	E-Stop Duty Order Code	Dims. (in.) H x W x D	10% Duty Cycle Order Code	Dims. (in.) H x W x D	25% Duty Cycle Order Code	Dims. (in.) H x W x D	50% Duty Cycle Order Code	Dims. (in.) H x W x D		
SKB1100075*	DBR-0400-00300-ENC	5 x 14 x 4	DBR-0400-00300-ENC	5 x 14 x 4	DBR-0400-00500-ENC	5 x 14 x 7	DBR-0400-00500-ENC	5 x 14 x 7		
SKB1100110*							DBR-0400-01000-ENC	5 x 14 x 10		
SKA1200025	DBR-0800-00300-ENC	5 x 14 x 4	DBR-0800-00300-ENC	5 x 14 x 4	DBR-0800-00300-ENC	5 x 14 x 4	DBR-0800-00300-ENC	5 x 14 x 4		
SKA1200037							DBR-0800-00600-ENC	5 x 14 x 7		
SKA1200055										
SKA1200075										
SKBD200110	DBR-0400-00300-ENC	5 x 14 x 4	DBR-0400-00300-ENC	5 x 14 x 4	DBR-0400-00500-ENC	5 x 14 x 7	DBR-0400-01000-ENC	5 x 14 x 10		
SKBD200150					DBR-0400-01000-ENC	5 x 14 x 10				
SKCD200220					DBR-0200-00400-ENC	5 x 14 x 4	DBR-0200-00600-ENC	5 x 14 x 4	DBR-0200-01500-ENC	5 x 14 x 13
SKDD200300	DBR-0200-03000-ENC	5 x 28 x 13								
SKD3200400			DBR-0400-00300-ENC	5 x 14 x 4					DBR-0400-00300-ENC	5 x 14 x 4
SP0201	DBR-0400-00300-ENC	5 x 14 x 4	DBR-0400-00300-ENC	5 x 14 x 4					DBR-0400-00300-ENC	5 x 14 x 4
SP0202										
SP0203					DBR-0400-00500-ENC	5 x 14 x 7				
SP0204										
SP0205										
SP1201	DBR-0500-00300-ENC	5 x 14 x 4	DBR-0500-00300-ENC	5 x 14 x 4	DBR-0500-00500-ENC	5 x 14 x 7	DBR-0500-01500-ENC	5 x 14 x 13		
SP1202										
SP1203										
SP1204	DBR-0400-00300-ENC	5 x 14 x 4	DBR-0400-00300-ENC	5 x 14 x 44	DBR-0350-01500-ENC	5 x 14 x 13	DBR-0350-01500-ENC	5 x 14 x 13		
y2201	DBR-0200-00400-ENC	5 x 14 x 4	DBR-0200-00600-ENC	5 x 14 x 7	DBR-0200-01500-ENC	5 x 14 x 13	DBR-0200-01500-ENC	5 x 14 x 13		
y2202							DBR-0200-03000-ENC	5 x 28 x 13		
y2203										
y3201	DBR-0055-00600-ENC	5 x 14 x 7	DBR-0055-02000-ENC	5 x 14 x 13	DBR-0055-03000-ENC	5 x 21 x 13	DBR-0055-04500-ENC	5 x 28 x 13		
y3202							DBR-0055-06000-ENC	7 x 29 x 18		
y4201	DBR-0055-02000-ENC	5 x 14 x 13	DBR-0055-02000-ENC	5 x 14 x 13	DBR-0055-04500-ENC	5 x 28 x 13	DBR-0055-09000-ENC	7 x 29 x 18		
y4202									DBR-0055-03000-ENC	5 x 21 x 13
y4203							DBR-0055-12000-ENC	14 x 29 x 18		
SP5201	DBR-0055-02000-ENC	5 x 14 x 13	DBR-0055-03000-ENC	5 x 21 x 13	DBR-0055-09000-ENC	7 x 29 x 18	DBR-0055-18000-ENC	14 x 29 x 18		
SP5202			DBR-0055-04500-ENC	5 x 28 x 13	DBR-0055-12000-ENC	14 x 29 x 18				

