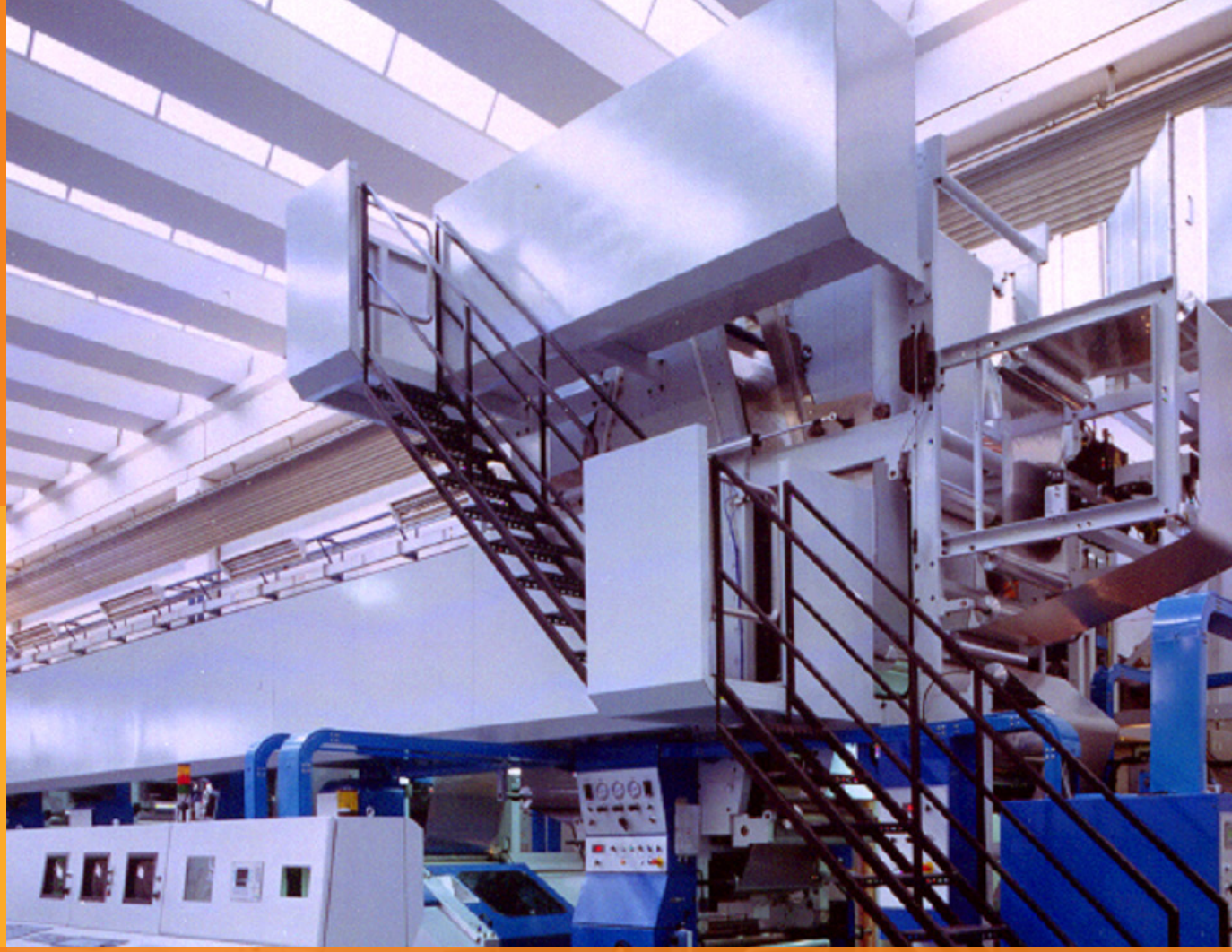


Unidrive SP: Servo

CONTROL TECHNIQUES™

Servo Drive Solutions

0.5 HP - 100 HP Heavy Duty (0.37 kW - 75 kW)
230 V | 460 V

Nidec
All for dreams

Unidrive SP
– Advanced Solutions Platform for Servo Motor Control

Control Techniques' Unidrive SP delivers dynamic performance to operate a wide array of servo motor types and power ratings. Click-in SM option modules allow the addition of programming platforms, distributed or centralized control architecture, I/O, communications and feedback to tailor the solution to specific application needs.

Terminal cover for DC bus, low voltage power supply and on board EMC filter

Smartcard for parameter, PLC program storage

Drive identification marker rail

Optional keypad, available as high- brightness LED or multi-language LCD with plain text

Internal EMC filter with easy disconnect

Power On / Drive Status LED

Aluminum heatsink: drive can be mounted on a flat surface, or through panel mounted so that the heat is dissipated outside the enclosure*

Modbus communications port for PC programming and device interfacing

3 universal SM option module slots for communications, I/O, additional feedback devices and automation/motion controllers*

Universal encoder port supporting Incremental, SinCos, SSI, EnDAT and HIPERFACE encoder types

Relay connections

Power connections with removable terminals*

Plug-in connections with removable terminals*

* Features and their locations vary on some drive sizes

E171230 N1652 ISO 14001 ISO 9001

One Drive, Any Power, Any Motor

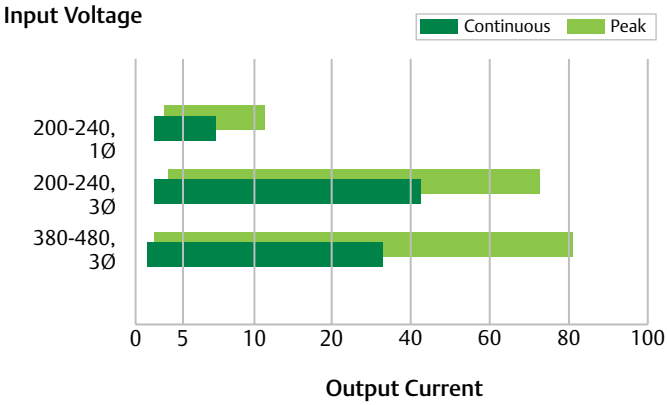
The Unidrive SP is a universal AC/Servo drive featuring field-proven dynamic servo performance with a wide array of power, motor types and click-in SM option modules including programming/automation platforms, distributed or centralized control, I/O, communications and feedback to tailor the solution to your exact needs.

(For full details on the wide range of available option modules, please see the Control Techniques SM Option Modules brochure.)

Panel Mount – Standard Drives

Unidrive SP Panel Mount drives are standard AC input, AC output sizes for installation within a control panel. Optional conduit boxes are available for wall mounting.

