



## Digital Servo Drive/Controllers

The COMPAX servo drive/controller family is the high-powered cousin to Compumotor's line of Gemini low- to mid-power servo drive/controllers. Providing an ideal solution for motion control systems where 120VAC - 460VAC direct input power is used, the COMPAX family provides up to 35kW continuous/70kW peak drive power for those more demanding high-speed, high-inertia, high-load applications. The COMPAX family is flexible, offering the choice of either standalone or modular packages for single- or multi-axis needs, thereby providing a complete motion control solution in a highly reliable and integrated package.

All COMPAX units incorporate the easy-to-use Servo Manager™ front-end software package – a user-friendly, parameter-based configurator that greatly simplifies setup and programming for software users of any level.

The COMPAX can communicate via ASCII and binary or via a number of supported fieldbus protocols for direct interface with PCs, HMIs and PLCs. Moreover, any standard COMPAX unit can be upgraded with specialized functionality and/or alternative feedback devices, allowing users to tailor the COMPAX to their specific application needs.

This combination of performance, flexibility and expandability makes the COMPAX a powerful and valuable member of the Compumotor servo product family.

### Features

#### Performance

- Eight power ranges available, providing up to 35kW of continuous drive power
- Direct online single or 3-phase power input (120VAC to 460VAC)\*
- Continuous current levels from 2.5 Amps to 50 Amps (RMS); peak current from 5 Amps to 100 Amps (RMS)
- Digital control of position, velocity and torque (current) loops
- High-speed DSP
  - 100 microsecond servo update rate
  - 1 millisecond command processing rate

### CE (EMC and LVD)

#### COMPAX Family Features

- Standalone servo controller and drive in one integrated package
- Control features such as registration, motion profiles, S-curve velocity profiles, conditional statements, arithmetic functions and resolver feedback all standard
- Specialized functions such as following, cam profiling, electronic gearing or cut-on-the-fly available as options for all COMPAX products
- Available in standalone or modular configuration for single- or multi-axis applications
- Serial, binary and fieldbus communication
- PLC-handshaking via onboard I/O
- Comprehensive program monitoring, status and diagnostic features
- Error log—records and stores the four most recent errors
- Easy parameter-based drive setup and motor configuration via the included Servo Manager™ software package
- Guided motor setup and tuning via software tools
- Non-volatile memory for reliable storage of parameters and programs
- Simple, BASIC-style programming language
- Floating point, integer and binary variables with high-level math functionality
- Position or velocity control via external encoder pulse, step/direction† or ±10VDC analog signal†
- Fully CE compliant (EMC & LVD)

\* Input power range depends on COMPAX model

† Optional feature; standard on COMPAX 1000SL

## Introduction

### Protection

- Short-circuit protection—phase-to-phase and phase-to-ground
- Over-voltage protection for both drive and controller sections
- Under-voltage (brownout) protection for both drive and controller sections
- Drive over-temperature protection
- Motor over-temperature protection
- Current foldback protection
- Regeneration protection

### Physical

- Compatible with a wide selection of brushless servo motors, such as the Compumotor SM, BE, NeoMetric, J and M Series motors
- Supports linear servo motors, such as the Daedal LXR and Compumotor SL motor series
- 3-digit LED display\* for monitoring diagnostic status and/or errors related to the following:
  - Controller section
  - Amplifier drive section
  - Fieldbus
- Bus power and 24VDC control power status light
- Built-in regeneration (power dissipation) circuitry on all units; optional external modules available for additional power dissipation capability

### Connectivity

- RS232 ASCII serial communication standard
- Additional communication options:
  - Fieldbus interfaces (Profibus, Interbus-S, CAN Bus, CANopen or CS31)
  - RS485 ASCII/binary (2- or 4-wire)

## COMPAX

### Software Options

- Software variants available for specialized applications, including:
  - Complete position-based following
  - Electronic cam generation and profiling
  - Electronic gearing
  - Cut-on-the-fly applications

### I/O Capabilities

- Onboard digital I/O—16 inputs, 16 outputs (8 inputs, 8 outputs for COMPAX 1000SL)
- Software-configurable onboard digital input and output functionality
- 2 D/A monitor outputs, 1 brake output
- Speed override input and registration input capability
- 24VDC reference voltage for direct interface with PLCs
- Optional I/O features:
  - Additional monitor output (on some models)
  - Encoder signal output‡ (encoder simulation)—to an individual COMPAX unit or multiple COMPAX units via Encoder Bus
  - $\pm 10$ VDC analog input‡

\* Not available on COMPAX 1000SL

‡ Standard on COMPAX 1000SL



For More Information on COMPAX Digital Servo Systems, Call 1-800-358-9070 Today.

## Application Specific Variants

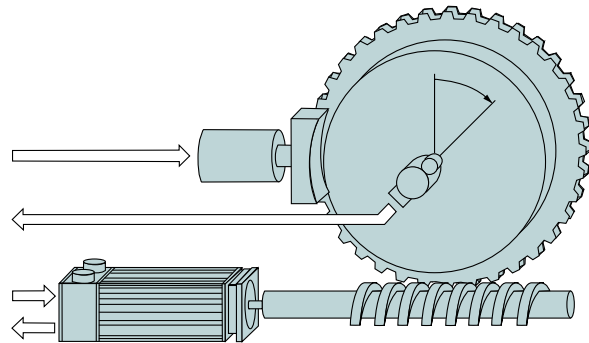
### COMPAX XX30M: Indexing table control

High precision control and positioning of indexing tables and endless assembly chains

**Special features:**

- External position sensing possible with E2 encoder option

- Indexing calculator up to 1000 increments per revolution
- Control of mechanical clamping
- Manual fine adjustment of table position
- No cumulative error



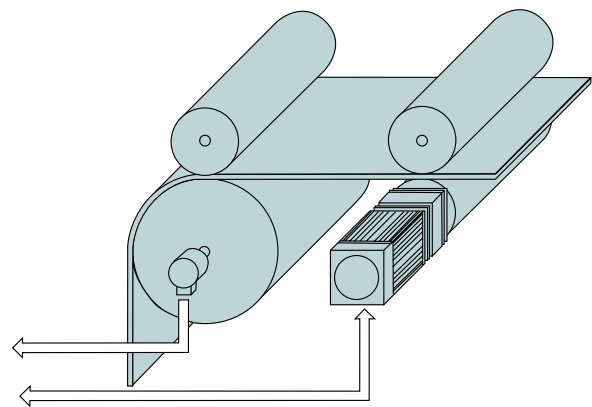
### COMPAX XX60M: Electronic gearing

Synchronous control of angle, synchronous control of speed, processing in motion. Requires E2 or E4 encoder option.

