An Introduction to dc Servo Systems

dc Servo Systems are high performance, low inertia, variable speed drives, giving full torque at zero rpm. They are a closed loop drive which has an integral tachometer on the motor shaft giving a voltage output signal even with the slightest of movement.

Baldor provides several alternative mounting arrangements for servo systems including stand-alone self-contained units, and chassis mount units. Rack mounting systems are not detailed in this catalogue, but are also available.

The Baldor Transistor Servodriver

The Servodriver is the main logic control or brain of the servo system. It takes in a dc voltage from the Power Supply module which is then pulse width modulated to create an almost pure dc output from zero to full volts (with a Form Factor > 1.01). The Servodriver input control signals come from an external ±10V source (eg. potentiometer or any process signal), with zero volts being stationary and 10V being full speed, positive one direction, negative opposite direction. The tachometer feed back to the Servodriver is then compared to the input signal and is continually monitored and therefore holds precise speed.

Power Supply for the Servodriver

The power supply for the Servodriver is simply a bridge rectifier with built in filtering. The power supply takes in ac voltage and creates a dc Bus voltage output which is sent to the Servodriver. The following are the appropriate ac input voltages to the power supply to produce the dc Bus volts.

dc Bus Volts required from Power Supply	ac Input Volts required to Power Supply
40	28
60	43
90	64
150	107
180	128
200	142

The preferred supply is three phase, however single phase can be used in many applications.

Motor Voltage/Speed Constant

The operating speed of a dc servo motor is a direct linear relationship to the applied dc voltage and is referred to as the Voltage Constant (Vdc/krpm).

For example an MT4525-CTYCN motor which has a Voltage Constant of 43Vdc/krpm, requires 43 x 3 = 129Vdc for 3000rpm operation.

Warning on ac Input Voltage

Our experience has shown that more problems arise with overvoltage rather than undervoltage of the ac mains input, therefore careful consideration should be given to the following information on the selection of the correct input voltage.

Since most motors achieve their rated speed with fewer volts than the Servodrivers maximum output volts, it is better to use the motor voltage to select the transformer's ac rating rather than the above chart, providing the undervoltage limits are not exceeded in the power supply and Servodriver. For example an MT4535-BTYCN motor achieves its full rpm at 128 volts (see rated volts of chosen motor), therefore one could drop by 10% the input ac volts from 107 to say 96 volts which would reduce the maximum output volts of the power supply from 150 to 136 Vdc and thereby eliminating possible damaging overvoltage situations.

Power Supply Regeneration

In most instances the power supply is fully regenerative, that is, it has built in resistors which absorb the energy created when the dc motor is used to slow down or stop. Because it is acting like a generator, this surplus energy is dumped into the resistors, thus enabling the motors to change speed or stop very rapidly. For large inertial loads it may be necessary to install larger capacity external resistors in lieu of standard internal resistors to absorb the additional energy within an acceptable time span.

'UM-H' Chassis Mount Servo System

The Baldor UM Series 'H' high frequency type dc servodriver provides high performance with attention to economy. It is designed to operate a wide range of Baldor dc servomotors, and could be used with nearly any good quality dc servomotor. The UM Series servo amplifier typically contains one to six servodriver modules and one multi-axis chassis with built-in power supply, over voltage regulator and associated hardware.

'TSD' Stand-alone Servo System

The Baldor TSD (Twin Servo Driver) is a stand-alone, one or two axis brush type PWM servodriver designed around a simplified and integrated package concept which allows this unit to be taken from its shipping carton and placed into operation within 10 minutes. It is capable of up to 500 watts per axis and is a perfect match for Baldor MT2200 and MT3300 motors.

Series 'M2200', 'M3300' & 'M4500' dc Servomotors

'MT2200', 'MT3300' SERIES SERVOMOTOR

Features

- Continuous Stall Torques from 0.021 Nm to 6.55Nm normally ex-stock.
- Integral Tachometer standard.
- High quality materials and manufacture for Low Inertia characteristics.
- Ceramic Magnets standard.
- Ideal for use with SCR and Transistor Drives.
- Peak Stall Torques 5-8 times continuous stall torques.
- Good thermal characteristics.
- Excellent low speed and smooth running characteristics.
- Encoder and Resolver feedback units available.
- Integral Fail Safe Brake optional on M3300 and M4500 series only.
- Special Flange or Shaft optional.