Ratings



Performance Advantage

Servo Motor Control
Closed-loop servo motor control and power regeneration control features in one drive

24 Vdc Auxiliary Power Supply Input
Maintains control, network communications and position loop on input AC power loss, minimizing system recovery time

Comprehensive Auto-Tune
Inertia monitoring and static auto-tune reduce startup time

Universal Feedback Interface
Supports 14 different types of feedback devices, including several absolute encoders; multiple encoders can be connected to a single drive with SM option modules

High-Resolution Analog Input
16-bit, 250µsec interface for high-performance applications; two additional 10-bit analog inputs for lower level controls

Extensive Fieldbus Connectivity
Modbus RTU (Standard), PROFIBUS DP, PROFINET RT, EtherNet/IP, EtherCAT, Modbus TCP/IP, DeviceNet, CAN, CANOpen, SERCOS, Interbus-S and CTNet/CTSync optional via zero-space option modules; up to four fieldbus devices can connect to a single drive, eliminating the need for expensive gateways

Universal SM Option Module Slots
Unidrive SP size 0 has two slots; Unidrive SP sizes 1 and up have three option module slots; SM fieldbus, I/O and Application modules fit in any of the open module slots

Safe Torque Off Function
Conforms to IEC61800-5-1, SIL 3 and EN954-1 Category 3 for machine safety and system cost reduction

Smartcard for Simple Set-up and Cloning
Easy-to-use card stores drive configuration for simple startup and parameter cloning — supplied complimentary with every Unidrive SP

Keypad Options
Choose no keypad, LED keypad or LCD keypad based on the system design and operating environment

Drive-Mounted Brake Resistors
Unidrive SP sizes 0, 1 and 2 feature a drive-mounted brake resistor option to reduce panel space requirements

Automation Solutions

Unidrive SP programmable drives provide compact, higher-performance and lower-cost solutions in machinery automation applications. Over the past 30 years, Control Techniques has pioneered the embedding of programmable automation, motion control and communications features within its drive products.

Featured SM Option Modules

To provide the best possible dynamic motor performance, the following Control Techniques SM option modules contain a high-performance microprocessor that allows the base drive to be dedicated to motion control as well as machine control.

SM-EZMOTION

The SM-EZMOTION option module and Control Techniques' complimentary PowerTools Pro software provide a user-friendly environment for easy "out-of-the-box" configuration and motion programming. The EZMotion approach is ideal for rapid development of motion application solutions. The module has four digital inputs and two digital outputs for high-speed I/O operations.

Made-to-Order Drive Configurations

Feature-rich Unidrive SP drives are optimized for servo applications requiring high peak torque, dynamic response, ease-of-use and versatile integration features. Several core configurations are listed below to which feedback, communications and I/O option modules can be added for custom solutions. All in all, there are over 10,000 possible Unidrive SP configurations allowing you to match your specific application and development requirements.

Unidrive SP EZMotion (Base drive + SM-EZMOTION module).

With out-of-the-box motion control in minutes, the Unidrive SP is the ultimate servo drive in terms of ease-of-use and motion performance. Utilizing a familiar Windows® interface, machine builders can use PowerTools Pro software to quickly set-up and program the Unidrive SP "EZ" to perform almost any motion profile. Applications requiring camming, indexing, electronic gearing, velocity and torque modes can be accomplished through simple drag-and-drop, fill-in-the-blank set-up. Real-time programs with "Basic-like" command structured text can be used to program the machine sequencing. The programming interface guides the user through the drive, I/O and motion configurations. The drive offers a standalone solution for many common indexing and synchronized motion applications.

Unidrive SP EZMotion Configuration

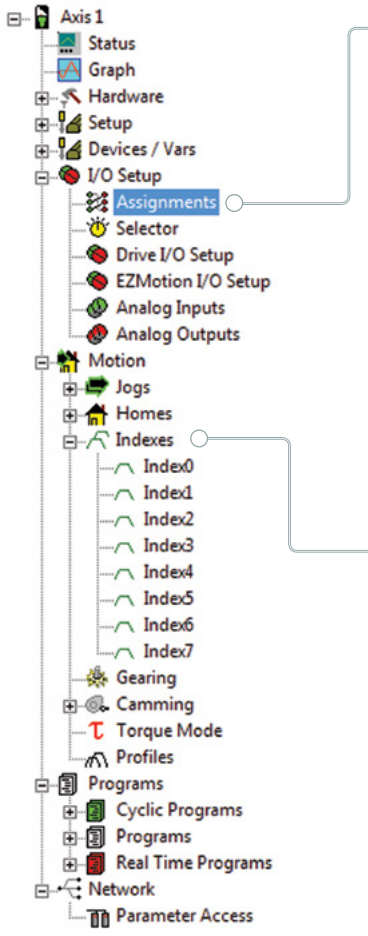
- Control Hierarchy
  - Decentralized Control System
  - Hybrid
  - Standalone Applications
- Motion Control Functionality
  - Velocity, Torque Mode
  - Position-Indexing
  - Synchronization, Electronic Gearing
  - CAMS
- Programming Environment
  - Drag-and-Drop, Fill-in-the-Blank
  - Text Programming
- Application Software Included
  - PowerTools Pro
  - CTScope
  - CTOPCServer

“Motion Made Easy”® Solutions

PowerTools Pro

“Motion Made Easy”®

Each step is configured using simple check boxes, drop-down selections and drag-and-drop functionality. A straightforward programming language allows users to develop more complex applications and advanced sequencing by simply dragging functions onto the work area and dropping them in place.



SOFTWARE INCLUDED

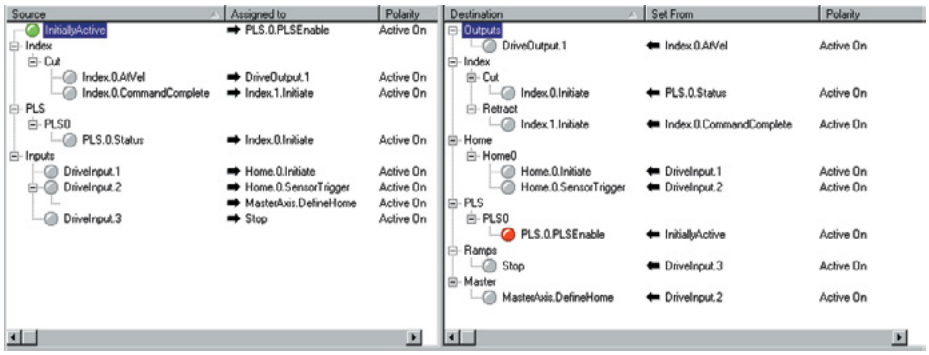
PowerTools Pro Software for Unidrive SP EZMotion

PowerTools Pro software provides advanced motion control programming for Control Techniques drives with internal motion controller. This complimentary software enables users to fully realize the power of our EZMotion motion controller. A familiar Microsoft® Windows® interface provides operators and machine builders with the tools needed to access everything they need for complete servo control — PLS, Queuing, High-Speed Capture, Electronic Gearing, Event Assignments and more.

