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Brushless Servo Solutions For the OEM

The Making of a Servo System

Servo systems rely on feedback devices to continuously correct for errors in current or torque, velocity, and position. A typical servo system includes a servo controller, amplifier, and motor with a feedback device. The servo amplifier can have varying degrees of complexity and performance. A torque amplifier (e.g. OEM670T) controls only the current loop. A positioning servo (e.g. OEM670SD, OEM675X) accepts encoder feedback to close the position loop.

The OEM670 Family

The OEM 670 family consists of the OEM670 and the OEM675 series of servo drives. These products bring high performance in a small, low cost package. The OEM670 family offers a cost effective solution to a number of fractional horsepower brushless servo applications.

The OEM670 family was designed to operate with Compumotor's SM, NeoMetric, and J Series motors or any standard three phase brushless DC servo motor equipped with Hall effect sensors. The OEM670 family uses three-state current control for efficient drive performance and cooler motor operation. These servo drives are high performance modules which the Original Equipment Manufacturer (OEM) can use to design a motion control system.

The OEM670 family products are small and convenient to use. Units install with only two screws (the screws also provide grounding and captivate the cover). Their right-angle screw terminal allows side-by-side mounting, and their small footprint maximizes cabinet space. The snap-on molded cover is removable for system configuration and helps provide a barrier against environmental contamination. The drives are the same size as a 3U Eurorack card. Their standard 25-pin D connector is compatible with universally available connectors.

Computer Programmable Stand-alone Servo Drives

Compumotor's OEM670X and OEM675X drive/controllers are stand-alone fully integrated servo systems for fractional horsepower applications. Designed to provide greater flexibility and user convenience, the single-axis OEM670X and OEM675X incorporate a built-in RS-232C based controller in the same small package for quick, easy programming. Users can program seven sequences and utilize five programmable inputs and two programmable outputs per unit.

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OEM 670 & 675



and (LVD)

Brushless Servo Drives For High-Volume Applications

Compumotor's OEM670 and OEM675 Series of servo drives were designed for the needs of OEMs and high-volume users with a fractional horsepower motion control application. These products were developed to provide performance, compact packaging, reliability, and power. The OEM670T and OEM675T are torque amplifiers utilizing a ± 10VDC analog input making them directly compatible with industry standard motion controllers. The OEM670SD and OEM675SD drives use the same command interface found on most step motor amplifiers, allowing an easy upgrade from step motors to the higher performance levels found in brushless servo systems.

Although the voltage and current are the same for the OEM670 and OEM675, the OEM670's current compensation loop is optimized for NeoMetric and J Series motors; the OEM675's current compensation loop is optimized for SM and SE motors. We recommend that you use the OEM670 with NeoMetric and J Series motors, and use the OEM675 with SM and SE motors. This provides optimum system transient response for better system performance (easier tuning, better settling time, etc.).

Features

Performance

- Torque Mode operation with OEM670T and OEM675T
- Step & Direction operation with OEM670SD and OEM675SD
- Three-state current control for more efficient drive and cooler motor operation
- Configurable current fold-back
- Plug-in resistors for peak and fold-back current
- Six-state drive design with hall effect sensors for commutation
- Operates with brushless or brushed servo motors
- Several Brushless Servo motors are available from Compumotor providing up to 190 oz-in continous and 570 oz-in peak torque

Reliability

- Short circuit protected—phase-to-phase and phase-to-ground
- Overvoltage circuitry protects the drive from large inertial loads
- Status/fault LED indicators to confirm proper operation
- Enclosed packaging reduces danger of environmental contamination
- Overtemperature circuitry protects the drive from excess heat

Packaging

- Application-specific integrated circuit (ASIC) and surface mount technology minimize product footprint, overall package size, and increase product reliability
- Removable snap-on molded cover for convenient configuration and protection against contaminants
- Heat is dissipated through the mounting surface
- Install with only two screws (also provides grounding and captivates cover)
- Universally available standard 25-pin D connector
- Right-angle screw terminal allows side-to-side mounting, or Eurorack compatibility

Power

- Provides 6 Amps continuous current and 12 Amps peak current
- Single 24-75 VDC power supply input

