SAMURAI SERIES

SERVOS AND DRIVES

SERVO DRIVE SYSTEM
DC2 SERIES

The improvement of servo technology allows higher precision, faster speeds, improved efficient and safer operation. Combining these characteristics with an easy to use and more intelligent package, the **SAMURAI SERIES** DC2 Servo System leads the automation industry to a more promising future.

ModuSystems
357 Piercy Rd San Jose CA 95138
408-708-5883

Other ModuSystems Servo System Products

SAMURAI SERIES AC4 Servo Systems

+ 4-wire high speed serial encoder bus, with 8-bit security code
+ Graphical interface, Adaptive Tuning Technology
+ Single/Three-Phase 110~240VAC ± 10% 50/60Hz input
+ Industry standard Position, Velocity, Torque servo modes
+ Serial [UART,SPI], Pulse/Sign, CW/CCW, A/B Quadrature, and Analog Command
+ A/B/Z Quadrature incremental encoder output
+ Motor Current, Absolute Position, Position Error Monitor Outputs
+ RS232/Modbus RS485/CAN Communication
+ Integrated Point to Point S-curve motion, linear & circular coordinated motion

SAMURAI SERIES AC5 Servo Systems

+ New and improved servo control for faster, more accurate positioning.
+ Standard 16-bit encoder, optional 20-bit encoder.
+ Single/Three-Phase 110~240VAC ± 10% 50/60Hz input
+ Position, Velocity, Torque servo modes
+ 50W to 3.0kW motor size
+ Industrial Ethernet Protocols including Modbus TCP/IP, EtherCAT, EtherNET/IP, Profibus
+ Optional Safe Torque Off (STO) option (per IEC/EN 61800-5-2)
+ Global Certification: UL 61800-5-1, CSA CSA C22.2 No. 274, European CE

BLADE Series BLC-4TC- 4 Axis Modular Digital Servo Controller

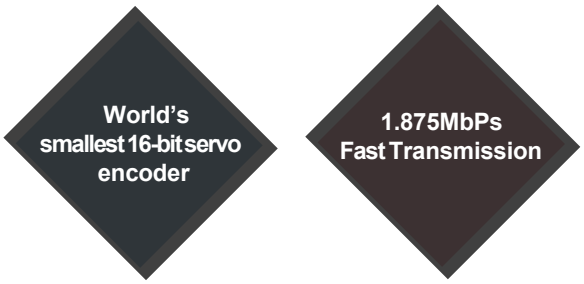
+ The BLC-4TC is a 4 Axis Pulse/Dir or Quadrature Controller capable of controlling digital servo drives or external stepper drives.
+ The BLC family of controllers designed to be a Cost-Effective OEM solution for Motion & Machine Control.
+ Each Module has 4-axes are internally coordinated; but with the dual RS232 serial ports, multiple units can be daisy chained together for higher axis count applications.
+ All axes are detected, and their resources are available during programming without needing to connect to each unit individually.

ModuSystems
357 Piercy Rd San Jose CA 95138
408-708-5883

High Resolution 16-bit Absolute Encoder

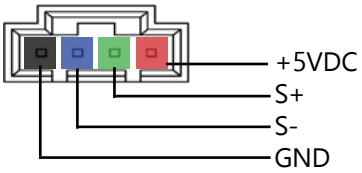
A new 16-bit absolute encoder with 65,536 pulses per revolution is standard on all servo motors. High resolution feedback increases motor smoothness, motion accuracy and maintain better dynamic performance under all speed/load characteristics. High speed 4-wire serial bus transmission with data redundancy check allows fast and reliable positioning.