y = SK for Commander SK, or SP for Unidrive SP

* 120V input drives

DB Resistors for AC Drives

460Vac

Drive Order Code	E-Stop Duty Order Code	Dims. (in.) H x W x D	10% Duty Cycle Order Code	Dims. (in.) H x W x D	25% Duty Cycle Order Code	Dims. (in.) H x W x D	50% Duty Cycle Order Code	Dims. (in.) H x W x D							
SKB3400037	DBR-1200-00300-ENC	5 x 14 x 4	DBR-1200-00300-ENC	5 x 14 x 4	DBR-1200-00300-ENC	5 x 14 x 4	DBR-1200-00300-ENC	5 x 14 x 4							
SKB3400055					DBR-1200-00800-ENC	5 x 14 x 7	DBR-1200-00800-ENC	5 x 14 x 7							
SKB3400075							DBR-1200-01500-ENC	5 x 14 x 13							
SKB3400110															
SKB3400150															
SKC3400220	DBR-0600-00400-ENC	5 x 14 x 4	DBR-0600-00400-ENC	5 x 14 x 4	DBR-1200-01500-ENC	5 x 14 x 13	DBR-1200-01500-ENC	5 x 14 x 13							
SKC3400300					DBR-0600-01500-ENC	5 x 14 x 13	DBR-0600-01500-ENC	5 x 14 x 13	DBR-0600-01500-ENC	5 x 14 x 13					
SKC3400400															
SKD3400550															
SKD3400750															
SP0401	DBR-1200-00300-ENC	5 x 14 x 4	DBR-1200-00300-ENC	5 x 14 x 4	DBR-0600-01500-ENC	5 x 14 x 13	DBR-0600-03000-ENC	5 x 14 x 13							
SP0402					DBR-1200-00800-ENC	5 x 14 x 7	DBR-1200-00300-ENC	5 x 14 x 4	DBR-0600-04500-ENC	7 x 29 x 18					
SP0403							DBR-0800-00600-ENC	5 x 14 x 7	DBR-1200-00800-ENC	5 x 14 x 7	DBR-1200-00300-ENC	5 x 14 x 4			
SP0404															
SP0405															
SP1401	DBR-0800-00300-ENC	5 x 14 x 4	DBR-0800-00300-ENC	5 x 14 x 4	DBR-1200-01500-ENC	5 x 14 x 13	DBR-0800-00600-ENC	5 x 14 x 7							
SP1402					DBR-0800-01500-ENC	5 x 14 x 13	DBR-0800-01500-ENC	5 x 14 x 13	DBR-0800-01500-ENC	5 x 14 x 13					
SP1403															
SP1404															
SP1405															
SP1406	DBR-0600-00400-ENC	5 x 14 x 4	DBR-0600-00600-ENC	5 x 14 x 7	DBR-0600-01500-ENC	5 x 14 x 13	DBR-0600-01500-ENC	5 x 14 x 13							
y2401	DBR-0200-00600-ENC	5 x 14 x 7	DBR-0200-00600-ENC	5 x 14 x 7	DBR-0200-01500-ENC	5 x 14 x 13	DBR-0200-03000-ENC	5 x 14 x 13							
y2402			DBR-0200-01500-ENC	5 x 14 x 13	DBR-0200-01500-ENC	5 x 14 x 13	DBR-0200-03000-ENC	5 x 14 x 13							
y2403					DBR-0200-04500-ENC	7 x 29 x 18	DBR-0200-03000-ENC	5 x 14 x 13	DBR-0200-04500-ENC	7 x 29 x 18					
y2404							DBR-0200-06000-ENC	7 x 29 x 18	DBR-0200-04500-ENC	7 x 29 x 18	DBR-0200-06000-ENC	7 x 29 x 18			
y3401									DBR-0200-03000-ENC	5 x 14 x 13	DBR-0200-06000-ENC	7 x 29 x 18	DBR-0200-09000-ENC	7 x 29 x 18	
y3402															
y3403															
y4401															
y4402	DBR-0120-03000-ENC	5 x 14 x 13	DBR-0200-03000-ENC	5 x 14 x 13	DBR-0120-09000-ENC	7 x 29 x 18	DBR-0200-12000-ENC	14 x 29 x 18							
y4403	DBR-0120-04500-ENC	5 x 14 x 13	DBR-0120-04500-ENC	5 x 14 x 13	DBR-0120-12000-ENC	14 x 29 x 18	DBR-0120-18000-ENC	14 x 29 x 18							
y4403					DBR-0100-03000-ENC	5 x 14 x 13	DBR-0100-06000-ENC	7 x 29 x 18	DBR-0100-12000-ENC	14 x 29 x 18	DBR-0100-24000-ENC	14 x 29 x 18			
y5401	DBR-0100-04500-ENC	5 x 14 x 13	DBR-0100-06000-ENC	7 x 29 x 18	DBR-0100-18000-ENC	14 x 29 x 18	DBR-0100-36000-ENC	21 x 29 x 18							
y5402	DBR-0100-06000-ENC	7 x 29 x 18	DBR-0100-09000-ENC	7 x 29 x 18	DBR-0100-24000-ENC	14 x 29 x 18	DBR-0100-36000-ENC	21 x 29 x 18							
y6401	DBR-0055-06000-ENC	7 x 29 x 18	DBR-0055-12000-ENC	14 x 29 x 18	DBR-0055-24000-ENC	14 x 29 x 18	DBR-0055-50000-ENC	28 x 29 x 18							
y6402	DBR-0055-09000-ENC	7 x 29 x 18			DBR-0055-36000-ENC	21 x 29 x 18	DBR-0055-60000-ENC	35 x 29 x 18							
SP6411	DBR-0055-06000-ENC	7 x 29 x 18			DBR-0055-24000-ENC	14 x 29 x 18	DBR-0055-50000-ENC	28 x 29 x 18							
SP6412	DBR-0055-09000-ENC	7 x 29 x 18			DBR-0055-36000-ENC	21 x 29 x 18	DBR-0055-60000-ENC	35 x 29 x 18							
SP7411	DBR-0055-12000-ENC	Consult Factory													
SP7412															
SP8411	2x DBR-0055-06000-ENC								7 x 29 x 18 (x2)						
SP8412	2x DBR-0055-09000-ENC								7 x 29 x 18 (x2)						
SP8413	2x DBR-0055-12000-ENC								14 x 29 x 18 (x2)						
SP8414															
SP9411	4x DBR-0055-06000-ENC								7 x 29 x 18 (x4)						
SP9413	4x DBR-0055-09000-ENC								7 x 29 x 18 (x4)						
SP9414	4x DBR-0055-12000-ENC								14 x 29 x 18 (x4)						
SP9415															