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OEM670 Torque & Step & Direction Drive Specifications

	Parameter	Value
Power Input	Voltage	24–75 VDC
	Current	0–12 amps
Power Output-Motor	Peak Current	12 A (approx 2 sec max duration at 45°C ambient temperature)
	Continuous Current	6A
	Voltage	90 VDC max
	Peak Power	840 W (1.1 hp) @ 75 V supply voltage
	Continuous Power	420 W (0.56 hp)
	Switching Frequency	20 kHz
	Bandwidth	2 kHz typical (dependent on motor)
	Transconductance	1 volt = 1.2 amp
	Commutation	120° hall effect sensors for six-state commutation method or brushed DC motor
	Short-Circuit Protected	Yes
Power Output-Hall Effect Sensors	Voltage	+5 VDC ±0.5 VDC
	Current	50 mA max
	Short-Circuit Protected	No
Power Output-to Controller Output Stage on OEM670T	Voltage	+15 VDC ±1.5 VDC; -15 VDC ± 1.5 VDC
	Current	10 mA max
	Short-Circuit Protected	No
Power Output-to Encoder on OEM670SD	Voltage	+5 VDC
	Current	200 mA max, each output
	Short-Circuit Protected	No
Control Inputs-OEM670T	Command Input	-10 V to +10 V analog voltage; 1 volt input = 1.2 amp output
	Enable Input	Active LOW: 0–0.8 V @ 2 mA; when disabled: internal 2.49 kΩ pull-up resistor to +5 VDC
Control Inputs-OEM670SD	Step +/Step -	5 V max input; Input current: 12 mA max, 6.3 mA min
	Direction +/Direction -	5 V max input; Input current: 12 mA max, 6.3 mA min; Pos input = Clockwise rotation
Hall Inputs	Low State	0-0.8 V
	High State	Internal 1 kΩ pull-up resistor to +5 V
	Input Frequency	0–2 kHz max
Signal Outputs-OEM670T	Fault Output	Active High: open collector output, max volts = 24 VDC; Inactive LOW: 0-0.4 VDC @ 0-20 mA
	Current Monitor	-10 V to +10 V analog voltage; scale: 1 V corresponds to 1.2 A output; Output Impedance: 10 KΩ
	LEDs	Green = power; Red = various fault conditions
Signal Outputs-OEM670SD	Fault Output-Isolated	50 V max voltage; 10mA max current
	Fault Output-non-isolated	24 V max voltage; 20 mA max current
	Velocity Monitor	1 V per 10kHz pre-quad encoder frequency
	Current Monitor	1 V output per 1.2A motor current; Output Impedance: 10 KΩ
	LEDs	Green = power; Red = various fault conditions
Protective Circuits	Short Circuit	Turns off outputs to motor; latched
	Overtemperature	55°C ±5°C trip temperature; latched
	Overvoltage	95 V ±5 V trip voltage; latched
	Undervoltage	21.5 V max; not latched
	Current Foldback	Configurable with 3 resistors
	Position Error (OEM670SD)	2,047-16,383 post-quad encoder counts
Motor Characteristics	Minimum Inductance	50 µH (micro Henrys)
	Minimum Resistance	0.25 Ω
	Loop Gain Adjustment	Configurable with one resistor
	Motor Type	Compumotor recommends the OEM670 Series with NeoMetric and J Series (slotted) motors and the OEM675 Series with SM Series (slotless) motors.
Environmental	Minimum Temperature	0°C (32°F)
	Max Temperature	45°C (113°F)
	Max Heatplate Temperatsure	45°C (113°F)
	Package Dissipation	Heatplate: 0–30 W, depending on motor current; PP = (I_{AVG}/12 A) 30 W; Cover: 3 watts max
Physical	Power Connector	10-pin screw terminal; 14 awg max wire size
	Input/Output Connector	25-pin D connector
	Approx Dimensions	5" x 1.6" x 3.5" (127 x 41 x 90)
	Weight	OEM670T: 12 oz; OEM670SD: 14 oz

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OEM 670X & 675X



and CE (LVD)

Fully Integrated Controller and Brushless Servo Drives For High Volume Applications

The OEM670X and OEM675X were designed for the needs of OEMs and high-volume users with a fractional horsepower motion control application. Compumotor's OEM670X and OEM675X fully integrated servo systems combine the power, compact packaging, and reliability of the OEM670T/OEM675T torque servo amplifiers with a simple, programmable, built-in, RS232C based servo controller. Users can program seven sequences and have five programmable inputs and two programmable outputs per unit.