- Robust and reliable magnetic sensor - Patented
- Over 18 years ABS encoder application heritage
- Eight sensor interpolation to achieve highest accuracy.
- Rigid structure. Resistant to heat, vibration, shock



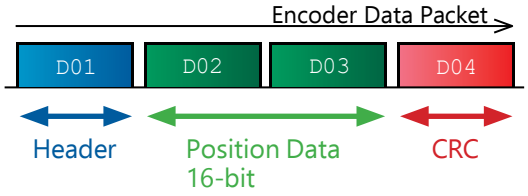
4-Wire Interface

Encoder feedback is achieved with only four wires - two for power and two for data. Wiring is easy and reliable.



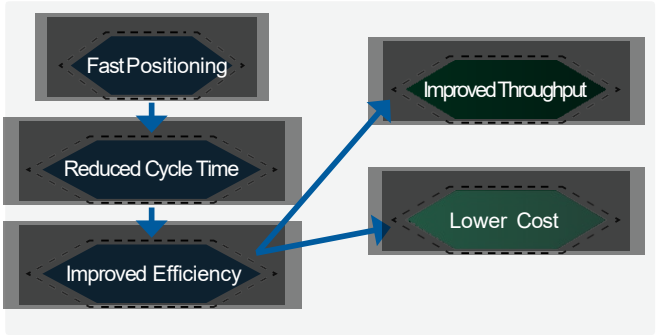
Transmission Speed and Reliability

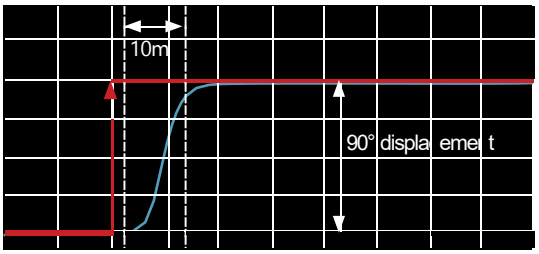
1.875MbPS speed with 8-bit CRC per data packet. Reliable, high-speed feedback.



Fast Positioning Response

High frequency response is key to achieving accurate and fast positioning. During development, the new DC2 servo drive was tested under harsh instantaneous acceleration/deceleration profiles. The servo drive achieved outstanding 10ms position response. The fast servo loop allows the new DC2 servo drive to perform even in the most demanding applications.



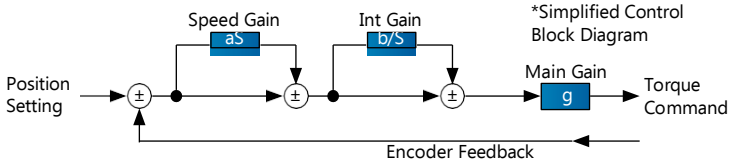


Command Reference
Motor Position

Typical response of 200W servo motor given 90° (16,384point) instantaneous step command. Servo drive in position servo mode.

DC2 *adaptive* TUNING II

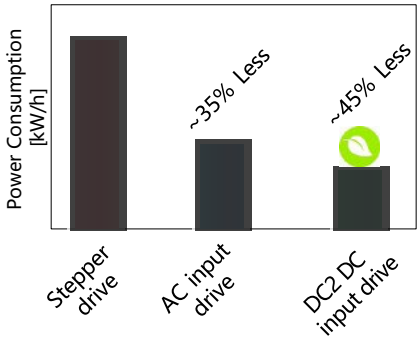
The DC2 servo drives adaptive tuning has been improved for better stability and a wider range of inertia load. The control algorithm uses only three parameters to adjust gain and internally optimizes position accuracy and torque ripple during real time operation. **The only** tuning method of this kind in the industry. Combines perfect simplicity and flexibility.



ModuSystems
357 Piercy Rd San Jose CA 95138
408-708-5883

Low Voltage DC Input

Low voltage initiative with max. +75VDC input allows easy application into new or existing designs with DC power supply or battery. Low voltage is also safer for both user and machine. DC input consumes less power and increases system efficiency by utilizing Common DC Bus voltage to minimize overall consumption.



* Tested for 3 Axis X/Y/Z 400W, 1.27Nm continuous output motor under the same load condition. Draw measured for 1 hour period.