- Electronic gearing
- Processing of moving parts

**Special features:**

- Any desired gear ratio, including negative values
- Synchronous control of angle or rotational speed
- Enable/disable external master reference value
- Internal motion program superimposed on master motion

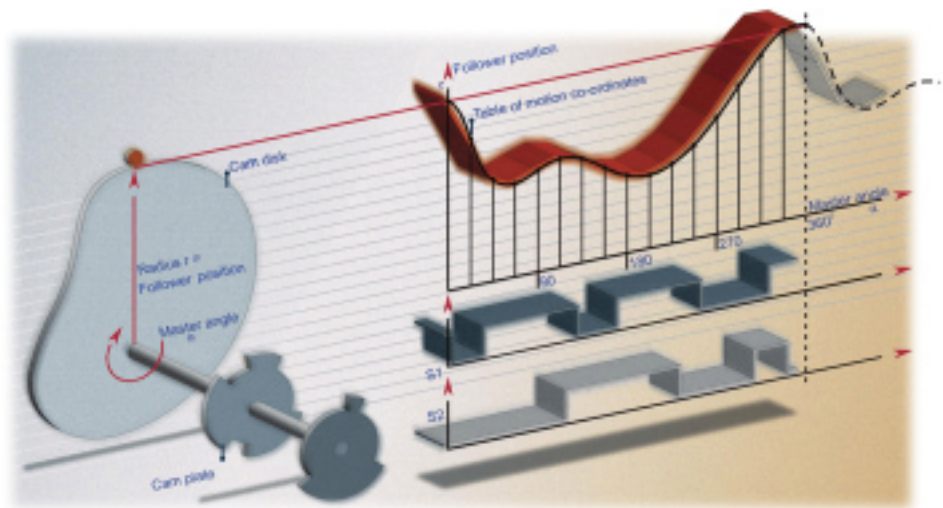


### COMPAX XX70M: Cam control

Replacement of mechanical elements of machines, for example cam plates and discontinuous shaft, camshaft or gear elements. Requires E2 or E4 encoder option

**Special features:**

- Several curves storable
- 8 digital outputs as a function of cam position
- Up to 2500 base points per curve
- Powerful software tool for design and implementation of curves
- Flying synchronization into predefined positions



**COMPAX -S (Standalone) Specifications**

Parameter	Value																																			
<b>Performance</b>	Resolver Accuracy ±10 arc min Resolution 2,048 or 4,096 post quadrature counts per rev																																			
<b>Output Power</b>	<table border="1"> <thead> <tr> <th></th> <th>COMPAX1000SL</th> <th>COMPAX2500S</th> <th>COMPAX4500S</th> <th>COMPAX8500S</th> </tr> </thead> <tbody> <tr> <td>Voltage</td> <td>170VDC or 325VDC</td> <td>325VDC</td> <td>650VDC</td> <td>650VDC</td> </tr> <tr> <td>Frequency Current</td> <td>10 kHz</td> <td>10 kHz</td> <td>10 kHz</td> <td>10 kHz</td> </tr> <tr> <td>Current</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Cont. (max rms per phase)</td> <td>2.5A</td> <td>6.3A</td> <td>6.5A</td> <td>12.5A</td> </tr> <tr> <td>Peak (max rms per phase)</td> <td>5.0A</td> <td>12.6A</td> <td>13.0A</td> <td>25.0A</td> </tr> <tr> <td>Power Dissipation</td> <td>50W</td> <td>80 W</td> <td>170 W</td> <td>170 W</td> </tr> </tbody> </table>		COMPAX1000SL	COMPAX2500S	COMPAX4500S	COMPAX8500S	Voltage	170VDC or 325VDC	325VDC	650VDC	650VDC	Frequency Current	10 kHz	10 kHz	10 kHz	10 kHz	Current					Cont. (max rms per phase)	2.5A	6.3A	6.5A	12.5A	Peak (max rms per phase)	5.0A	12.6A	13.0A	25.0A	Power Dissipation	50W	80 W	170 W	170 W
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<b>Input Power</b>	Max Input Voltage, AC Supply 120-230VAC, 1-Phase Frequency 50/60 Hz AC Supply Tolerance +10%, -15% Voltage (Control) +24VDC ±10%, ripple <1V p-p Fuses Input, AC Supply 16 amp																																			
<b>Protection</b>	Short Circuit Phase to phase, Phase to earth Brownout Below 80VDC Overvoltage Will shut down when power dump capacity is exceeded Overtemperature Motor 170°C (330°F); Drive 85°C (185°F) I <sup>2</sup> t Error generated if peak current > 3 seconds Safety Isolation VDE0160																																			
<b>Inputs</b>	Programmable Enable, Brake, Auto Offset, Mode Select, Limit (NPN type, sinking only) 24V nom. @ 10 mA high = 14-32V, low <7.5V Internal clamp w/ zener diode @ 6.8V, fully optically isolated, sink or source																																			
<b>Outputs Digital</b>	Encoder 5V line driver (RS485) output, TTL compatible, source 60 mA max, requires external +5VDC supply @ 100 mA User selectable 2,048 or 4,096 ppr Programmable: Fault, Error Ready Contact Output PNP type, sourcing only, rated for 24V @ 100 mA fully optically isolated, short circuit protected 125V, 500 mA, 30W maximum																																			
<b>Outputs Analog</b>	Velocity Absolute: 8V = 6,000 rpm Normalized: +10V = max speed Motor Voltage 0.7-10V = 70-1000VDC Current Monitor 1V = 1.2 A for COMPAX 1000SL, 2500S, COMPAX 4500S; 1V = 2.4A for COMPAX 8500S																																			
<b>Physical</b>	<b>Connections</b> Inputs/Outputs 16-pin screw terminal, removable (15-pin D connector on 1000SL) Resolver 15-pin D connector Encoder Output 15-pin D connector RS-232, RS-485 9-pin D connector Motor and brake 8-pin screw terminal, removable (6-pin screw terminal on 1000SL) AC supply 4-pin screw terminal, removable (3-pin screw terminal on 1000SL) Control voltage 2-pin screw terminal, removable Absolute encoder 9-pin D connector (not available on 1000SL)																																			
<b>Environment</b>	Drive temp range (ambient) 0-45° C (32-113° F) Maximum heat sink temp 85° C (185° F) Motor temp range (ambient) 0-40° C (32-104° F) Maximum motor case temp 125° C (257° F) Humidity 0-95% non-condensing Storage -30-85° C (-22-185° F)																																			
<b>Tuning</b>	Position Mode Stiffness, damping, speed feedforward, accel feedforward, current feedforward																																			
<b>Diagnostics</b>	LEDs Ready and error LEDs 3-digit, 7-segment LED display will indicate 23 error conditions and 31 status messages (not available on COMPAX1000SL)																																			