The OEM670X and OEM675X are ideal for less demanding motion control applications such as rotary indexing, step-and-repeat, and linear positioning. The "X" version is a cost-effective, single-axis servo system to meet your high-volume application needs.

Although the current and voltage are the same for the OEM670 and OEM675, the OEM670's current compensation loop is optimized for NeoMetric and J Series motors; the OEM675's current compensation loop is optimized for SM and SE motors. We recommend that you use the OEM670 with NeoMetric and J Series motors, and use the OEM675 with SM and SE` motors. This provides optimum system transient response for better system performance (easier tuning, better settling time, etc.).

Features

Performance

- Servo controller and drive in one small package
- Standard RS-232C serial communications interface
- Optional 2 kBytes of battery-backed RAM to store up to 7 command sequences (-M2 option)
- Daisy chaining up to 256 units on one serial port
- Five configurable inputs for remote sequence select, trigger, and home limit, and two dedicated limit inputs.
- Two programmable outputs for machine interaction
- Operates with standard differential, optical encoder for velocity and position feedback
- PID control algorithm used for servo tuning
- Several AC Brushless Servo motors are available from Compumotor providing up to 190 oz-in continous and 570 oz-in peak torque

Reliability

- Short circuit protected: phase-to-phase, and phase-to-ground
- Overvoltage circuitry protects the drive from large inertial loads
- Status/fault LED indicators to confirm proper operation
- Enclosed packaging reduces danger of environmental contamination
- Overtemperature circuitry protects the drive from excess heat

Packaging

- Application-specific integrated circuit (ASIC) and surface mount technology minimize product footprint, overall package size, and increase product reliability
- Removable snap-on molded cover for convenient configuration and protection against contaminants
- Heat is dissipated through the mounting surface
- Install with only two screws (also provides grounding and captivates cover)
- Universally available standard 25-pin D connector
- Right-angle screw terminal allows side-to-side mounting, or Eurorack compatibility
- Overall dimension 5.0 x 3.6 x 1.6 in (127 x 9 x 41 mm)

Power

- Provides 6 amps continuous current and 12 amps peak current
- Single 24-75 VDC power supply input

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OEM670X & 675X Specifications