New Model Number	Old Model Number	Stall Torque Continuous Nm	Stall Torque Peak Nm	Power at Peak Stall Trq kW	Mech. Time Constant millisec	Elec. Time Constant millisec	Theor. Accel at Peak Trq. rad/s²	Current at Cont Stl Trq A	Current at Peak Trq A	Voltage at Peak Trq V	
M2200 SERIES SERVOMOTORS — 57mm dia. (2 1/4")											
MT-2240-AMYAN	IM2240-B14	0.21	1.40		7.8	2.0	40,000	2.05	12.3		➡
MT-2250-AMYAN	IM2250-B14	0.35	1.83	0.67	7.4	2.8	38,961	3.40	16.05	42.0	
MT-2250-ADYCN	IM2250-B5-A24	0.35	1.83	0.67	12.0	2.8	38,961	3.40	16.05	42.0	
MTE-2250-AMACN	IM2250-B14-A30A	0.35	1.83	0.67	7.4	2.8	38,961	3.40	16.05	42.0	➡
M3300 SERIES SERVOMOTORS — 86mm dia. (3 3/8")											
MT-3363-BDYCN	IM3363-B5-A24	1.27	8.5	1.70	9.99	2.54	24,700	4.76	28.5	54.0	
MTE-3363-BDACN	IM3363-B5-A30A	1.27	8.5	1.70	9.99	2.54	24,700	4.76	28.5	54.0	
M4500 SERIES SERVOMOTORS — 101mm dia. (4")											
MT-4525-BTYCN	SD25-20A1	3.40	14.7	1.10	8.43	4.52	9,360	6.16	24.0	44.2	
MT-4525-CTYCN	SD25-30A1	3.40	14.7	1.10	8.0	4.9	9,360	9.17	36.0	30.7	
MT-4525-DTYCN	SD25-40A1	3.40	14.7	1.10	8.0	4.8	9,360	12.0	46.6	22.7	
MT-4535-ATYCN	SD35-15A1	4.52	21.5	1.50	7.51	5.15	9,110	5.70	24.0	63.1	
MT-4535-BTYCN	SD35-20A1	4.52	21.5	1.50	8.07	4.19	9,110	8.30	36.0	42.8	➡
MT-4535-CTYCN	SD35-30A1	4.52	21.5	1.50	8.63	4.2	9,110	11.2	47.0	30.9	
MT-4545-ATYCN	SD45-15A1	5.65	28.2	1.70	6.63	4.8	9,030	8.00	36.0	48.6	
MT-4545-BTYCN	SD45-20A1	5.65	28.2	1.80	7.27	4.2	9,030	10.6	48.0	37.2	➡
MT-4545-CTYCN	SD45-30A1	5.65	28.2	2.00	9.44	3.2	9,030	15.7	73.0	27.9	
MT-4555-ATYCN	SD55-15A1	6.33	32.0	2.10	7.9	5.9	7,900	8.50	42.0	50.0	
MT-4555-BTYCN	SD55-20A1	6.33	32.0	2.00	8.7	6.5	7,900	10.9	48.8	38.0	➡

Details continued over page

All specification ratings at 25°C.

Optional Encoders, Plugs and Connectors for MT2200, MT3300and MT4500 Motors

Model Number	Description
Encoder Assembly – Encoder, housing, wired with socket and shaft coupling	
A64A	500 pulses/rev to suit MT4500 motors
A64B	1000 pulses/rev to suit MT4500 motors
A64E	2500 pulses/rev to suit MT4500 motors
MSCF	Mating 6 Pole MS Plug for 2250/3363-BDYCN style motors with MS Connector
MSCN	Mating 14 Pole Plug for motor/tach/encoder to suit MTE2250 motor
MSCLM	Mating 12 Pole Plug for encoder to suit MTE3363 motor and A64A, A64B and A64E
MSCI	Mating Connector Required on ALL MT4500 series motors