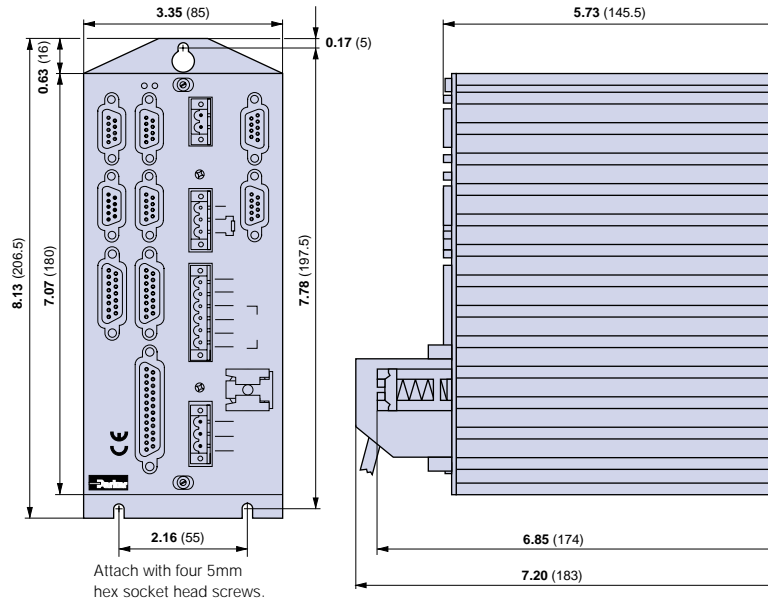
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**COMPAX -M (Modular) Specifications**

Parameter	Value
<b>Performance</b>	Resolver Accuracy Resolution
	±10 arc min 2,048 or 4,096 post quadrature counts per rev
<b>Output Power</b>	<b>COMPAX200M</b> <b>COMPAX500M</b> <b>COMPAX1500M</b> <b>COMPAX3500M</b>
	650VDC from NMD power supply module: see NMD module specs below for additional info
	Voltage
	Frequency Current
	Continuous (max rms per phase)
	Peak (max rms per phase)
	Power Dissipation
<b>Power Supply Module</b>	<b>NMD10</b> <b>NMD20</b>
	Voltage
	Input—AC Supply
	Input—Control
	Output
	Frequency
	Power (max continuous)
	Power (peak <3 seconds)
	Fuses
	Input—AC Supply
<b>Protection</b>	Short Circuit
	Brownout
	Overvoltage
	Overtemperature
	I <sup>2</sup> t
	Safety Isolation
<b>Inputs</b>	Programmable
	Enable, Brake, Auto Offset, Mode Select, Limit
<b>Outputs Digital</b>	Encoder
	Programmable: Fault, Error
	Ready Contact Output
<b>Outputs Analog</b>	Velocity (X8, pin 10) (X8, pin 11)
	Motor Voltage (X8, pin 12)
	Current Monitor
<b>Physical</b>	<b>Connections</b>
	Inputs/Outputs
	Resolver
	Encoder Output
	RS-232, RS-485
	Motor and brake
	AC supply
	Control voltage
	HEDA, Absolute encoder
<b>Environment</b>	Drive temperature ambient
	Maximum heat sink temp
	Motor temperature ambient
	Maximum motor case temp
	Humidity
	Storage
<b>Tuning</b>	Position Mode
<b>Diagnostics</b>	LEDs