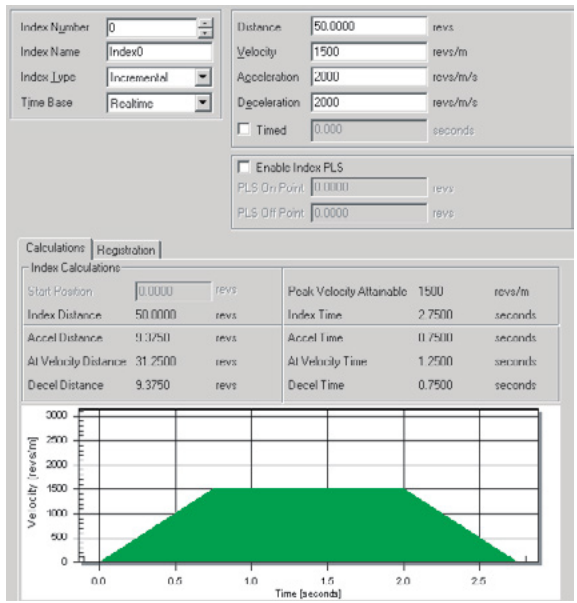
Developing motion applications with PowerTools Pro is a simple five-step, top-down process. The five steps are displayed in a familiar explorer bar (insert, left) for easy navigation:

1. Hardware configuration
2. Drive setup
3. I/O setup
4. Motion
5. Programs

Assignments – Use virtual wiring to create programs right out of the box without writing a single line of code. For example, the assignment screen (below) allows you to drag-and-drop the desired machine function onto the digital inputs and outputs.



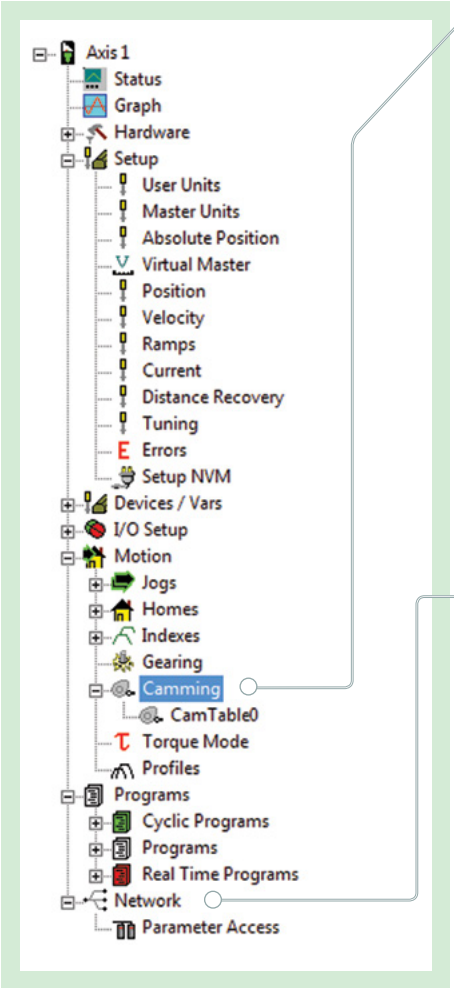
Indexes – Indexes are easily set-up by filling in the screen’s blanks to create an index profile. Select from Incremental, Absolute, Registration or Rotary Plus and Minus types. Position Tracker® synchronization is easily achieved using menu selections. Choose the time base of the index by selecting either real-time or synchronization with a master.



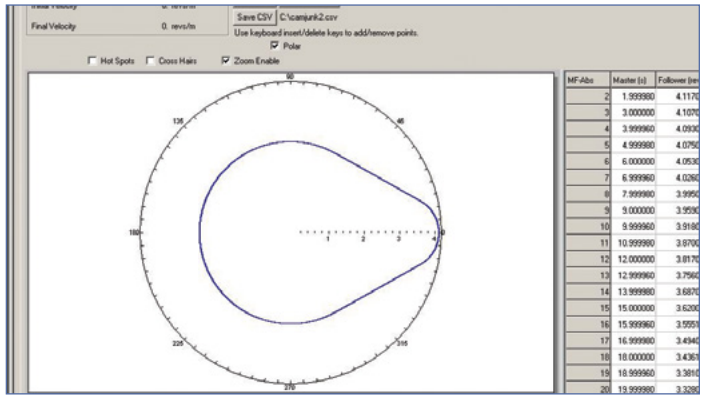
Microsoft and Windows are registered trademarks of Microsoft Corporation in the United States and other countries.

Software Matched to Your Application Requirements

PowerTools Pro continued

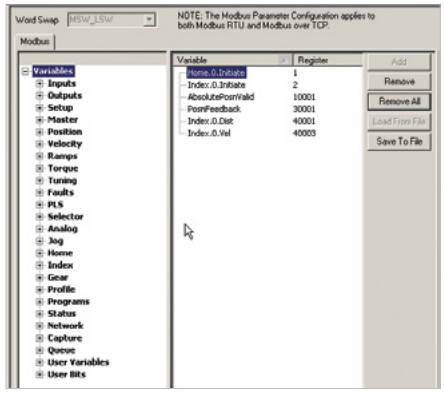


Camming – Cams make set-up and programming of complex motion profiles easy. The use of real-time programs provides smooth transitions when switching between cam profiles on the fly. Cam data is easily imported within PowerTools Pro and the cam graphing tool features multiple interpolation types.

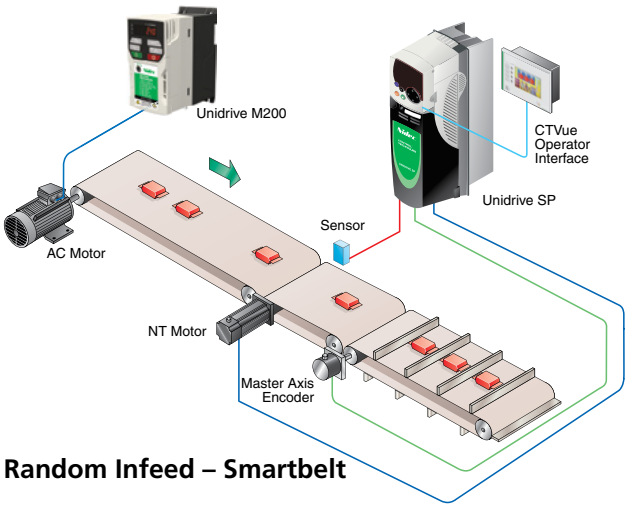


Sophisticated motion routines such as camming, gearing or multiple profile summation are easily implemented with PowerTools Pro and Unidrive SP.