Series 'M2200', 'M3300' & 'M4500' dc Servomotors

Additional Features of 'M4500' dc Servomotors

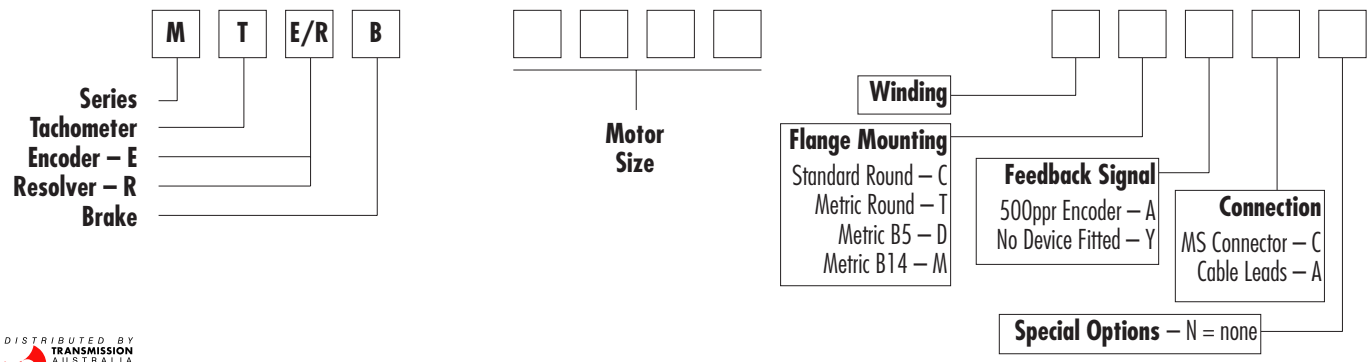
- Rear end through shaft for Encoder on all MT4500 series motors.
- Thermal protection on all MT4500 Series motors.
- Motors to 200 Nm available on special order.

'MT4500' SERIES SERVOMOTOR

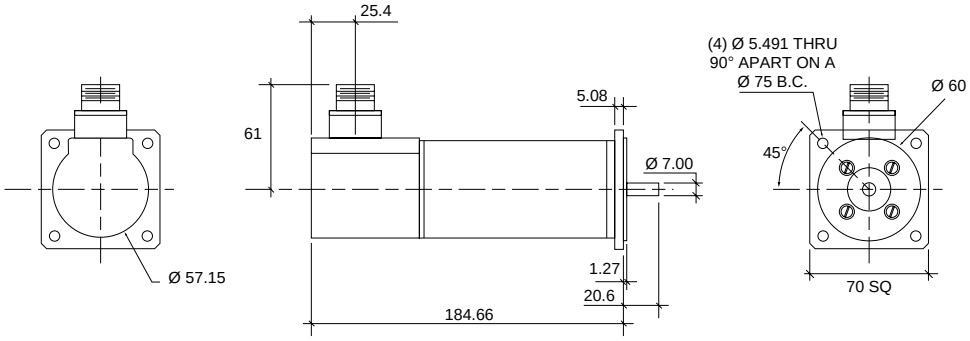
Details continued from over page

New Model Number	Old Model Number	Torque Constant Nm/amp	Voltage Constant V/rad/s	Voltage Constant Vdc/Krpm	Arm. Resistance Less Brushes Ohms	Armature Inductance millihenrys	Max. Terminal Voltage Vdc	Max. Speed rpm	Tacho Volt Gradient V/krpm	Arm. Polar Mom of Inertia kgm^2	Static Friction Torque Nm	Motor Weight kg
M2200 SERIES SERVOMOTORS — 57mm dia. (2 1/4")												
MT-2240-AMYAN	IM2240-B14	0.115	0.115	12	4.0	7.7	60	5000	7.0	.000035	0.02	1.28
MT-2250-AMYAN	IM2250-B14	0.115	0.115	12	2.3	5.8	60	5000	7.0	.000054	0.02	1.64
MT-2250-ADYCN	IM2250-B5-A24	0.115	0.115	12	0.9	2.5	60	5000	7.0	.000054	0.02	1.64
MTE-2250-AMACN	IM2250-B14-A30A	0.115	0.115	12	2.3	5.8	60	5000	7.0	.000054	0.02	1.64
M3300 SERIES SERVOMOTORS — 86mm dia. (3 3/8")												
MT-3363-BDYCN	IM3363-B5-A24	0.297	0.297	30	2.4	6.1	100	4000	7.0	.00037	0.05	4.90
MTE-3363-BDACN	IM3363-B5-A30A	0.297	0.297	30	2.4	6.1	100	4000	7.0	.00037	0.05	4.90
M4500 SERIES SERVOMOTORS — 101mm dia. (4")												
MT-4525-BTYCN	SD25-20A1	0.61	0.61	64	1.99	9.0	180	2500	9.5	.0016	0.17	7.0
MT-4525-CTYCN	SD25-30A1	0.41	0.41	43	1.02	4.2	180	3500	9.5	.0016	0.17	7.0
MT-4525-DTYCN	SD25-40A1	0.31	0.31	33	0.65	2.3	180	4500	9.5	.0016	0.17	7.0
MT-4535-ATYCN	SD35-15A1	0.879	0.879	92	2.7	13.9	180	1900	9.5	.0024	0.19	8.5
MT-4535-BTYCN	SD35-20A1	0.60	0.60	63	1.36	5.7	180	2500	9.5	.0024	0.19	8.5
MT-4535-CTYCN	SD35-30A1	0.44	0.44	47	0.81	3.4	180	3000	9.5	.0024	0.19	8.5
MT-4545-ATYCN	SD45-15A1	0.78	0.78	82	1.50	7.2	180	2000	9.5	.0032	0.20	12.0
MT-4545-BTYCN	SD45-20A1	0.59	0.59	62	0.94	4.0	180	2500	9.5	.0032	0.20	12.0
MT-4545-CTYCN	SD45-30A1	0.40	0.40	42	0.56	1.8	180	3000	9.5	.0032	0.20	12.0
MT-4555-ATYCN	SD55-15A1	0.86	0.86	90	1.52	7.9	180	1500	9.5	.004	0.21	12.5
MT-4555-BTYCN	SD55-20A1	0.60	0.60	63	0.62	3.8	180	2200	9.5	.004	0.21	12.5