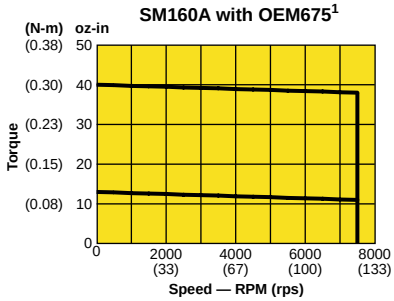
	Parameter	Value
Power Input	Voltage	24–75 VDC
	Current	0–12 amps
Power Output- Motor	Peak Current	12 A (approx 2 sec max duration at 45°C ambient temperature)
	Continuous Current	6A
	Voltage	90 VDC max
	Peak Power	840 W (1.1 hp) @ 75 V supply voltage
	Continuous Power	420 W (0.56 hp)
	Switching Frequency	20 kHz
	Bandwidth	2 kHz typical (dependent on motor)
	Transconductance	1 volt = 1.2 amp
	Commutation	120° hall effect sensors for six-state commutation method or brushed DC motor
	Short-Circuit Protected	Yes
Power Output-Hall Effect Sensors	Voltage	+5 VDC ±0.5 VDC
	Current	50 mA max
	Short-Circuit Protected	No
Hall Inputs	Low State	0-0.8 V
	High State	Internal 1 kΩ pull-up resistor to +5 V
	Input Frequency	0–2 kHz max
Inputs	Programmable Inputs	5 user defined, TTL signal levels: low = 0–0.8 V, high = 2–5 V
	End-of-Travel Limits	CW/CCW, 0-5 TTL signal levels: low = 0–0.8 V, high = 2–5 V
	Enable Input	Active Low: 0-0.8V@2mA; when disabled: Internal 2.49W pull-up resistor to +5VDC
	Encoder	2-phase differential (recommended) or single-ended (+5VDC TTL compatible), 960 kHz max frequency
Outputs	Programmable Outputs	2 user-defined, TTL signal levels: low = 0–0.8 V, high = 2–5 V
	Fault Output	Active High: open collector output, max volts = 24 VDC; Inactive LOW: 0-0.4 VDC @ 0-20 mA
	Current Monitor	-10 V to +10 V analog voltage; scale: 1 V corresponds to 1.2 A output; Output Impedance: 10 KΩ
	LEDs	Green = power; Red = various fault conditions
Performance	Position Range	±1,073,741,823
	Velocity Range	0.01 to 200 rps
	Acceleration Range	0.01 to 9999 rps^2
	Velocity Accuracy	±0.02% of maximum rate
	Velocity Repeatability	±0.02% of set rate
	Resolution	400-65,532 encoder counts/rev
Digital Servo Loop	Update Time	266 µsec
	Output	12-bit DAC
	Servo Tuning	Digital, via RS232C
	Tuning Parameters	PID with digital filter
Protective Circuits	Short Circuit	Turns off outputs to motor; latched
	Overtemperature	55°C ±5°C trip temperature; latched
	Overvoltage	95 V ±5 V trip voltage; latched
	Undervoltage	21.5 V max; not latched
	Current Foldback	Configurable with 3 resistors
Motor Characteristics	Minimum Inductance	50 µH (micro Henrys)
	Minimum Resistance	0.25 Ω
	Loop Gain Adjustment	Configurable with one resistor
	Motor Type	Compumotor recommends the OEM670 Series with NeoMetric and J Series motors and the OEM675 Series with SM Series motors.
Environmental	Minimum Temperature	0°C (32°F)
	Max Temperature	45°C (113°F)
	Max Heatplate Temperature	45°C (113°F)
	Package Dissipation	Heatplate: 0–30 W, depending on motor current; P = (I_{AVG}/12 A) 30 W; Cover: 3 watts max
Physical	Power Connector	10-pin screw terminal; 14 awg max wire size
	Input/Output Connector	25-pin D connector
	Approx Dimensions	5" x 1.6" x 3.5" (127 x 41 x 90)
	Weight	14 oz

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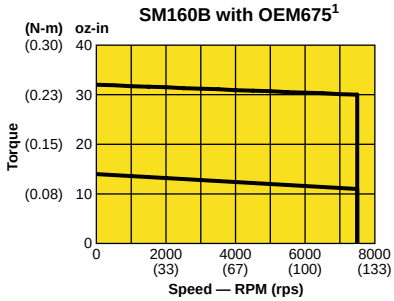
Speed/Torque Curves for SM, SE, NeoMetric, and J Series Motors @ 75VDC[2,3]

Size 16 SM and SE Motors

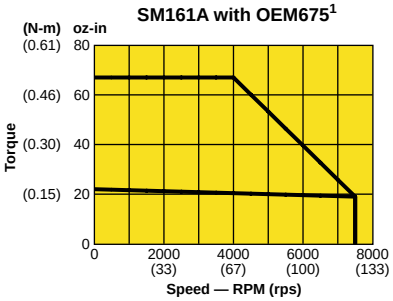
SM160A with OEM675[1]



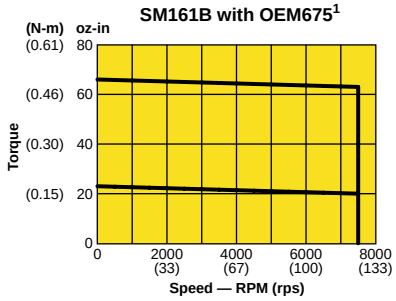
SM160B with OEM675[1]



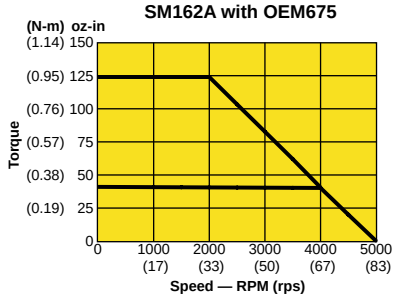
SM161A with OEM675[1]