Small Modular Size

The new SAMURAI DC2 servo drive sets an unprecedented package size for its class, measuring just 32mm wide, 85mm tall and 75mm deep. Instead of being *designed* into the system, the new DC2 servo drive can simply be *fit* into the system.

World's smallest servo drive with a 20A peak output capacity!

Simple and Effective I/O

To maximize usability and application range, new I/O signals were added. Simplified down to key selections, with available custom selections for fast and easy integration. Standard outputs include Servo On Position, Zero Point Index, Servo Alarm and +5VDC supply. Standard inputs include command pulse/analog, Servo Enable, and Drive Reset. No matter what the application, the new DC2 servo drive has the relevant communication to meet your requirements.

ModuSystems
357 Piercy Rd San Jose CA 95138
408-708-5883

Industry Standard Control Input

Standard pulse formats with photo-isolated interface. High pulse frequency capability and electronically scalable travel. Differential line receiver reduces transmission noise. Analog speed/ torque reference with ±10VDC voltage range.

Pulse Reference

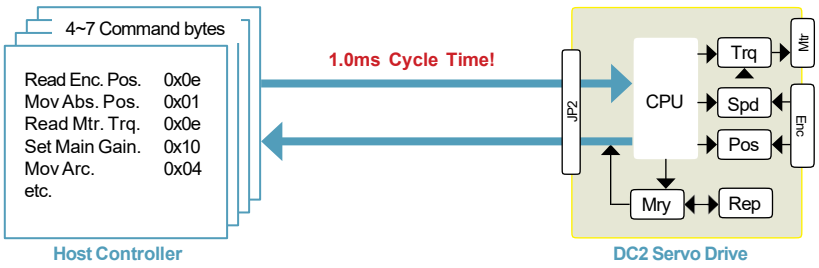
- ♦ PULSE + DIRECTION
- ♦ CW + CCW
- ♦ A + B PHASE QUADRATURE

Analog Command

- ♦ -10VDC~+10VDC analog reference input for Speed and Torque servo control mode.

DC2 Integrated Control

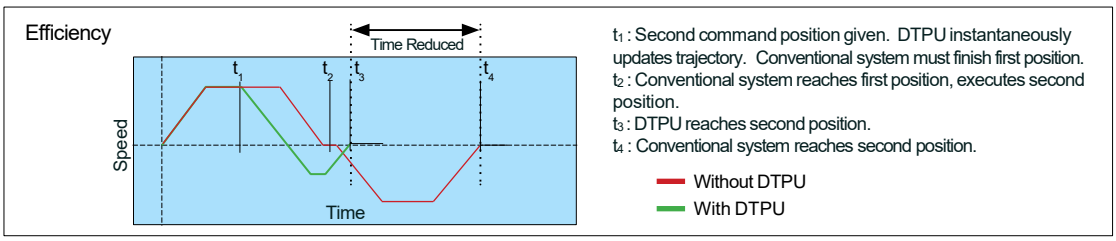
Through DC2 serial communication, the host controller has direct access to all servo drive parameters and status including absolute encoder position and motor torque. All drives feature integrated point to point S-Curve, linear and circular multi-axis interpolated positioning. Can communicate with any device with serial port.