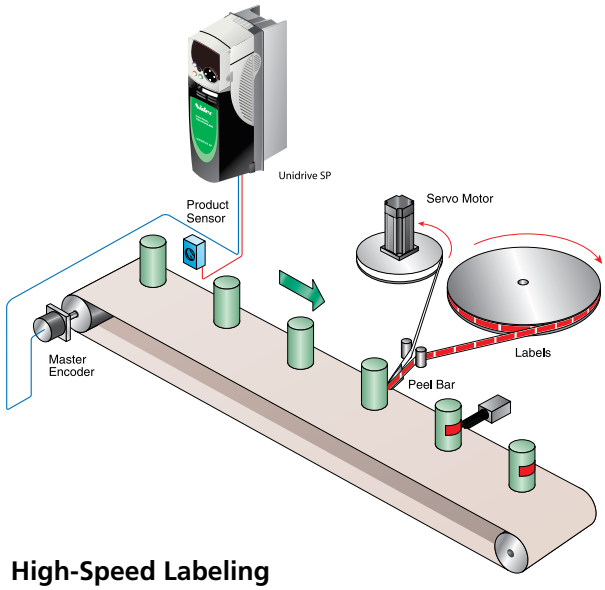
Network – Regardless of the fieldbus being used, setting up network communications is quick and easy. Fill-in-the-blank, drag-and-drop procedures are used to set-up communication. PowerTools Pro's diagnostics allow you to monitor the data being sent and received.



Typical Applications



Random Infeed – Smartbelt



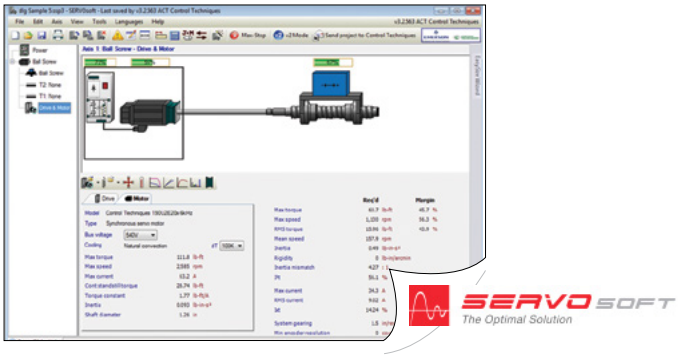
High-Speed Labeling

Additional Software

CTOPC Server

OPC is the industry standard for connecting industrial automation components to higher-level information systems such as SCADA, MRP, ERP and others. Control Techniques' CTOPC server is an OPC-compliant server that allows PCs to communicate with Control Techniques drives via Ethernet, CTNet, RS485 and USB. The OPC standard allows OPC clients to browse data from an OPC server thus eliminating the need for gateway data concentrators or proprietary drivers and gateways. CTOPC server "serves" data to the various OPC clients then polls data from all Control Techniques components connected via Modbus RTU, Modbus TCP/IP or CTNet.

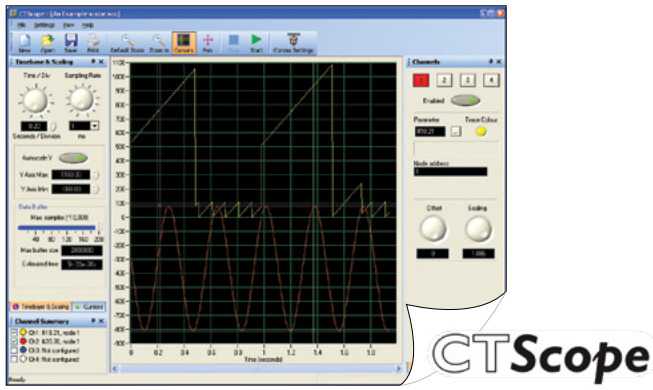
SERVOsoft



SERVOsoft CTA is a standalone software tool designed to help you select the optimum servo drive and motor combination for your machine in 8 easy steps using the EasySize Wizard tool:

1. Select the number of axes and electrical configuration
2. Name the axes to match your machine
3. Select the load type for each axis
4. Define the motion profile for each axis
5. Enter the mechanical characteristics
6. Add any mechanical transmission elements
7. Select drives and motors products from the database
8. Run a system check to ensure the products selected meet all of the desired operating conditions

CTScope



This Windows®-based software utility is designed to trend/trace parameter values on Control Techniques drives and option modules. CTScope has the look and feel of a traditional hardware oscilloscope and can plot up to four channels of data simultaneously. All channel data appears in single-scope view for easy comparison and CTScope files can be saved for future use.

Unidrive SP, fast and easy integration flexibility

Applications with PLC or Motion Functionality

SM-APPS-LITE-V2

SM-APPS-PLUS

CTNET CTSYNC

SM-REGISTER

SM-EZMOTION

PowerTools Pro

SOFTWARE INCLUDED

External Control

Windows 98, NT 4.0, 2000, XP, Vista 32 or 7-compatible PC

USB Port-to-Drive Serial Interface Cable
CT-USB-CABLE

Programmable Logic Controller

Multi-axis Controller

MCz200

Operator Interface Options

Smartcard

Memory device to store and copy drive parameters SMARTCARD

Software

CTSoft
CTScope
OPC FOUNDATION MEMBER

HMI Operator Interface

See the *Options & Accessories* brochure for order codes

LCD Keypad

Remote panel or drive-mount LCD multilingual text keypad display to IP54 (NEMA 12)
SM-KEYPAD-PLUS

LED Keypad

Drive mount LED display to IP65 (NEMA 12)
Size 1 and up.
SM-KEYPAD

LED Keypad

Drive mount LED display to IP65 (NEMA 12)
Size Zero.
KEYPAD-SP0

Interconnect Cable
See the *Options & Accessories* brochure for order codes

Communications

Standard | Options

Modbus RTU

SM-CAN
SM-CANOPEN
SM-DEVICENET
SM-ETHERCAT

SM Option Modules

SM-ETHERNET:
EtherNet/IP, Modbus TCP/IP, email, web server, simple network time Protocol