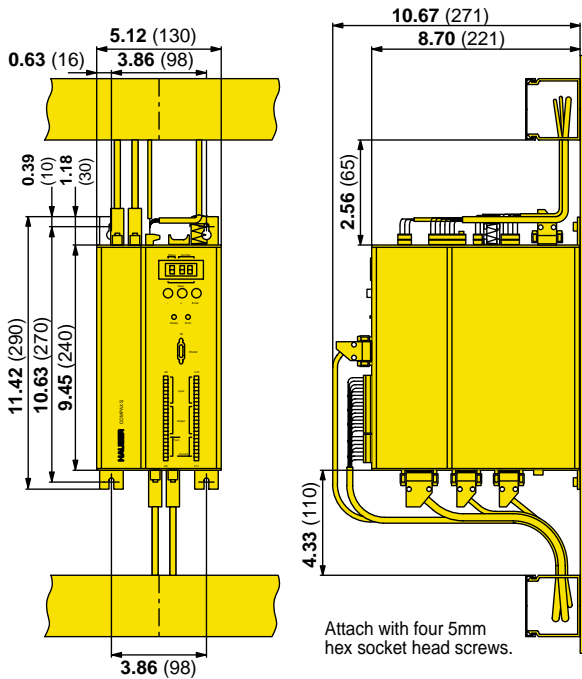
**COMPAX1000SL Dimensions**

Dimensions in inches (mm)



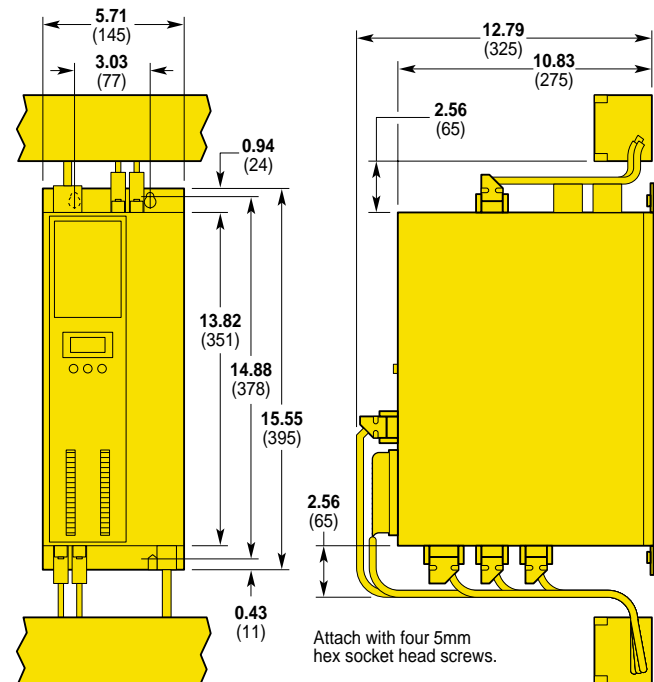
**COMPAX2500S**

Dimensions in inches (mm)



**COMPAX4500S and COMPAX8500S**

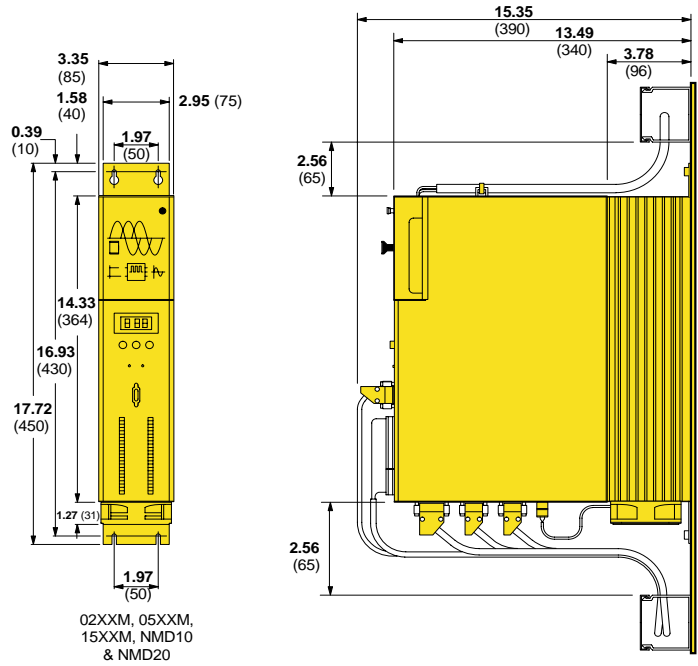
Dimensions in inches (mm)



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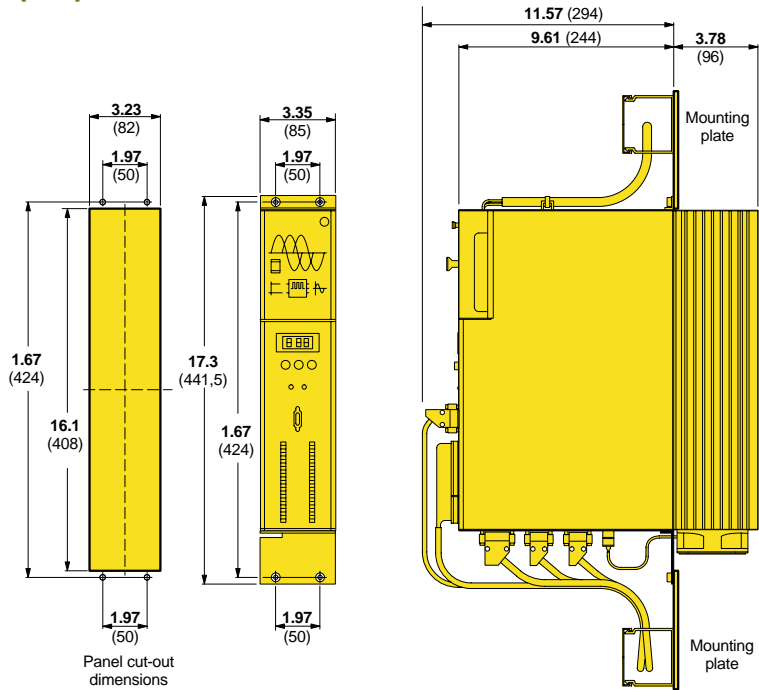
## Mounting Details for direct-panel mounting

Dimensions in inches (mm)



## Dimensions and Mounting Details for through-panel mounting

Dimensions in inches (mm)



All backplate and bracket fixings accept M6 screws.  
For through-panel mounting, use bracket type MTS2/01.