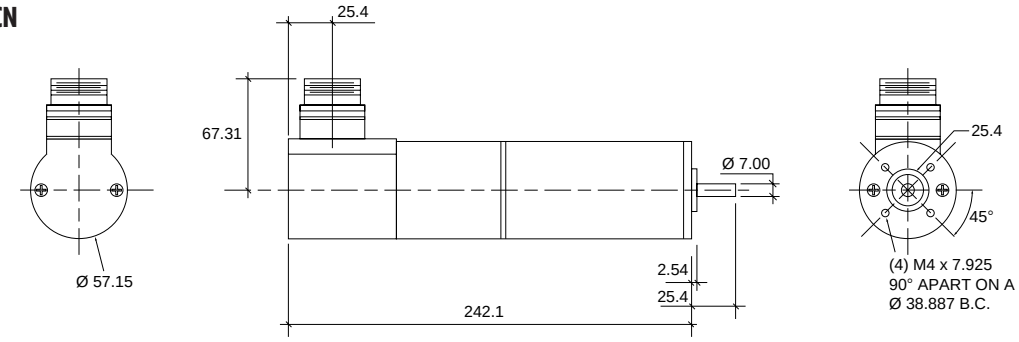
Baldor 'M' Series dc Motor Nomenclature System eg. MTE2250-AMACN