SM-INTERBUS
SM-PROFIBUS-DP
SM-PROFINET-RT
SM-SERCOS

CANopen
DeviceNet
PROFIBUS

Modbus RTU
Modbus TCP/IP
EtherCAT
EtherNet/IP

Input / Output

Standard | Options

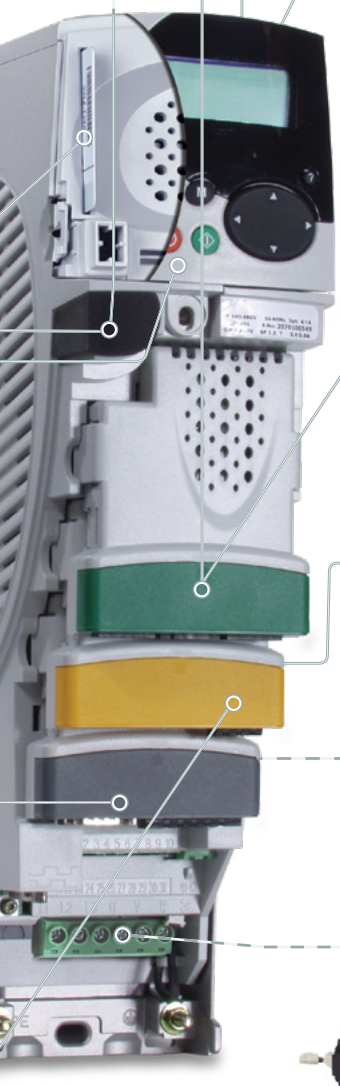
5 Analog input/outputs
7 Digital input/outputs
1 Safe Torque Off

SM Option Modules

SM-I/O-32 (32 digital I/O)
SM-I/O-24 V (protected)
SM-I/O-LITE
SM-I/O-PEL V
SM-I/O-TIMER (Real-Time Clock)
SM-I/O-120 V (120 Vac I/O)
SM-I/O-PLUS

Remote I/O

See the *Options & Accessories* brochure for order codes



Dynamic Braking Options

Filters

Standard | Options

Internal EMC Filter

External EMC Filter

See the *Options & Accessories* brochure for order codes

Internal Zero-Space Braking Resistor

Frame sizes 0 to 2.

See the *Options & Accessories* brochure for order codes

Dynamic Brake Resistors E-Stop or Cyclic Duty

See the *Options & Accessories* brochure for order codes

Feedback

Standard | Options

Sincos Quadrature
Frequency/Direction
Clockwise/Counter Clockwise

EnDat HIPERFACE® ssi

SM Option Modules

SM-UNI-ENCODER*
SM-ENCODER-OUT**
SM-ENCODER-PLUS**
SM-RESOLVER

* Accepts and replicates incremental and absolute feedback types. Recommended for servo and positioning applications

**For use with Induction motors and incremental feedback devices.

Installation Accessories

DC Back-up Power Supply

24 Vdc Control

48-96 Vdc Power

Conduit Boxes

Available on sizes 1 to 6 for wall-mount applications

See the *Options & Accessories* brochure for order codes

Servo Motors & Motor Cables

XV Motors

Motor Power Cable*

Motor Feedback Cable*

Motor Brake Cable *

XV Motors 130mm

Motor Power Cable (+Brake)*

Motor Feedback Cable *

NT Motors

Motor Power Cable*

Motor Feedback Cable *

Motor Brake Cable*

Unimotor FM

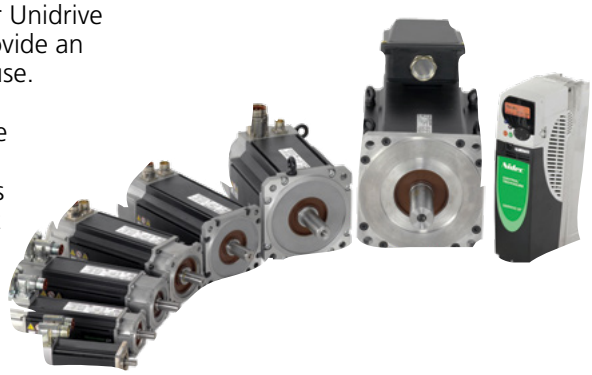
Unimotor HD

Motor Power Cable (+Brake)**

Motor Feedback**

Motors to Match Your Application Needs

The Unidrive SP supports 14 feedback devices as standard for flawless operation with nearly any servo motor or actuator to fit a wide range of motion control needs. Control Techniques manufactures several matched motor solutions for Unidrive SP servo drives. Control Techniques drive-and-motor combinations provide an optimized system in terms of ratings, performance, cost and ease-of-use. Some motors fitted with high-resolution SinCos or absolute encoders are pre-loaded with the motor "electronic nameplate" data during the manufacturing process. This data can be read by Control Techniques' servo drives and used to automatically optimize the drive settings. This feature simplifies commissioning and maintenance, ensures consistent performance and saves time.



Servo Motor Product Matrix

	Unimotor fm	Unimotor hd	NT Series	XV Series
Motor Family				
Drive Voltage	230 V / 460 V	230 V / 460 V	230 V	230 V
Continuous Stall Torque	Up to 1204 lb-in (136 Nm)	Up to 752 lb-in (85.0 Nm)	Up to 56 lb-in (6.3 Nm)	Up to 101 lb-in (11.4 Nm)
Flange	IEC (NEMA option)	IEC	IEC, NEMA	Metric
Frame	75, 95, 115, 142, 190, 250 mm	55, 67, 89, 115, 142, 190 mm	2, 3 in	40, 60, 80, 130 mm
Inertia	Med. (high inertia option)	Low	Low	Low, medium
Peak Torque	Up to 3611 lb-in (408 Nm)	Up to 2257 lb-in (255 Nm)	Up to 144 lb-in (16.2 Nm)	Up to 301 lb-in (34 Nm)
Base Speeds	Up to 6000 rpm	Up to 6000 rpm	Up to 5000 rpm	Up to 5000 rpm
Brake Options	24 Vdc Holding Brake			
Connector Options	Circular style frame-mounted 90° and rotatable; optional 90° fixed, vertical, or mixed	Circular style frame mounted 90° and rotatable	MS or circular style frame mounted, MS style on 40-in lead, flying leads, drive connector terminated leads (20 ft max.)	AMP Mat-n-Loc on 1-ft. lead (40 to 80 mm); MS style frame-mounted (130 mm)
Feedback Options	Incremental encoders, SinCos single- and multi-turn, SinCos single and multi-turn, resolver, HIPERFACE® and EnDat	Incremental encoders, SinCos single- and multi-turn, SinCos single and multi-turn, resolver, HIPERFACE® and EnDat	Incremental 2048 line count	Incremental 2048 line count
Ingress Protection	IP65	IP65	IP65, IP67, IP68	IP55, IP65
Approvals	CE, UL, RoHS	CE, UL, RoHS	UL, RoHS	CE, UL, RoHS
Shaft Seals	✓	✓	✓	

Assembled in the U.S.A.

Assembled in the U.S.A.