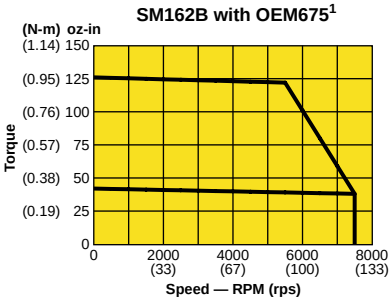
SM161B with OEM675[1]



SM162A with OEM675

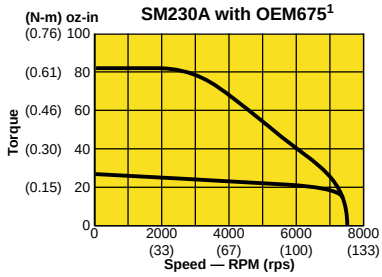


SM162B with OEM675[1]

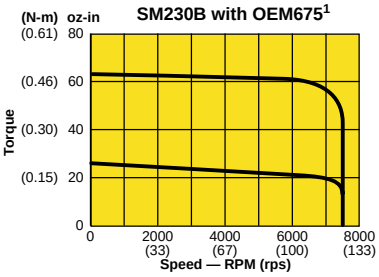


Size 23 SM and SE Motors

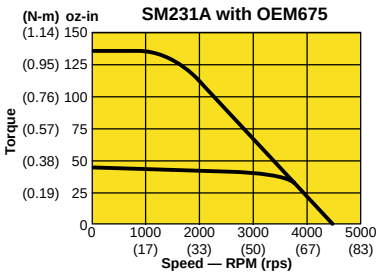
SM230A with OEM675[1]



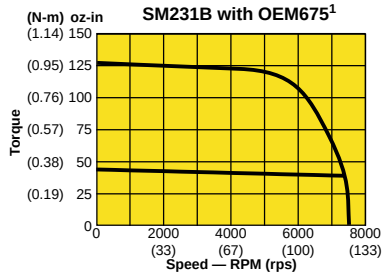
SM230B with OEM675[1]



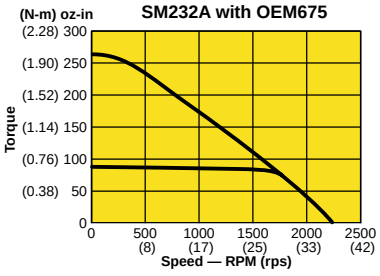
SM231A with OEM675



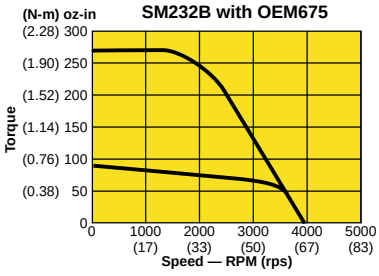
SM231B with OEM675[1]



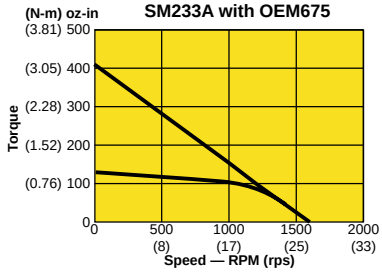
SM232A with OEM675



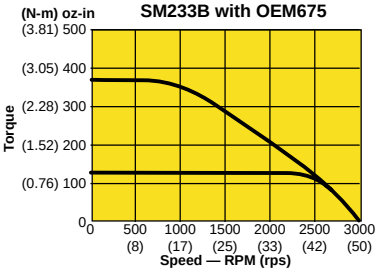
SM232B with OEM675



SM233A with OEM675



SM233B with OEM675



* For motor specifications and dimensions, please refer to the servo motor section.