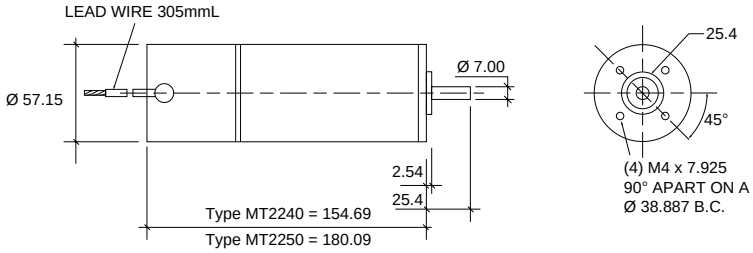
MT2250-BDYCN



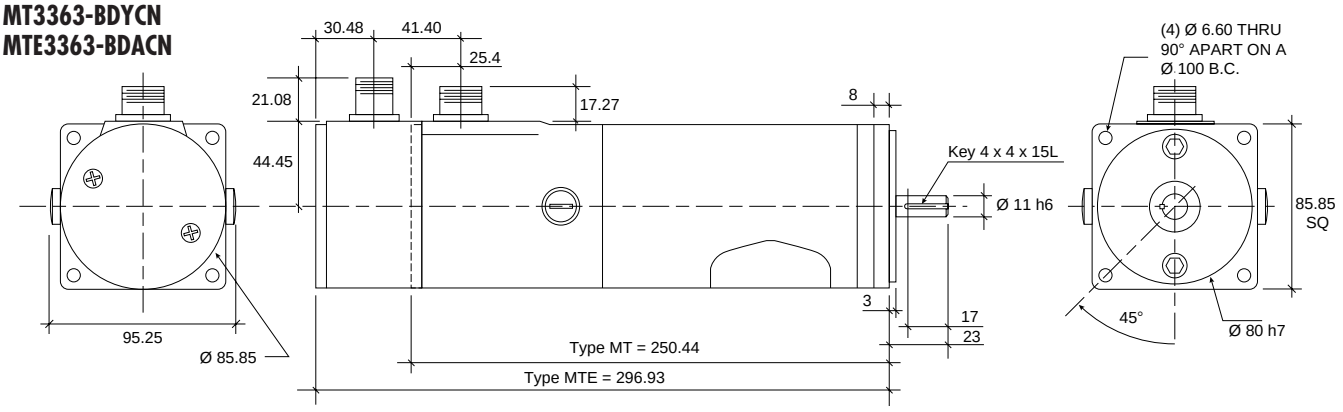
MTE2250-AMACN



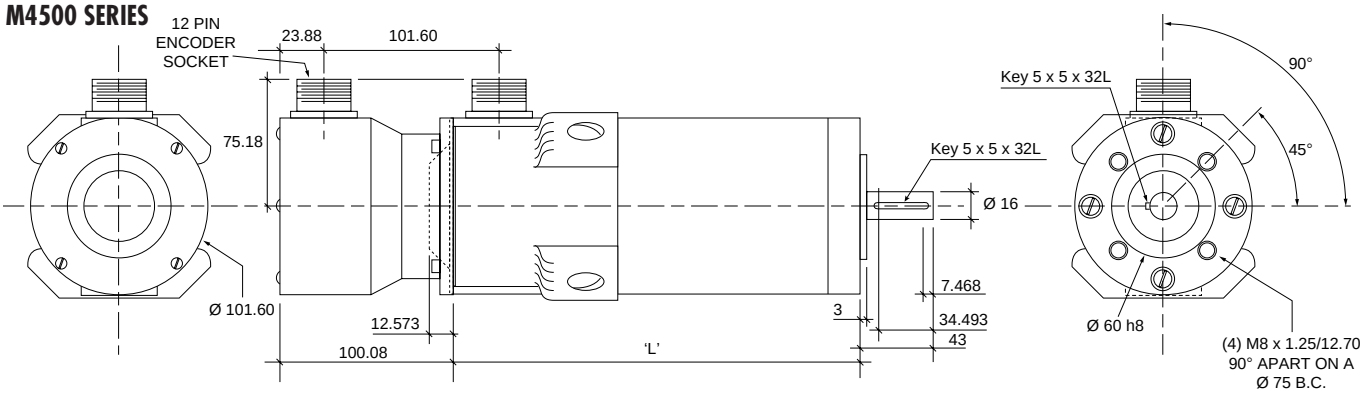
MT2240-BMYAN
MT2250-AMYAN



MT3363-BDYCN
MTE3363-BDACN

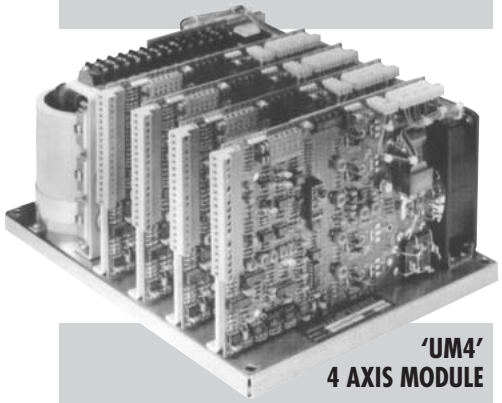


M4500 SERIES



Motor Body Length 'L' for (MT4525 = 236.47) (MT4535 = 274.57) (MT4545 = 312.67) (MT4555 = 350.77)

Series 'UM' dc Servo Control Systems



'UM4'
4 AXIS MODULE

The Baldor UM high frequency dc servodrivers provide high performance with attention to economy. It is designed to operate a wide range of Baldor dc servomotors, and could be used with nearly any good quality dc servomotor. The UM Series servo amplifier typically contains one to four servodriver modules and one multi-axis chassis. The chassis includes the required power supply, over voltage regulator and associated hardware.