Assembled in the U.S.A.

Selecting the Right Motor for the Right Drive

Control Techniques' drive-and-motor combinations provide an optimized system in terms of ratings, performance, cost and ease-of-use. Use SERVOsoft software to select system components or manually select the system using the following steps.

1. Determine the application's continuous and peak torque requirements at various motor shaft speeds, then refer to motor data tables and the visual-reference overview on the facing page to help determine which motor family will be most appropriate for the application.
2. Once the motor family is selected, refer to the Control Techniques' *Servo Motors* brochure to select a specific motor that delivers the required torque and speed. Make note of the continuous and peak current (Amps) requirements of the selected motor.
3. Check the ratings tables on page 15 of this brochure to select the drive model that delivers adequate continuous and peak current for the selected motor.
4. Go to the Control Techniques' *Servo Motors* brochure to select motor power and feedback cables for the selected drive and motor combination.

For optimum performance, verify the rotor inertia of the selected motor has a ratio of <10 when calculated with the load inertia using the following equation:

Load inertia / rotor inertia

Note: A gear reducer will reduce the load inertia based on the following equation:

Reflected load inertia = load inertia / (gear ratio)²

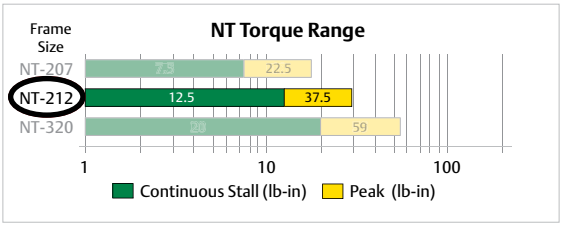
When specifying a motor system, be sure to consider such factors as user-interface (HMI) options, braking resistors and other options and accessories that will enhance the system's performance and value (see the *Options & Accessories* brochure for information and order codes).

Electronic nameplates

Some motors fitted with high-resolution SinCos or absolute encoders are pre-loaded with the motor "electronic nameplate" data during the manufacturing process. This data can be read by Control Techniques' servo drives and used to automatically optimize the drive settings. This feature simplifies commissioning and maintenance, ensures consistent performance and saves time.

Example (using Control Techniques' NT Motor family and Unidrive SP servo drive family):

Step 1: The application requires 10 lb-in continuous torque. The input voltage available is 230 Vac.



Step 2: The Control Techniques *Servo Motors* brochure lists the NT-212 motor with 2.7 A continuous torque and 6 A peak.

Step 3: Select the Unidrive SP drive with adequate current rating.

Frame Size	200-240 Vac +/- 10% 3Ø (kW@220 V, HP@230 V) Order Code	Normal Duty Max Continuous Current (A)	Normal Duty Motor Power (HP)	Normal Duty Typical Output (kW)	Heavy Duty Max Continuous Current (A)	Heavy Duty Motor Power (HP)	Heavy Duty Typical Output (kW)
0	SP0201	2.2	0.5	0.37	2.2	0.5	0.37
	SP0202	3.1	0.75	0.55	3.1	0.75	0.55
	SP0203	4	1	0.75	4	1	0.75

Step 4: Select the appropriate power and feedback cables.

NT Motor Specifications

Motor Model	Rated Torque lb-in (Nm)	Cont. Stall Current Arms	Peak Current Arms	Motor Resistance Ohms	Motor Inductance mH	Max Operating Speed rpm	Inertia lb-in-sec² (kgm²)	Motor Ke Vrms/ krpm	Motor Kt lb-in/ Arms (Nm/Arms)	Motor Weight lb (kg)
NT-207	7.5 (.85)	1.7	3.6	11.1	39.1	5000	0.000094 (0.000011)	35	5.12 (.58)	3 (1.36)
NT-212	12.5 (1.4)	2.7	6	4.56	18.9	5000	0.000164 (0.000018)	35	5.12 (.58)	4 (1.82)
NT-320	20 (2.2)	5.4	16.2	1.5	16.0	4000	0.000328 (0.000037)	29	3.50 (.40)	6 (2.72)

Standard Features

Smartcard

The Smartcard is a memory device that is supplied with every Unidrive SP and can be used to backup parameter sets and PLC programs and copy them from one drive to another.

- Parameter and program storage
- Simplify drive maintenance and commissioning
- Quick set-up for sequential build of machines
- Machine upgrades can be stored on a Smartcard and sent to the customer for installation

SMARTCARD

Internal Dynamic Braking Resistors

During deceleration, the kinetic energy stored in the spinning mass of the motor/load combination is converted to electrical energy which recharges the drive's DC bus. Dynamic braking resistors provide a means of rapidly dissipating that energy so that the drive does not fault from the DC bus over voltage trip. The Ohmic value and power rating of the braking resistor is a function of the drive type, size and duty cycle of the application.

A zero-space braking resistor is available for heatsink mounting on Unidrive SP frame sizes 0 to 2. These resistors are designed for low-inertia loads commonly used in servo type applications. For higher inertia loads, the heatsink-mounted resistor may not have enough braking capacity and a larger external resistor may be required. No additional thermal protection device is required with these heatsink-mounted resistor packages.

Frame Size	DC Resistance	Power Rating	Order Code
0	70 Ω	50 W	SM-HEATSINK-DBR0
1	75 Ω	50 W	SM-HEATSINK-DBR1
2	37.5 Ω	100 W	SM-HEATSINK-DBR2

(Drives larger than Size 2 do not have this option.)

Unidrive SP-Compatible Encoders

Encoder Type
Quadrature incremental encoders with or without marker pulse
Quadrature incremental encoders with UVW commutation signals for permanent magnet motors with or without marker pulse
Forward / reverse incremental encoders with or without marker pulse
Forward / reverse incremental encoders with UVW commutation signals for permanent magnet motors with or without marker pulse
Frequency and direction incremental encoders with or without marker pulse
Frequency and direction incremental encoders with UVW commutation signals for permanent magnet motors with or without marker pulse
SinCos incremental encoders
Heidenhain sin/cos encoders with Endat comms for absolute position
Stegmann sin/cos encoders with Hiperface comms for absolute position
SinCos encoders with SSI comms for absolute position
SSI encoders (gray code or binary)
Endat comms only encoders
UVW commutation only encoders*

** This feedback device provides very low resolution feedback and should not be used for applications requiring a high level of performance*

Options

The Unidrive SP provides application and system designers with an incredibly flexible drive platform which is easily modified using an extensive range of sophisticated click-in SM option modules for economical, space saving solutions. SM option modules install easily into any of the three option slots on the Unidrive SP with no tools required. The I/O, feedback, motion control, communication and application modules enhance the Unidrive SP functionality delivering an optimized solution to meet your specific application requirements.