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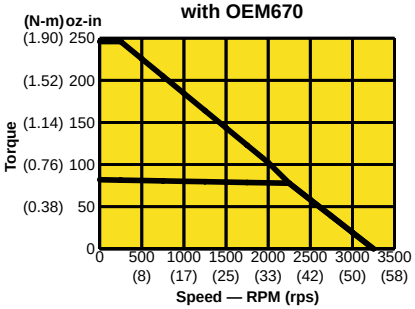
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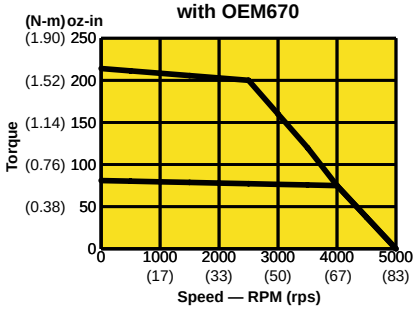
Speed/Torque Curves for SM, SE, NeoMetric, and J Series Motors

Size 70 mm & 34 Frame, NeoMetric & J Series Motors

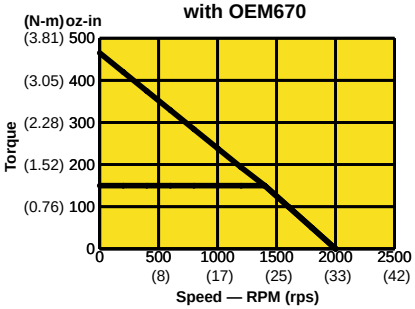
N0701D/N0341D/J0701D/J0341D with OEM670



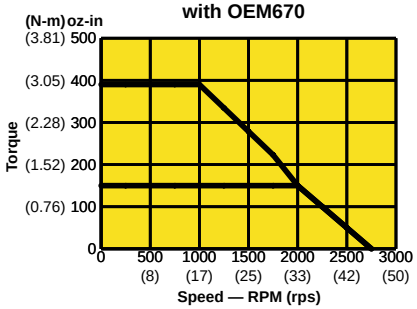
N0701F/N0341F/J0701D/J0341D with OEM670



N0702E/N0342E/J0702D/J0342D with OEM670



N0702F/N0342F/J0702F/J0342F with OEM670



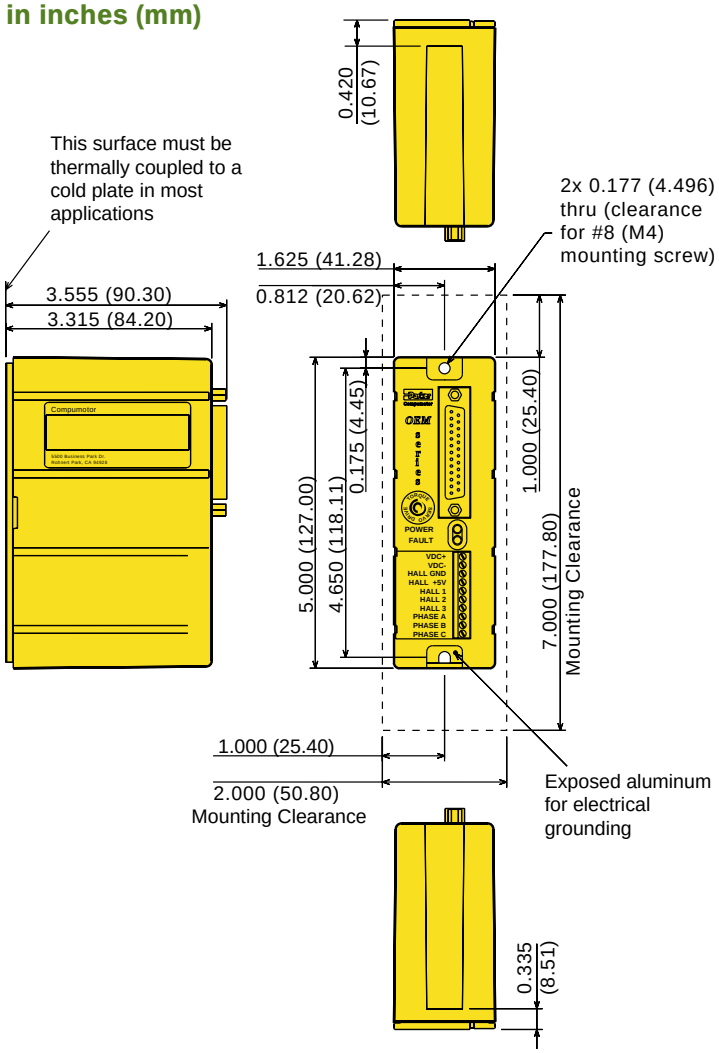
* For motor specifications and dimensions, please refer to the servo motor section.