y = SK for Commander SK , or SP for Unidrive SP

DB Resistors for AC Drives

575Vac

Drive Order Code	E-Stop Duty Order Code	Dims. (in.) H x W x D	10% Duty Cycle Order Code	Dims. (in.) H x W x D	25% Duty Cycle Order Code	Dims. (in.) H x W x D	50% Duty Cycle Order Code	Dims. (in.) H x W x D
SP3501	DBR-0200-00600-ENC	5 x 14 x 7	DBR-0200-00600-ENC	5 x 14 x 7	DBR-0200-00600-ENC	5 x 14 x 7	DBR-0200-01500-ENC	5 x 14 x 13
SP3502								
SP3503								
SP3504								
SP3505	DBR-0200-01500-ENC	5 x 14 x 13	DBR-0200-01500-ENC	5 x 14 x 13	DBR-0200-01500-ENC	5 x 14 x 13	DBR-0200-03000-ENC	5 x 28 x 13
SP3506								
SP3507								
					DBR-0200-03000-ENC	5 x 28 x 13	DBR-0200-04500-ENC	7 x 29 x 18
					DBR-0200-06000-ENC	7 x 29 x 18	DBR-0200-09000-ENC	7 x 29 x 18

575Vac or 690Vac

Drive Order Code	E-Stop Duty Order Code	Dims. (in.) H x W x D	10% Duty Cycle Order Code	Dims. (in.) H x W x D	25% Duty Cycle Order Code	Dims. (in.) H x W x D	50% Duty Cycle Order Code	Dims. (in.) H x W x D
SP4601	DBR-0150-01500-ENC	5 x 14 x 13	DBR-0150-01500-ENC	5 x 14 x 13	DBR-0150-04500-ENC	5 x 28 x 13	DBR-0150-09000-ENC	7 x 29 x 18
SP4602					DBR-0150-06000-ENC	7 x 29 x 18		
SP4603			DBR-0150-03000-ENC	5 x 21 x 13	DBR-0150-09000-ENC	7 x 29 x 18		
SP4604								
SP4605	DBR-0150-03000-ENC	5 x 21 x 13	DBR-0150-04500-ENC	5 x 28 x 13	DBR-0150-12000-ENC	14 x 29 x 18	DBR-0150-18000-ENC	14 x 29 x 18
SP4606			DBR-0150-06000-ENC	7 x 29 x 18				
SP5601			DBR-0120-06000-ENC	7 x 29 x 18	DBR-0120-18000-ENC	14 x 29 x 18		
SP5602			DBR-0120-09000-ENC	7 x 29 x 18				
SP6601	DBR-0130-06000-ENC	7 x 29 x 18	DBR-0120-12000-ENC	14 x 29 x 18	DBR-0120-24000-ENC	14 x 29 x 18	DBR-0120-36000-ENC	21 x 29 x 18
SP6602								
					DBR-0120-36000-ENC	21 x 29 x 18	DBR-0130-60000-ENC	35 x 29 x 18