**Ordering Nomenclature**

COMPAX 10  SL /  /   
 COMPAX 25  S /  /   
 COMPAX 45  S /  /   
 COMPAX 85  S /  /   
 COMPAX 2  M /  /   
 COMPAX 5  M /  /   
 COMPAX 15  M /  /   
 COMPAX 35  M /  /

*Power Supply Module*  
 (Required for COMPAX 200M,  
 500M and 1500M)  
**NMD 10**  
**NMD 20**

*Class*  
 S or SL - Standalone unit  
 M - Modular unit

*Application Variant*  
 00 - Standard drive/controller  
 30 - Indexing table control  
 60 - Following / electronic gearing  
 70 - Electronic cam following

*Options*  
 A1 - Absolute Encoder\*  
 D1 - D-to-A monitor w/o box  
 E2 - Encoder input module  
 (individual unit)\*  
 E3 - Encoder simulation output\*  
 E4 - Encoder input module  
 (encoder bus)  
 E7 - Analog input module  
 F1 - RS485, 4 wire  
 F2 - Interbus-S  
 F3 - Profibus  
 F4 - CAN bus  
 F5 - RS484, 2 wire  
 F8 - CAN open  
 S1 - SinCos encoder (single turn)  
 S2 - SinCos encoder (multi turn)  
 S3 - Linear motor support  
 \* Not available on COMPAX1000SL

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## NMD

### Three-phase direct online power supplies

Two central power modules are available to power COMPAX-M drives, with continuous ratings of 10 kW (NMD10) and 20 kW (NMD20). These supplies operate from a 3-phase AC input up to 480V. The DC output is connected to one or more servo drives by jumper cables fitted behind a removable front plate. A separate 24 VDC supply is required to power the control circuits, permitting communication and diagnostic facilities to be retained should the main power supply fail.

Energy regenerated during deceleration will be stored in the power supply capacitors unless the DC bus voltage exceeds a preset level, in which case a ballast resistor is automatically switched in to dissipate the surplus energy. The high-power NMD20 module may be used in conjunction with an external ballast resistor to handle high regenerated energy levels.



#### Power Supply Characteristics

- AC supply voltage: 100-480V +10% -15%
- Supply frequency: 50-60 Hz
- Safety specification: VDE0160
- Control voltage: +24 VDC ±10%, ripple <1V p-p
- Control current: See ratings below
- Standby contact rating: 0.5 A, 125V, 30 W
- Overheating protection: Heatsink temperature >85°C
- Undervoltage protection: DC output <80V
- Overvoltage protection: Braking resistor switched in at preset level
- Phase failure monitoring: Red LED flashes on phase failure, system disabled after 40 seconds

#### Power Supply Ratings

Model No.	Continuous Power	Peak (<3s) Power	AC Supply Voltage	DC Output Voltage	AC Supply Protection*
NMD10	10kW	20kW	480V 3ø	680V	16A
NMD20	20kW	40kW	480V 3ø	680V	35A

\* External cutout or equivalent cartridge fuse, supplied by customer

#### Power Supply Braking & Ballast Ratings

Model No.	Continuous Power Dissipation	Intermittent ratings			DC Bus Capacity	Storable Energy
		Power	Duration	Cooling Time		
NMD10	120W*	4.5kW	<1s 17kW	>50s <50ms	1100µF >10s	173 Ws
NMD20	120W*	3kW	<1s 9.5kW	>50s <50ms	1650µF >10s	260 Ws
BMR4/1†	570W	37kW	<0.4s	>120s	-	-
BMR4/2†	740W	37kW	<0.6s	>120s	-	-
BMR4/3†	1.5kW	37kW	<1.2s	>120s	-	-

\* Increased to 250W with fan option †External ballast used with NMD20

## COMPAX Accessories

### Additional Accessories (Entire Family)

Part	Description
IVD1	Limit switch interface kit
BDF2/01	Hand-held terminal with cable
BDF1/02	Teach pendant without housing, no cable
BDF1/03	Teach pendant with housing, no cable
SSK6/01	Teach pendant cable - 1m
SSK6/02	Teach pendant cable - 2.5m
ASS1/01	D-to-A option junction box with cable

### Power Dissipation Modules/ EMC Accessories (Entire Family)

Part	Description
BRM4/01	.57kW resistor for NMD20
BRM4/02	.74kW resistor for NMD20
BRM4/03	1.5kW resistor for NMD20
BRM5/01	Power dissipation resistor 2500S
BRM6/01	Power dissipation resistor 4500/8500S
BRM7/01	Power dissipation resistor 3500M
MDR01/01	Output throttle/choke - 16A/2mH
MDR01/02	Output throttle/choke - 30A/1.1mH
MDR01/03	Output throttle/choke - >30A/0.64mH
NF11/01	AC line filter - 2500S (for motor cable >10m), 1000SL
NF11/02	AC line filter - 4500S, 8500S, NMD10, 1000SL
NF11/03	AC line filter - NMD20
NF11/04	AC line filter - 3500M
NF11/05	AC line filter - 3500M w/ additional COMPAX -M slave units
NF11/06	AC line filter - 2500S (motor cable ≤ 10m)

### Fieldbus & Communication Cables / Encoder Bus / Feedback Accessories

Part	Description
SSK1/01	RS232 cable - 1m
SSK1/02	RS232 cable - 2.5m
SSK13/01	Fieldbus communication cable - 1m
SSK13/02	Fieldbus communication cable - 2.5m
EAM4/01	Encoder bus distributor
SSK4/01	COMPAX-to-EAM4/01 cable - 1m
SSK4/02	COMPAX-to-EAM4/01 cable - 2.5m
SSK7/01	COMPAX-to-EAM4/01 encoder bus cable - 1m
SSK7/01	COMPAX-to-EAM4/01 encoder bus cable - 2.5m
BUS1/01	Encoder bus terminator
AG100	Absolute encoder with flange
GBK1/02	Absolute encoder cable - 2.5m
GBK1/04	Absolute encoder cable - 7.5m
GBK1/07	Absolute encoder cable - 15m
GBK1/10	Absolute encoder cable - 30m
G71SSLDBIO200-151-15	Incremental master encoder
GBK11/04	Encoder-to-COMPAX cable - 7.5m
GBK11/07	Encoder-to-COMPAX cable - 15m
GBK11/10	Encoder-to-COMPAX cable - 30m