Option	Description	Order Code
Base Drive Configuration and Programming	Cloning and parameter storage card	SMARTCARD[1]
	Configuration software	CTSOFT
	USB 485 communications cable	CT-USB-CABLE
	Keypad to drive cable, 5 ft	SP-LCD-485-005
	Keypad to drive cable, 10 ft	SP-LCD-485-010
	Keypad to drive cable, 15 ft	SP-LCD-485-015
	Keypad to drive cable, 25 ft	SP-LCD-485-025
	Keypad to drive cable, 50 ft	SP-LCD-485-050
	Keypad to drive cable, xxx is cable length in 5 ft increments (max length 100 ft)	SP-LCD-485-xxx
Operator Interface	No keypad option	Standard
	LED keypad (SP size 1 to 6)	SM-KEYPAD[2]
	LED keypad (SP size 0 only)	KEYPAD-SP0[2]
	LCD keypad	SM-KEYPAD-PLUS[2]
	Programmable HMI panels	See the *Options & Accessories* brochure
Power Accessories	Zero-space brake resistor	Based on Drive
	E-Stop duty braking resistor	See page 12
	Cyclic-duty braking resistor	See the *Options & Accessories* brochure
	Zero-space EMC filter	Standard
	External EMC filters	See the *Options & Accessories* brochure
Programmable SM Option Modules	Dedicated motion control	SM-EZMOTION[4]

Option	Description	Order Code
Communications SM Option Modules	Modbus RTU follower	Standard
	DeviceNet	SM-DEVICENET
	PROFIBUS DP	SM-PROFIBUS-DP
	PROFINET RT	SM-PROFINET-RT
	Ethernet (Modbus TCP/IP, EtherNet/IP)	SM-ETHERNET
	INTERBUS-S	SM-INTERBUS
	CANopen	SM-CANOPEN
	EtherCAT	SM-ETHERCAT
	SERCOS	SM-SERCOS
	CTNet, CTSync	SM-APPS-PLUS
	CTNet, CTSync	SM-REGISTER
Feedback SM Option Modules	Universal encoder feedback SM-Universal Encoder Plus	SM-UNI-ENCODER
	Incremental encoder input SM-Encoder Plus	SM-ENCODER-PLUS
	Incremental encoder input and output SM-Encoder Output Plus	SM-ENCODER-OUT
	Resolver feedback	SM-RESOLVER
	Screw terminal connector	SM-ETC
I/O SM Option Modules	Extended analog and digital I/O	SM-I/O-PLUS
	Extra analog and digital I/O	SM-I/O-LITE
	Extended I/O	SM-I/O-32
	Extra I/O with Real-Time Clock/Calendar	SM-I/O-TIMER
	120/240 Vac I/O	SM-I/O-120 V
	Double insulated extended I/O	SM-I/O-PELV
	Remote network I/O	See the *Options & Accessories* brochure
	+24 Vdc protected I/O	SM-I/O-24 V
Safety	Safe Torque Off (STO)	Standard
	High-speed IEC 61800-5-2 functions	SM-SAFETY
Miscellaneous	Conduit entry plates	See the *Options & Accessories* brochure
	IP54 or IP55 cooling fans	(Based on drive)

1 Can be ordered separately, but comes standard with Unidrive SP
2 Must be ordered separately
3 Provides an additional Modbus RTU port (in addition to one on drive)
4 Only one of these modules can be used in a Unidrive SP at a time
5 Requires an SM-Application module

Terminals and Pinouts

RS485	
Pin #	**Function**
1	120 Ω Termination resistor
2	RX TX
3	Isolated 0 V
4	+24 V (100 mA)
5	Isolated 0 V
6	TX enable
7	RX\ TX\
8	RX\ TX\ (if termination resistors are required, link to pin1)
Shell	Isolated 0 V

Control Terminals - Bottom Row		
Pin #	**Function**	**Description**
21	0 V Common	Common for external digital inputs
22	+24 Vdc Output	200 mA max user supply
23	0 V Common	Common for external digital inputs
24	Digital I/O 1	0 to 24 Vdc input, or 1 to 24 Vdc, 240 mA max output digital I/O
25	Digital I/O 2	0 to 24 Vdc input, or 1 to 24 Vdc, 240 mA max output digital I/O
26	Digital I/O 3	0 to 24 Vdc input, or 1 to 24 Vdc, 240 mA max output digital I/O
27	Digital Input 4	0 to 24 Vdc, 6 kΩ digital input
28	Digital Input 5	0 to 24 Vdc, 6 kΩ digital input
29	Digital Input 6	0 to 24 Vdc, 6 kΩ digital input
30	0 V Common	Common for external digital inputs
31	Safe Torque Off	0 to 24 Vdc, 8 µsec typical/20 µsec max sample digital input
41	Status Relay	240 Vac, 2 A resistive normally open
42	Status Relay	240 Vac, 2 A resistive normally open

Power - Line/Motor	
Pin #	**Function**
PE	Ground Connection
L1	Line In
L2	Line In
L3	Line In
U	Motor Connection
V	Motor Connection
W	Motor Connection
GND	Motor Ground

Connection shown for Size 1 unit

Bottom view

Power - DC Connections	
Pin #	**Function**
48 V	48 Vdc
-DC	- DC Bus
+DC	+ DC Bus
BR	Brake Resistor
GND	Ground

Connection shown for size 1 unit
Terminal locations may vary based on unit size

Control Terminals - Top Row		
Pin #	**Function**	**Description**
1	0 V Common	Common for backup power supply
2	+24 Vdc External Input	60 W, 24 Vdc - Backup power supply for control
3	0 V Common	Common for external analog signals
4	10 Vdc source	10 m A max reference supply
5	Analog Input 1+	±10 Vdc 100 kΩ - differential analog input, non-inverting input, 16 bit
6	Analog Input 1-	±10 Vdc 100kΩ - differential analog input, inverting input, 16 bit
7	Analog Input 2	±10 Vdc,100 k Ω or 0-20/ 4-20 mA, 200 Ω single-ended analog input 10 bit
8	Analog Input 3	±10 Vdc, 100 kΩ or 0-20/ 4-20 mA, 200 Ω single-ended analog input 10 bit, motor thermistor input
9	Analog Output 1	±10 Vdc or 0-20 / 4-20 mA single-ended analog output, bi-polar, 10 bit
10	Analog Output 2	±10 Vdc or 0-20 / 4-20 mA single-ended analog output, bi-polar, 10 bit
11	0 V Common	Common for external analog signals