[1] *With 500 ppr encoders. For 1000 ppr encoders, maximum speed is derated to 6000 rpm.*
[2] *With 75VDC bus voltage; 25°C (77°F) ambient temperature.*
[3] *Although the speed/torque curves are the same for the OEM670 and OEM675, the OEM670's current compensation loop is optimized for NeoMetric and J Series (slotted) motors; the OEM675's current compensation loop is optimized for SM (slotless) motors. We recommend that you use the OEM670 with NeoMetric and J Series motors, and use the OEM675 with SM motors. This provides optimum system transient response.*

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OEM670 and OEM675 Series Dimensional Drawings

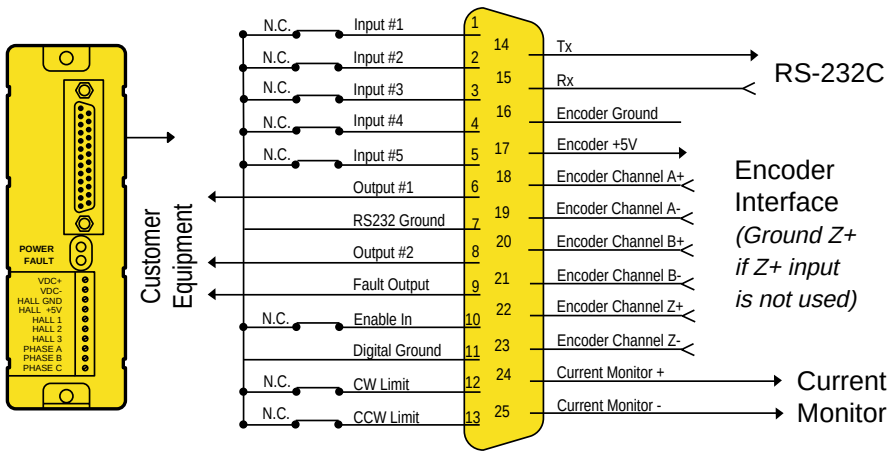
Dimensions in inches (mm)



Motor/Power Screw-Terminal

Pin No.	Signal
1	VDC+
2	VDC-
3	Hall GND
4	Hall +5V
5	Hall 1
6	Hall 2
7	Hall 3
8	Phase A
9	Phase B
10	Phase C