## Compatible Servo Motors

### Compumotor (rotary brushless)

- SM Series (in NEMA 23 frame size)
- BE Series (in NEMA 23, 34 frame sizes)
- NeoMetric Series (in NEMA 34, 70mm and 92 mm frame sizes)
- J Series (in NEMA 34, 70mm and 92 mm frame sizes)
- M Series (in NEMA 105, 145 and 205 mm frame sizes)

See the Servo Motor section of this catalog for specific dimensions and specifications.

### Linear Motors

- Compumotor: SL Series
- Daedal: LXR, HLE Series

### Other supported motors

- HDY (55mm, 70mm, 92mm, 115mm, 142mm, 190mm frame sizes)
- HJ (96mm, 116mm, 155mm, 190mm frame sizes)
- Asynchronous motors

For More Information on COMPAX Digital Servo Systems, Call 1-800-358-9070 Today.

## Selecting a Servo Motor and Cable Set

The following chart describes compatible Compumotor motors and the corresponding cable set for COMPAX drive/controllers.

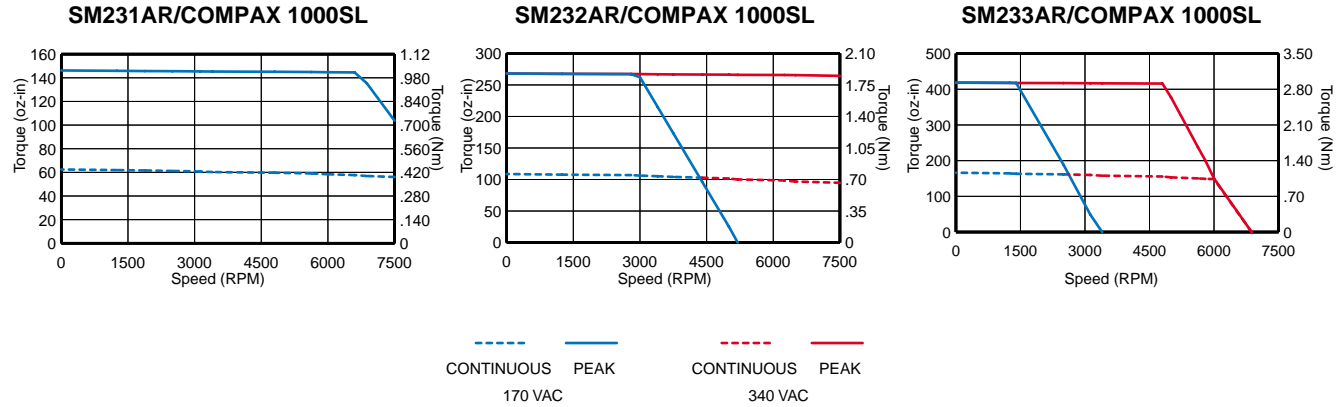
**Motor Connectivity Options**

For complete motor and cable information, please refer to the Motor Cable Table at the end of the Servo Motors section.