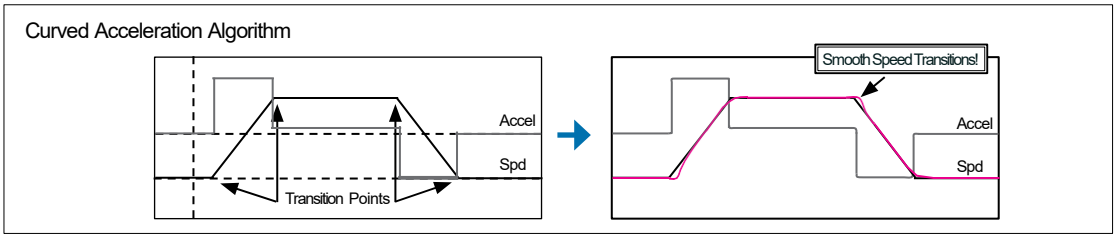


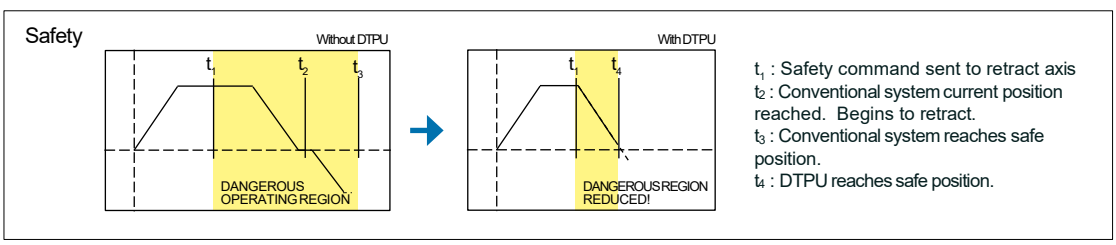
Dynamic Target Position Update (DTPU) technology allows instantaneous position target update regardless of whether the current command position is completed or not.

DTPU™ POSITIONING

The world's only drive integrated positioning of this kind!







ModuSystems
357 Piercy Rd San Jose CA 95138
408-708-5883

High Motor Capacity

The new DC2 servo drive's highly efficient and reliable control technology allows for the highest motor capacity pair than any other servo drive in its class. The motor capacity selection reflects industry requirements including low inertia or medium inertia. With 5,000rpm peak speed (within 0.4kW) and 7.2Nm (1,020Oz-in) peak torque (0.75kW).

7.2Nm Peak Torque!

5,000rpm Peak Speed!

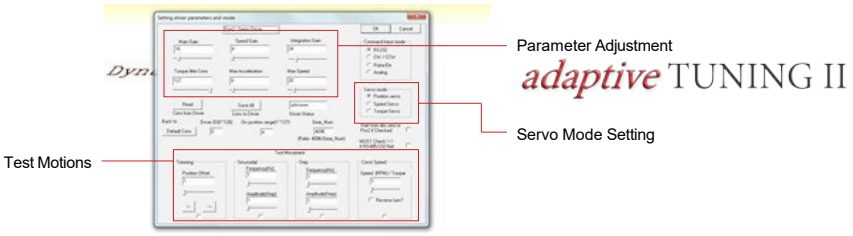
Low Inertia Motor
0.05 ~ 0.40kW Capacity
3.6Nm Peak Torque
5,000rpm Peak Speed

Medium Inertia Motor
0.75kW Capacity
7.2Nm Peak Torque
2,000rpm Peak Speed

Easy Set Up and Communication

Servo drive testing and tuning is all done through simple RS232 or USB connection with PC using DC2DRV graphic interface. Using a few parameters, the user has full control over communication and behavior. For application requirements that are dynamic and changing, the new DC2 servo drive gives the user maximum control over the machine.