OEM670X/OEM675X Drive Connections

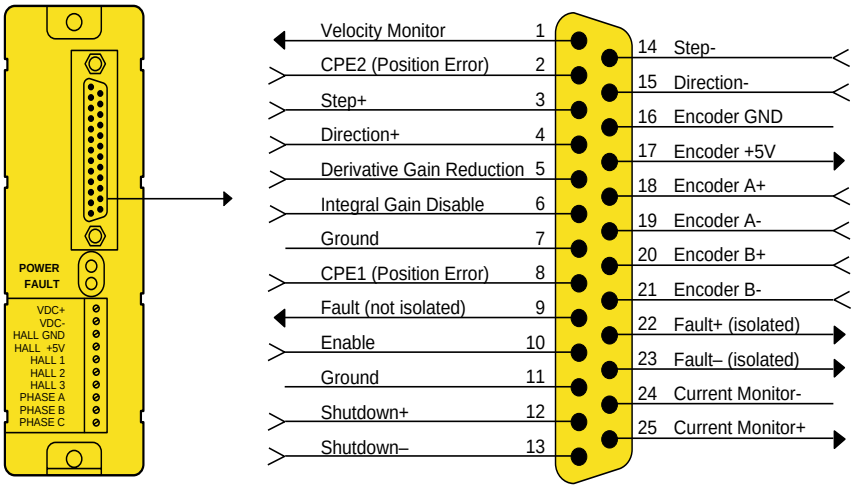


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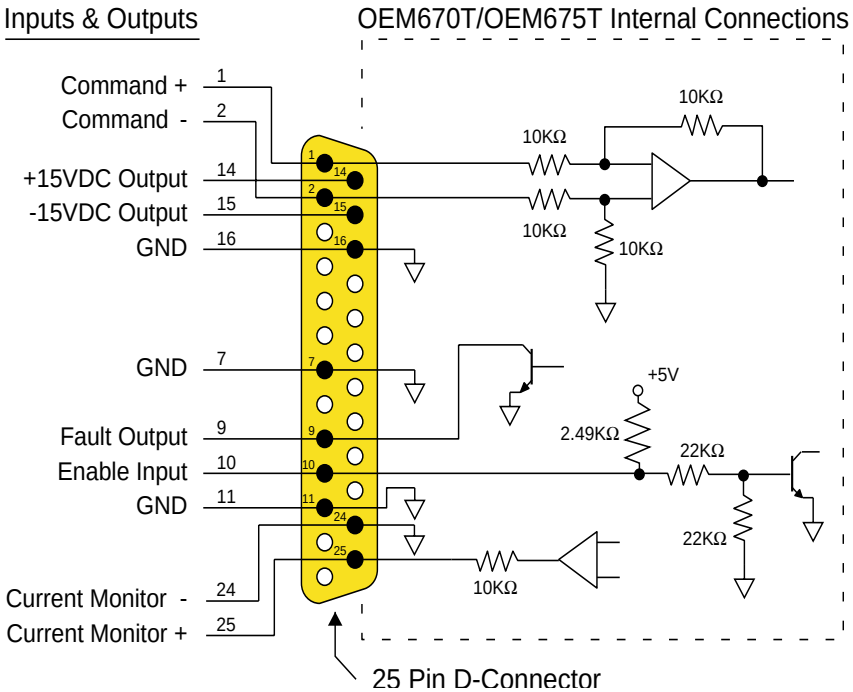
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OEM670SD/OEM675SD Drive Connections



OEM670T/OEM675T Drive Connections



Parker Automation
Parker Hannifin Corporation
Compumotor Division
Rohnert Park, California
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Ordering Information

Drives
UL and CE (LVD)

Part No.	Description
OEM670T	Torque Servo Drive
OEM670SD	Step and Direction Servo Drive
OEM670X	Servo Drive/Controller
OEM670X-M2	Servo Drive/Controller with battery-backed RAM (2KBytes)

Use the OEM670 Series with the NeoMetric and J Series motors or "slotted" motors.

OEM675T	Torque Servo Drive
OEM675SD	Step and Direction Servo Drive
OEM675X	Servo Drive/Controller
OEM675-M2	Servo Drive/Controller with battery-backed RAM (2KBytes)

Use the OEM675 Series with the SM motors or "slotless" motors.

Accessories
UL and CE (LVD)

Part No.	Description
OEM-HS1*	Heatsink Size 1
OEM-HS2*	Heatsink Size 2
58-013465-01	Thermstrate mounting pad (ordered in multiples of 25)
OEM300	300 Watt peak power output at 75 VDC. Operates at 120 or 240 VAC, 50/60 Hz
OEM1000	1000 Watt peak power output at 70 VDC. Operates at 120 or 240 VAC, 50/60 Hz
OEM1000-Cover	OEM1000 Power Module Cover
M2-KIT	Memory Upgrade Kit (Battery-backed RAM 2 KBytes)

** Note: Heatsinks are available for applications with inadequate mounting surface. Whether or not a heatsink is required depends on duty cycle and load characteristics.*

OEM 670 Motor Compatibility

The following motors are compatible with the OEM 670 Series drives.

N0701D	J0701D
N0701E	J0701E
N0702E	J0702E
N0702F	J0702F

Please refer to the servo motor section for motor options, specifications, dimensions, and cables.

OEM 675 Motor Compatibility

All SM Series and SE Series motors are compatible with the OEM 675 Series drives. Please refer to the servo motor section for motor options, specifications, dimensions, and cables.

Quality Products Designed and Priced for OEMs and High-Volume Users. Call 1-800-358-9070.

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