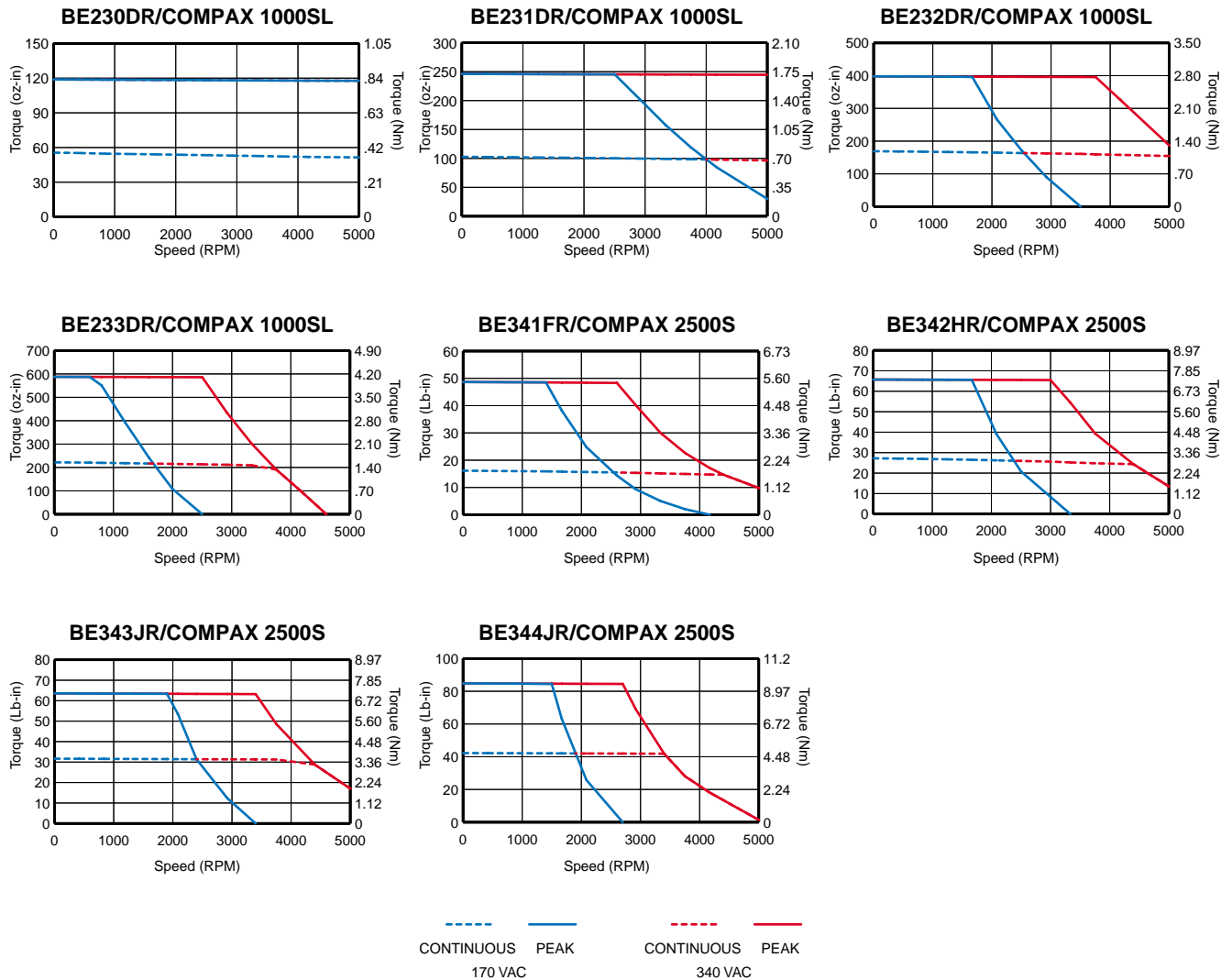
Motor	Cable Set
SM231AR-NMSN	23CX CABLE-xx
SM232AR-NMSN	23CX CABLE-xx
SM233AR-NMSN	23CX CABLE-xx
BE230DR-NMSN	23CX CABLE-xx
BE231DR-NMSN	23CX CABLE-xx
BE232DR-NMSN	23CX CABLE-xx
BE233DR-NMSN	23CX CABLE-xx
BE341FR-NMSN	34CX CABLE-xx
BE342HR-NMSN	34CX CABLE-xx
BE343JR-NMSN	34CX CABLE-xx
BE344JR-NMSN	34CX CABLE-xx
JO341FR-NMSN	34CX CABLE-xx
JO342GR-NMSN	34CX CABLE-xx
JO343GR-NMSN	34CX CABLE-xx
JO701FR-NMSN	70CX CABLE-xx
JO702GR-NMSN	70CX CABLE-xx
JO703GR-NMSN	70CX CABLE-xx
NO701FR-NMSN	70CX CABLE-xx
NO702FR-NMSN	70CX CABLE-xx
NO703GR-NMSN	70CX CABLE-xx
NO704GR-NMSN	70CX CABLE-xx
JO921JR-NMSN	92CX CABLE-xx
JO922HR-NMSN	92CX CABLE-xx
JO923JR-NMSN	92CX CABLE-xx
NO921GR-NMSN	92CX CABLE-xx
NO922JR-NMSN	92CX CABLE-xx
NO923HR-NMSN	92CX CABLE-xx
NO924JR-NMSN	92CX CABLE-xx
M1053KR-KMSN	CALL FACTORY
M1054KR-KMSN	CALL FACTORY
M1453KR-KMSN	CALL FACTORY
M1454LR-KMSN	CALL FACTORY
M1455NR-KMSN	CALL FACTORY
M2052PR-KMSN	CALL FACTORY
M2053RR-KPTN	CALL FACTORY

# Motor Speed-Torque Performance Curves

**COMPAX with SM motors, 23 frame, resolver feedback. 120/240 VAC**



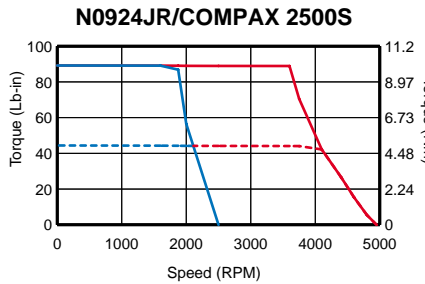
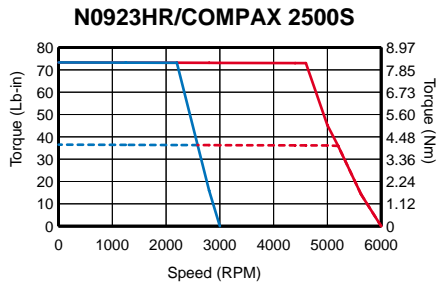
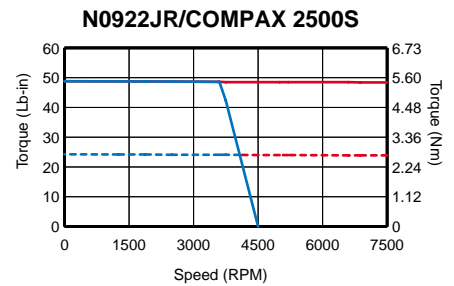
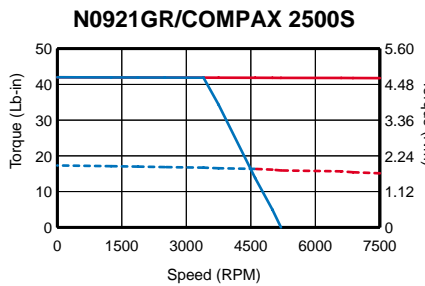
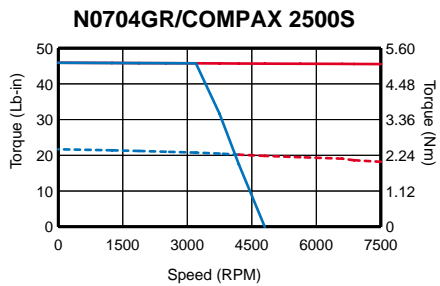
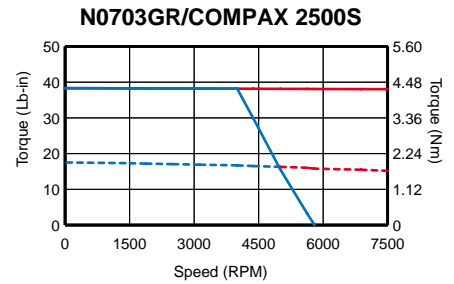
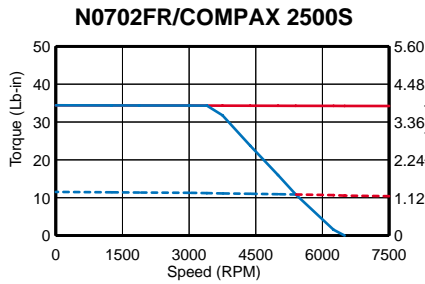
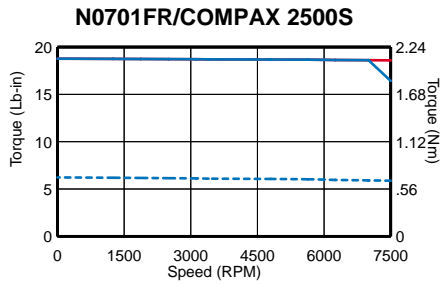
## COMPAX with BE motors – 23 and 34 frame, resolver feedback