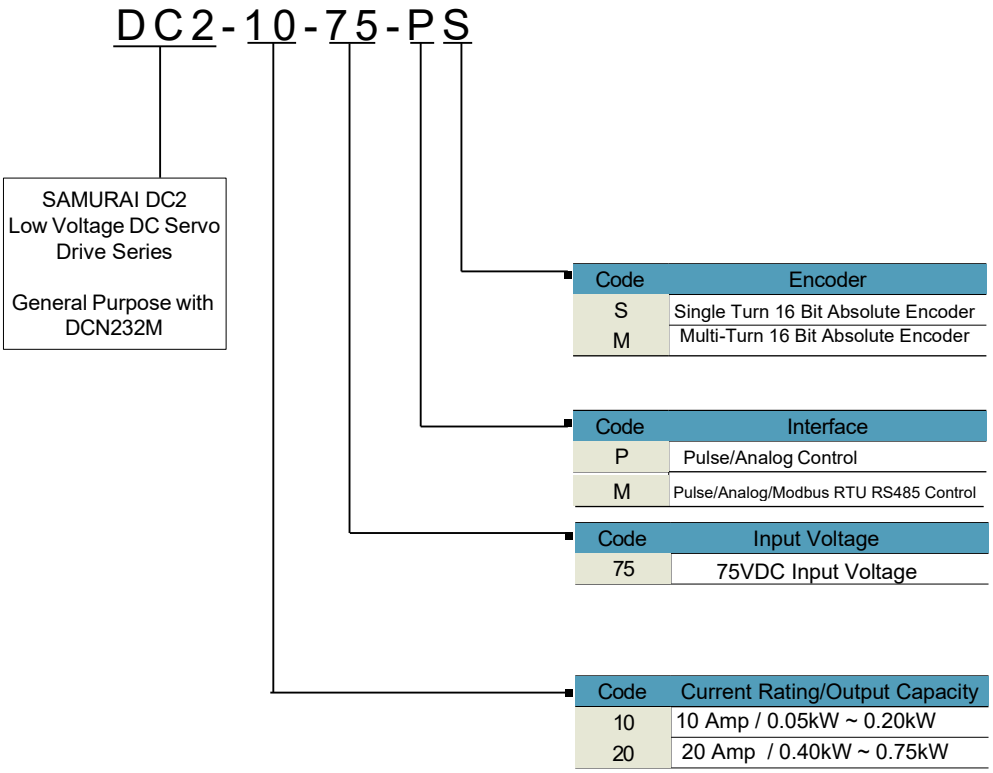
■ Easy to use PC Interface



DC2DRV Parameter Setting

ModuSystems
357 Piercy Rd San Jose CA 95138
408-708-5883

Servo Drive Designation



Code	Encoder
S	Single Turn 16 Bit Absolute Encoder
M	Multi-Turn 16 Bit Absolute Encoder

Code	Interface
P	Pulse/Analog Control
M	Pulse/Analog/Modbus RTU RS485 Control

Code	Input Voltage
75	75VDC Input Voltage

Code	Current Rating/Output Capacity
10	10 Amp / 0.05kW ~ 0.20kW
20	20 Amp / 0.40kW ~ 0.75kW