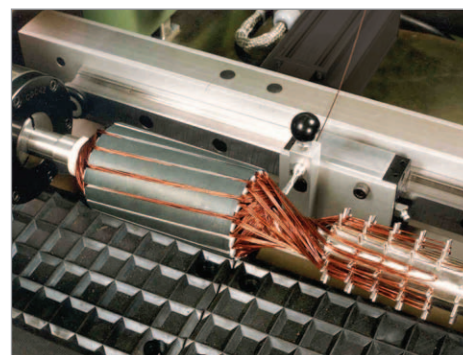
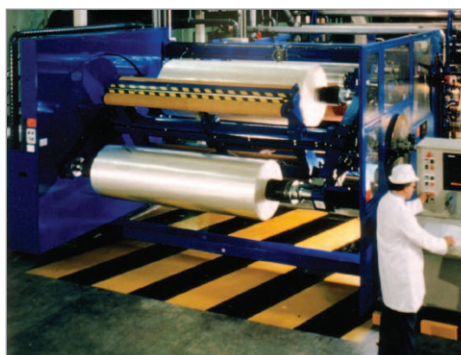


DB Resistors for Servo Drives

115/230/460Vac

Drive/ Module Order Code	Drive kW	Internal Energy Absorption (Joules)	Min Ohms	Drive Heatsink/Internally Mounted			500 Watt UL Listed Panel Mount			500 Watt		
				Order Code (UL Listed)	Watts	Ohms	Order Code	Ohms	Dimensions (HxWxD)	Order Code	Ohms	Dimensions (HxWxD)
DST1201	0.5	26/7 (115V/230V)	23	SM-HEATSINK-DBR0	50	70	MS-530-00-000	30	13.7 x 3.4 x 9.7	DBR-0400-00500-ENC	40	5 x 14 x 7
DST1202	1.2	52/14 (115V/230V)	23									
DST1203	1.6	52/14 (115V/230V)	23									
DST1204	2.3	78/21 (115V/230V)	16									
DST1401	0.8	13/4 (115V/230V)	111							DBR-1200-00800-ENC	120	5 x 14 x 7
DST1402	1.4	13/4 (115V/230V)	111							DBR-0800-00600-ENC	80	5 x 14 x 7
DST1403	2	13/4 (115V/230V)	75							DBR-0400-00500-ENC	40	5 x 14 x 7
DST1404	3	13/4 (115V/230V)	28									
DST1405	4.1	13/4 (115V/230V)	28				MS-530-00-000	30	13.7 x 3.4 x 9.7	DBR-0400-00500-ENC	40	5 x 14 x 7
EP202	0.77	39/8 (115V/230V)	30	SM-HEATSINK-DBR1	50	33	MS-530-00-000	30	13.7 x 3.4 x 9.7	DBR-0400-00500-ENC	40	5 x 14 x 7
EP204	1.27	58/12 (115V/230V)	30									
EP206	1.77	97/20 (115V/230V)	30							DBR-0200-00600-ENC	20	5 x 14 x 7
EP209	2.32	117/24 (115V/230V)	30									
EP216	2.32/4.8	132/28 (115V/230V)	20									
MP-1250	12.5	236/110 (230V/460V)	30							DBR-0400-00500-ENC	40	5 x 14 x 7
MP-2500	25	393/183 (230V/460V)	30							DBR-0200-00600-ENC	20	5 x 14 x 7
MP-5000	50	629/293 (230V/460V)	9				MS-510-00-000	10	13.7 x 3.4 x 9.7			