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# Motor Speed-Torque Performance Curves

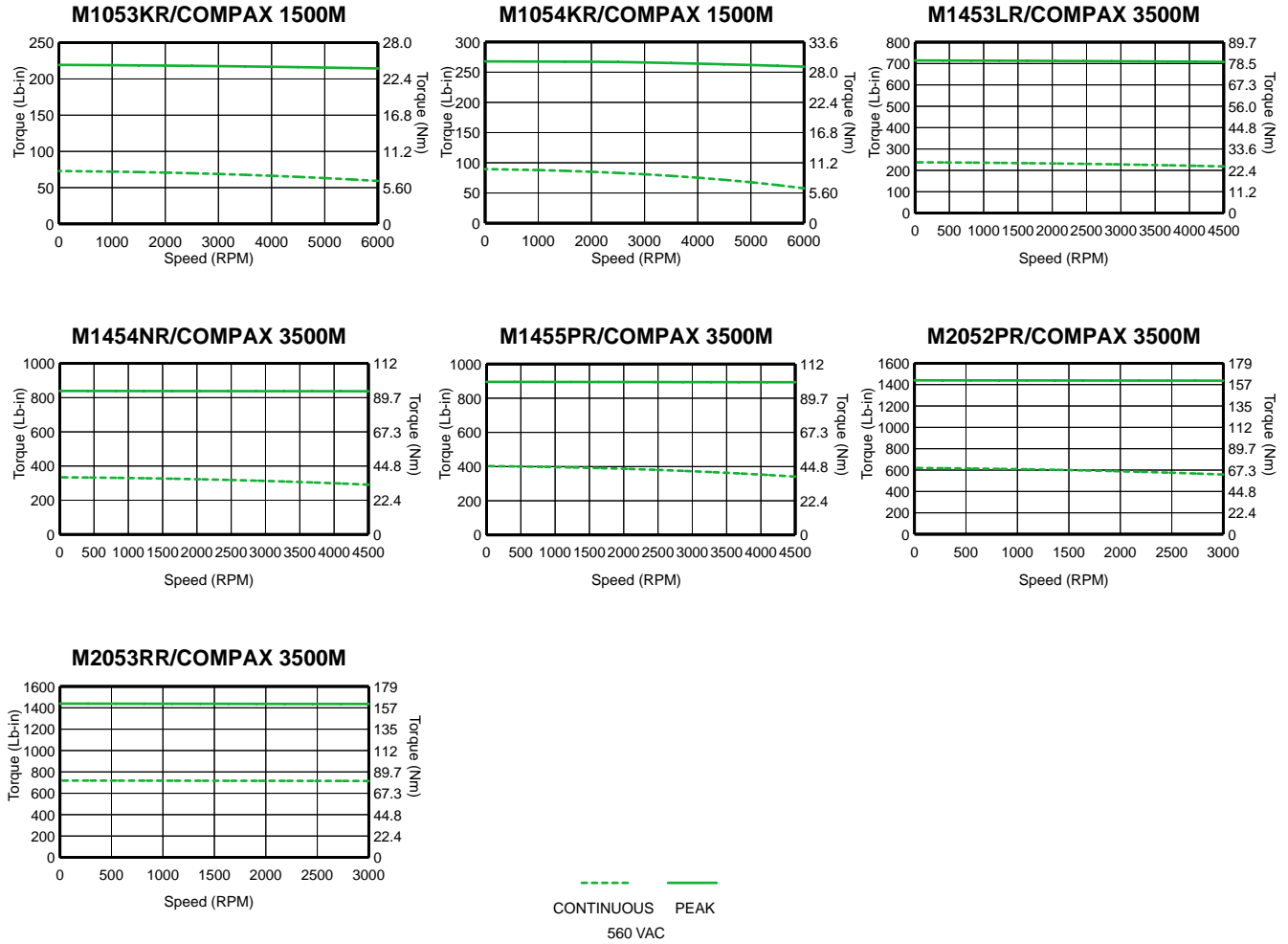
## COMPAX with NeoMetric and J series motors, 70mm and 92mm, resolver feedback, 120/240 VAC



- - - - - CONTINUOUS    - - - - - CONTINUOUS  
 ————— PEAK         ————— PEAK  
 170 VAC                    340 VAC

# Motor Speed-Torque Performance Curves

**COMPAX with M series motors, 105mm, 145mm and 205mm, resolver feedback, 480 VAC**



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