Encoder			
Pin #	**Signal Quadrature**	**ABS**	**Pulse**
1	A	Cos	F
2	A/	Cosref	F/
3	B	Sin	D, R
4	B/	Sinref	D/, R/
5	Z	Data	Z
6	Z/	Data/	Z/
7	U	n/c	U
8	U/	n/c	U/
9	V	n/c	V
10	V/	n/c	V/
11	W	Clock	W
12	W/	Clock/	W/
13	+V	+V	+V
14	0 V Common	0 V Common	0 V Common
15	Thermistor	Thermistor	Thermistor

Specifications, Dimensions, and Ratings

Specifications

Environment

Ambient Operating Temperature	32 to 104 °F (0 to 40 °C) 32 to 122 °F (0 to 50 °C) with derating
Cooling method	Forced convection
Humidity	95% maximum non-condensing at 104 °F (40 °C)
Storage Temperature	-40 to 122 °F (-40 to 50 °C)
Altitude	0 to 9,900 ft (0 to 3000 m). Derate 1% per 328 ft (100 m) between 3280 ft (1000 m) and 9,900 ft (3000 m)
Vibration	Tested in accordance with IEC 60068-2-6, 2-29, 2-64
Mechanical Shock	In accordance with IEC 60068-2-27
Enclosure	NEMA 1 (IP 20), NEMA 12 (IP 54) through-panel mounting
Electromagnetic Immunity	In compliance with EN 61800-3 and EN 61000-6-2, and complies with EN61800-3 2nd environment with built-in filter
Electromagnetic Emissions	In compliance with EN61000-6-4 when the recommended RFI filter is used and EMC installation guidelines are followed

AC Supply Requirements

Voltage	200 to 240 Vac ±10% 380 to 480 Vac ±10%
Phase	3Ø (SP size Zero: 200 to 240 V 1Ø or 3Ø)
Phase Imbalance	2% negative phase sequence (equivalent to 3% voltage imbalance between phases)
Frequency	48 to 65 Hz
Input Power Factor	Displacement 0.97

Control

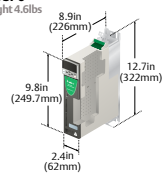
Carrier Frequency	3, 4, 6, 8, 12,16 kHz - Panel Mount drives 3, 4, 6 kHz - Free Standing and SPM drives
Output Frequency	0 to 3000 Hz (Open-loop)
Output Speed	0 to 40,000 rpm (Closed-loop)
Frequency Accuracy	±0.01% of full scale
Frequency Resolution	0.001 Hz
Analog Input	10 bit + sign (Qty 2); 16 bit + sign (Qty 1) resolution
Serial Communications	2-wire RS485 4-wire RS232 or RS485 with SM-APPS module Protocol is ANSI x 3.28-2.5-A4, or Modbus RTU Baud rate 300 to 115,200
Braking	DC injection braking (stopping and holding) and dynamic braking transistor standard.
Control Power Ride Through	Up to 1 second depending on inertia and decel time

Protection

DC Bus Undervoltage Trip	175 / 330 (approximately 124 / 233 line voltage)
DC Bus Overvoltage Trip	415 / 830 (approximately 293 / 587 / 700 Vac line voltage)
MOV Voltage Transient Protection	120 Joules, 1500 Vdc clamping (line-to-line); 140 Joules, 1815 Vdc clamping (line-to-ground)
Drive Overload Trip	Current overload value is exceeded Programmable for Normal Duty or Heavy Duty, open-loop or closed-loop operation
Instantaneous Overcurrent Trip	225% of drive rated current
Phase Loss Trip	DC bus ripple threshold exceeded
Overtemperature Trips	Drive heatsink, control board, and option module(s) monitoring
Short Circuit Trip	Protects against output phase to phase fault
Ground Fault Trip	Protects against output phase to ground fault
Motor Thermal Trip	Electronically protects the motor from overheating due to loading conditions

Dimensions

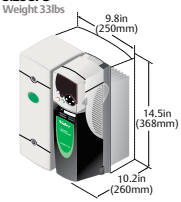
Size SP0
Weight 4.6lbs



Size SP1
Weight 11lbs

Size SP2
Weight 15.5lbs

Size SP3
Weight 33lbs



Ratings

200-240 Vac, 1Ø Input, 3Ø Output

Frame Size	Order Code	Max. Continuous Current (A)	Max. Peak Current (A)	Typical HP	Typical kW
0*	SP0201	2.2	3.3	0.5	0.37
	SP0202	3.1	4.6	0.75	0.55
	SP0203	4	6	1	0.75
	SP0204	5.7	8.5	1.5	1.1
	SP0205	7.5	11.2	2	1.5

200-240 Vac, 3Ø Input and Output

Frame Size	Order Code	Max. Continuous Current (A)	Max. Peak Current (A)	Typical HP	Typical kW
0*	SP0201	2.2	3.8	0.5	0.37
	SP0202	3.1	5.4	0.75	0.55
	SP0203	4	7	1	0.75
	SP0204	5.7	10	1.5	1.1
	SP0205	7.5	13.1	2	1.5
1	SP1201	4.3	7.5	1	0.75
	SP1202	5.8	10.1	1.5	1.1
	SP1203	7.5	13.1	2	1.5
	SP1204	10.6	18.5	3	2.2
2	SP2201	12.6	22	3	2.2
	SP2202	17	29.7	5	3.7
	SP2203	24.2	43.7	7.5	5.5
3	SP3201	31	54.2	10	7.5
	SP3202	42	73.5	15	11

380-480 Vac, 3ø Input and Output

Frame Size	Order Code	Max. Continuous Current (A)	Max. Peak Current (A)	Typical HP	Typical kW
0*	SP0401	1.3	2.2	0.5	0.37
	SP0402	1.7	2.9	0.75	0.55
	SP0403	2.1	3.6	1	0.75
	SP0404	3	5.2	1.5	1.1
	SP0405	4.2	7.3	2	1.5
1	SP1401	2.1	3.6	1	0.75
	SP1402	3	5.2	1.5	1.1
	SP1403	4.2	7.3	2	1.5
	SP1404	5.8	10.1	3	2.2
	SP1405	7.6	13.3	5	3.7
	SP1406	9.2	16.6	7.5	5.5
2	SP2401	13	22.7	7.5	5.5
	SP2402	14.9	28.8	10	7.5
	SP2403	19.9	40.2	15	11
	SP2404	20.5	50.7	15	11
3	SP3401	30.3	56	20	15
	SP3402	33.8	70	25	18.5
	SP3403	33.8	80.5	25	18.5

Notes:
All ratings based on 104° F (40° C) ambient temperature and 6 kHz switching frequency. Refer to the Unidrive SP User Guide for ratings for alternative operating conditions.

** Frame 0 drives can accept quantity 2 SM option modules, all other frames can accept quantity 3.*

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