357 Piercy Rd San Jose CA 95138
408-708-5883

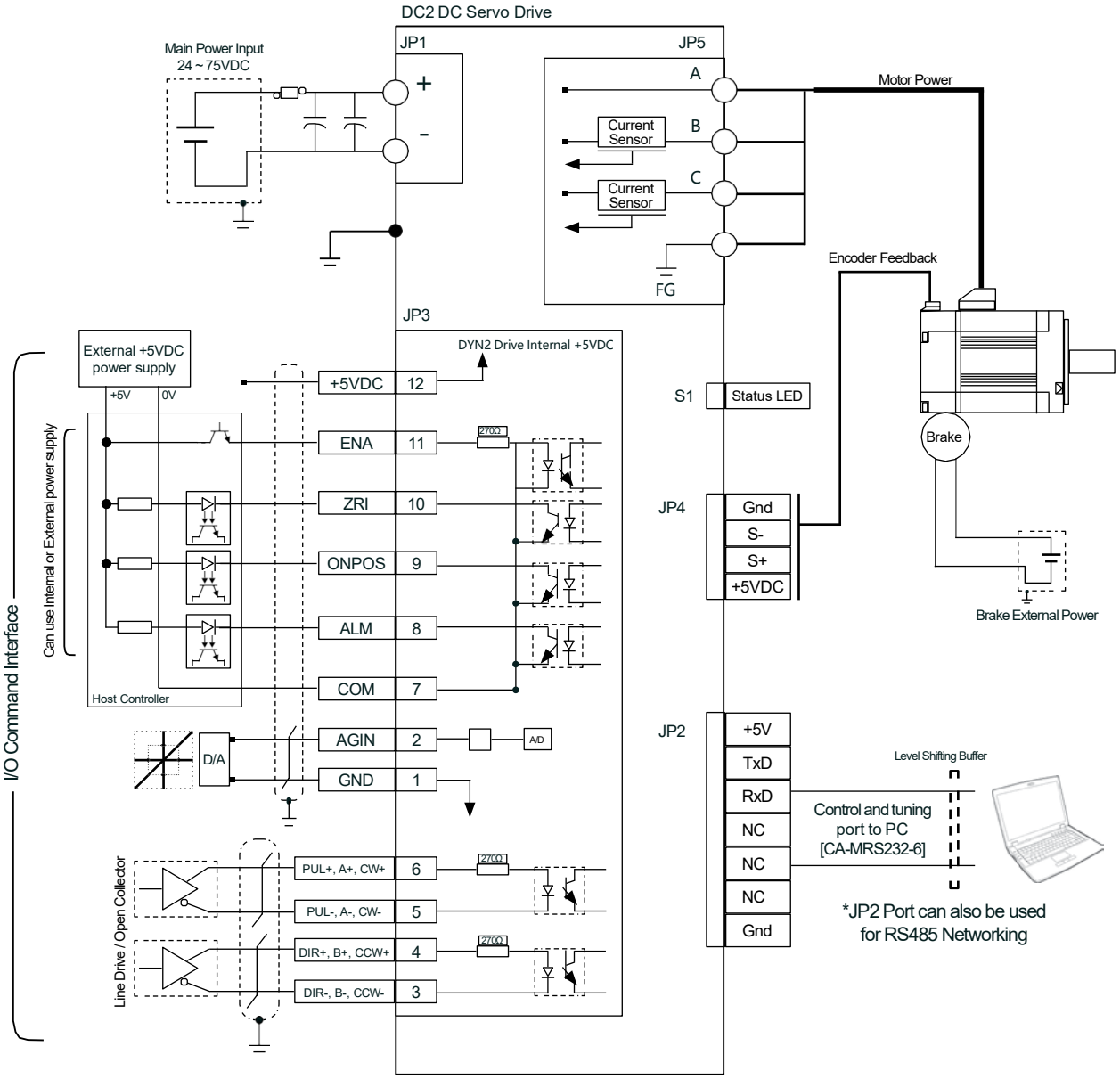
Servo Drive Specification

DC2 Servo Drive		DC2-10-75-PS	DC2-20-75-PS
Input	Rated Voltage	60VDC±10%	
	Permissible Input Voltage	24~75VDC*1	
	Rated Current	16A	
Output	Rated Voltage	Peak +75VAC between any two-motor phase	
	Current	20A Peak	10A Peak
	Motor Capacity	0.40kW ~ 0.75kW	0.05kW ~ 0.20kW
Drive Interface Power Supply (JP2 Pin. 12)	Voltage	5VDC±5%	
	Max Current Draw	50mA	
Control Method		3-Phase SVPWM Amplifier	
Dynamic Brake		Integrated non-adjustable	
Encoder Feedback		16-bit Absolute [65,536ppr] - Serial - Magnetic Sensor	
Protection Functions		Over Current, Over/Under Voltage, Over Temperature, Over Power, Position Lost Follow, CRC Error, Parameter Error	
Position Servo	Pulse Format*2	Pulse+Sign, A/B Phase Quadrature 90° Phase Differential, CW+CCW*2	
	Max. Input Frequency	500kHz	
	Input Voltage	5VDC ± %5 (Higher voltage available as option) Over drive photo-coupler diode	
	Positioning Feedback	Z Index pulse output	
Speed Servo	Speed Control Range	0:5000	
	Input Reference Voltage	±10VDC ± 5% 3,000min^{-1} reference at ± 5VDC	
	Max Input Voltage	±12VDC	
Torque Servo	Input Reference Voltage	±10VDC ± 5% 50% peak current output at ± 5VDC	
	Max Input Voltage	±12VDC	
DC2 232M Serial	Port	RS232 Serial [UART/SPI]	
	Position Commands	Point to Point, S-Curve, Linear & Circular Coordinated	
Environment	Protection	IP10	
	Operation Temperature	0°C~55°C	
	Storage Temperature	-20°~65°C	
	Max. Operation Humidity	95RH% (No Condensation)	
	Max. Storage Humidity	95RH% (No Condensation)	
Mass		0.2kg ± 10%	