Features

- No audible noise with 20kHz switching.
- Multi-axis, up to 4 axes on a single chassis.
- Reduced motor heating due to an excellent form factor of 1.01.
- Easily set up for current (torque) control applications.
- External inductors not required (short circuit proof).
- Adjustable current limits – Peak and Continuous.
- Screw terminal inputs (no special tools).
- Test points and reset button to aid in setup.
- Zero deadband.
- Extremely high band width.
- Protection features, including diagnostic LEDs – Over-current, Over-voltage, Ground Fault, Surge Current, Thermal Protection.
- Auxiliary inputs and outputs – Remote on/off, interlock line, Overtravel limits, (separate right and left for NO and NC switches), Remote reset, Externally adjustable current, Motor current monitor, ±15V dc output, Differential or single ended input.
- Clear and simple support documentation.
- The most popular models, which are list here, are normally available ex-stock. However other ratings are available. Please contact your Baldor supplier for your specific requirements.

Series 'TSD' Servo Control System

'TSD'
SERVODRIVER

The Baldor TSD (Twin Servo Driver) is a stand-alone, one or two axis brush type PWM servodriver, utilising the latest in FET/IGBT transistors for efficiency and 'bullet-proof' reliability. The simple, fully packaged concept allows this unit to be taken from it shipping carton and placed into operation within 10 minutes. Just attach a plug, plug it in and it's ready to go. It is capable of up to 500 watts per axis and is a perfect match for Baldor M2200 and M3300 motors.

- Easily set up for velocity or torque (current) control applications.
- Form factor 1.01 or better.
- Zero deadband performance
- Adjustable current limits: Peaks and Continuous.
- Detachable screw terminal inputs (no special tools).
- Plugs into a standard 240 Vac, 1 phase, 50 Hz outlet (no transformers required). A cord is supplied ready to accept a plug.
- Panel mount enclosure ensures there are no exposed electronics.
- Simplified 'start up' as all connections are defined right on the exterior of the enclosure.
- ON/OFF main toggle switch.
- No audible noise with 20 kHz switching.
- No additional inductors required.
- Protection features, with LED indicators for — • Voltage Error • Surge Current • Over Temperature
- Extremely high bandwidth.
- Detachable calibration card 'Personality Module'. Helps simplify the set up of additional drives and makes servicing possible without a skilled technician.
- Auxiliary inputs and outputs • Overtravel limits, left and right • Remote reset • Enable line • ±15Vdc output • Motor current monitor
- Clear and simple support documentation.

Catalogue Number	Integrated Features	Output Continuous/Peak amps	Nominal bus Vdc	Nominal Input Vac	Input Phase ph	Control Axes	Weight kg	List Price $
TSD Servodriver + Power Supply								
TSD-050-05-1-I	Servodriver+Power Supply	5/10	50	240	1	1	7.7	**1,106**
TSD-050-05-2-I	Servodriver+Power Supply	5/10	50	240	1	2	8.6	**1,727**
TSD-100-05-1-I	Servodriver+Power Supply	5/10	100	240	1	1	9.0	**1,198**
TSD-100-05-2 I	Servodriver+Power Supply	5/10	100	240	1	2	11.8	**1,907**
UM Servodriver + Power Supply								
UM2-150-5-01S	Servodriver+Power Supply*	15/30	150	105	1	1	5.6	**2,194**
UM2-150-5-02S	Servodriver+Power Supply*	15/30	150	105	1	2	6.3	**3,231**
UM4-150-6-01S	Servodriver+Power Supply*	15/30	150	105	3	1	6.9	**2,248**
UM4-150-6-02S	Servodriver+Power Supply*	15/30	150	105	3	2	7.5	**3,212**
UM4-150-6-03S	Servodriver+Power Supply*	15/30	150	105	3	3	8.3	**4,176**
UM4-150-6-04S	Servodriver+Power Supply*	15/30	150	105	3	4	9.1	**5,140**
UM Individual Servodriver or Power Supply Modules								
UM3015HS-100	Servodriver	15/30	100			1	0.8	**852**
UM3015HS-150	Servodriver	15/30	150			1	0.8	**963**
UM2-100-5	Power Supply+Chassis*		100	70	1	≤2	5.0	**1,121**
UM2-150-5	Power Supply+Chassis*		150	105	1	≤2	5.0	**1,158**
UM4-150-6	Power Supply+Chassis*		150	105	3	≤4	6.1	**1,285**

Notes — Separate 240Vac single phase input required for Fan and Logic Power requirements.
Models marked with * require an Isolation Transformer.