Drive/Module Order Code	1k Watt			2k Watt			3k Watt					
	Order Code	Ohms	Dimensions (HxWxD)	Order Code	Ohms	Dimensions (HxWxD)	Order Code	Ohms	Dimensions (HxWxD)			
DST1203	DBR-0400-01000-ENC	40	5 x 14 x 10									
DST1204												
EP209	DBR-0400-01000-ENC	40	5 x 14 x 10									
EP216	DBR-0200-01500-ENC	20	5 x 14 x 13									
MP-1250	DBR-0400-01000-ENC	40	5 x 14 x 10				DBR-0300-02000-ENC	30	5 x 21 x 10			
MP-2500												
MP-5000	DBR-0200-01500-ENC	20	5 x 14 x 13	DBR-0100-02000-ENC	10	5 x 14 x 13	DBR-0150-03000-ENC	15	5 x 21 x 13			



DB Resistors for DC Drives

DB Resistors for DC Drives

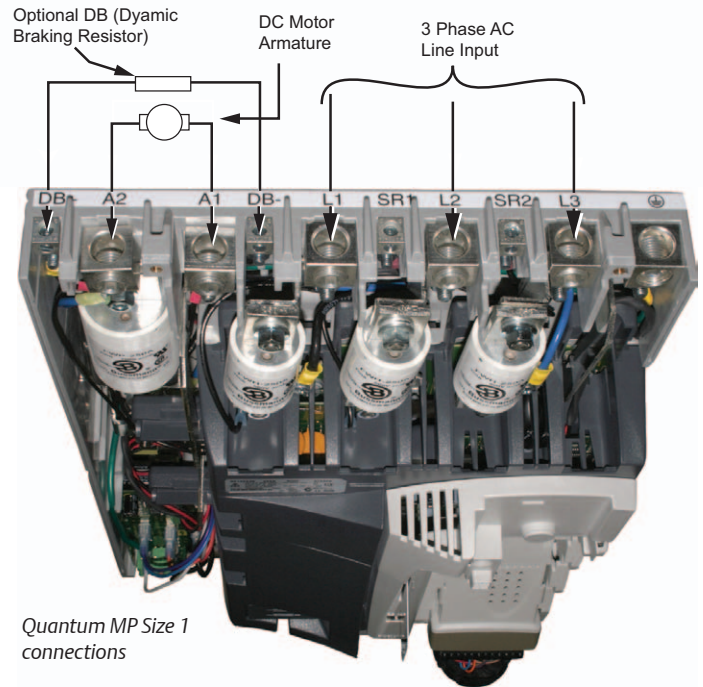
E-stop duty dynamic braking resistors are available to provide for the fast stopping of DC motors.

Quantum MP DC drives up to 400A include a DB Resistor Pole, which is conveniently located adjacent to the main armature connections.

DB resistors are shipped loose and mounted external to the drive (by customer). NEMA 1 enclosure is galvanized steel and meets the UL508A standard.

230Vac DC Drives DB Resistors

HP	Order Code	Ohms	Watts	Dims. (in.) H x W x D
5	005-4301	8	128	5 x 14 x 4
7.5	005-4302	5.5	185	
10	005-4303	4.2	243	
15	005-4304	2.9	351	
20	005-4305	2.2	456	
25	005-4306	1.8	570	
30	005-4307	1.5	674	
40	005-4308	1.1	862	
50	005-4309	0.9	1077	5 x 14 x 7
60	005-4310	0.7	1307	
75	005-4311	0.6	1560	5 x 14 x 10
100	005-4312	0.4	2139	
125	005-4313	0.37	2736	5 x 21 x 10
150	005-4314	0.31	3288	5 x 28 x 13
200	005-4315	0.23	4316	



460Vac DC Drives DB Resistors

HP	Order Code	Ohms	Watts	Dims. (in.) H x W x D
5-7.5	005-4351	24.5	180	5 x 14 x 4
10	005-4352	18.5	240	
15	005-4353	12.3	358	
20	005-4354	9.8	453	
25	005-4355	7.7	560	5 x 14 x 7
30	005-4356	6.5	676	
40	005-4357	4.9	880	
50	005-4358	4	1100	
60	005-4359	3.3	1290	5 x 14 x 10
75	005-4360	3.3	1633	
100	005-4361	2	2151	5 x 14 x 13
125	005-4362	1.6	2698	
150	005-4363	1.4	3388	5 x 21 x 13
200	005-4364	1	4356	
250	005-4365	0.8	5780	5 x 28 x 13
300	005-4366	0.6	6762	
400	005-4367	0.5	9250	8.5 x 29 x 18
500	005-4368	0.4	11560	
600	005-4369	0.32	13317	15.5 x 29 x 18
700	005-4370	0.28	15860	
800	005-4371	0.25	18496	



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