Note. 1) Over-voltage alarm triggered at 80VDC input. Drive circuit protection up to 100VDC.
Note. 2) CW+CCW command format available as option.

ModuSystems
357 Piercy Rd San Jose CA 95138
408-708-5883

Standard Wiring Diagram Example



Connector	Type	Housing	Plug	Pin Contact	Mfg.
JP1	Main power supply input	MSTBA 2,5/ 2-G	MSTB 2,5/ 2-ST	-	Phoenix
JP2	RS232 port to PC or controller	70553-0041	50-57-9407	70058	Molex
JP3	I/O to controller	MC 1,5/ 12-G-3,5	MC 1,5/ 12-ST-3,5	-	Phoenix
JP4	Encoder feedback	70553-0038	50-57-9404	70058	Molex
JP5	Servomotor power	MSTBA 2,5/ 3-G	MSTB 2,5/ 3-ST	-	Phoenix

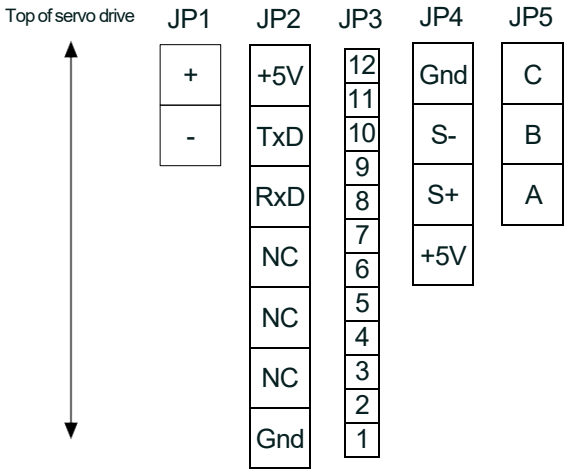
357 Piercy Rd San Jose CA 95138
408-708-5883

Servo Drive Interface

Applicable Model: All DC2 models

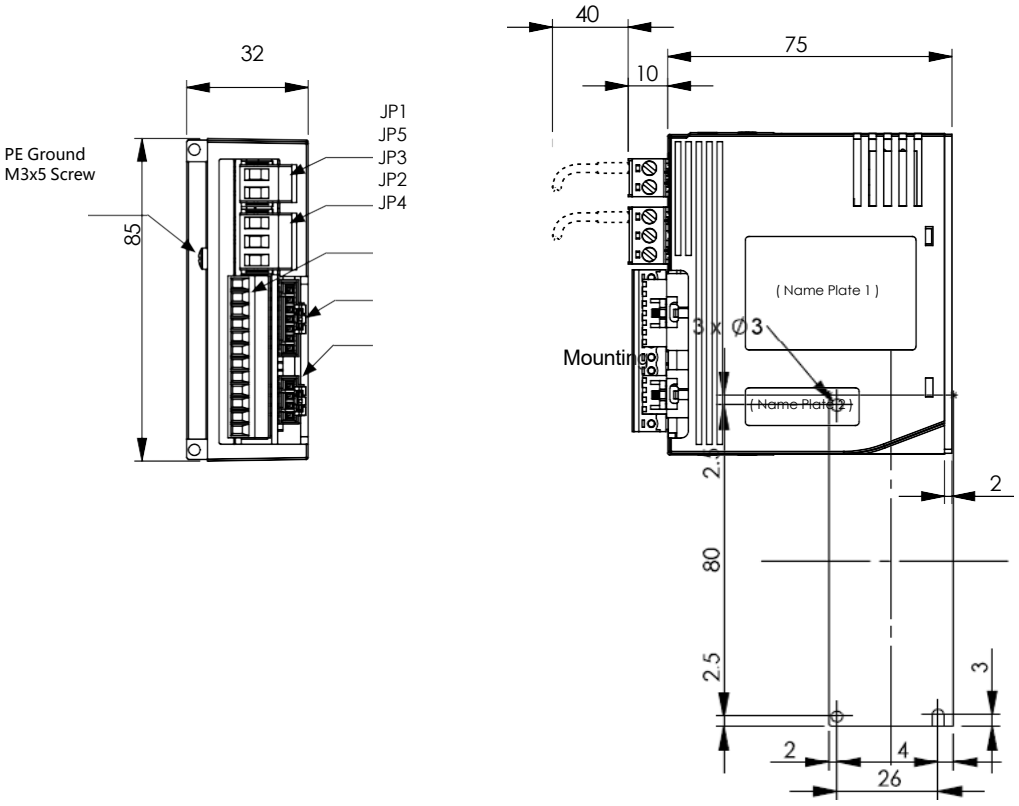
Connector	Type
JP1	Main power supply input
JP2	RS232 port to PC or controller
JP3	I/O to controller
JP4	Encoder feedback
JP5	Servomotor power

Terminal Layout



Dimension

Units: Millimeter [mm]



Mass: 0.2kg

ModuSystems
357 Piercy Rd San Jose CA 95138
408-708-5883

Servo Motor Designation

SVM-MV40-100-60-AE

Code	Servo Motor Family
SVM	SAMURAI

Code	Brake
B	With +24VDC Holding Brake
E	No Brake

Code	Encoder
A	Single Turn 16 Bit Absolute Encoder
M	Multi-Turn 32 Bit Absolute Encoder

Code	Voltage Class
60	60 VAC
150	150 VAC
220	220 VAC
230	230 VAC

Code	Power
50	50 W
60	60 W
100	100 W
150	150 W
200	200 W
400	400 W
750	750 W

Code	Frame Size
MV40	40 mm
MV60	60 mm
MV80	80 mm
MV90	90 mm
MV130	130 mm
NV23	NEMA23
NV34	NEMA34
NV42	NEMA42

357 Piercy Rd San Jose CA 95138
408-708-5883

Servo Motor Specification

Motor Model	SVM	MV40-50	MV40-100	MV60-200	MV60-400	NV34-750
Inertia Class		Low				Medium
Frame Size	mm	40		60		86
Rated Voltage	V	60				150
Rated Output	kW	0.05	0.1	0.2	0.4	0.75
Encoder		16-bit Absolute [ABS-16-00 (01)] 14-bit Absolute [ABS-14-00]				
Rated Torque	N•m	0.159	0.318	0.637	1.27	2.4
Rated Current	A	2	3	4.5	8.4	7.2
Instantaneous Peak Torque	N•m	0.447	0.955	1.9	3.8	7.16
Peak Current	A	6	9	11.3	21	19
Rated Speed	min^{-1}	3000				2000
Max Speed	min^{-1}	5000				N/A
Line Resistance	Ω			0.63	0.28	0.7
Voltage Gradient	$V/1,000min^{-1}$	6.5	7	9.41	9.72	22
Torque Coefficient	N•m/A	0.107	0.115	0.156	0.161	0.33
Rotor Inertia	$kg\text{-}cm^2$			0.232	0.426	2.45
Insulation Class		F				
Dielectric Strength		1500VAC - Withstand 60 seconds				
Insulation Resistance		DC 500V - 20MΩ or higher				
Enclosure		IP65 (Excluding shaft)				
Ambient Temperature		0 ~ 40°C (Operating) -20 ~ 40°C (Storage)				
Storage Temperature		-20 ~ 80%RH (No Condensation)				
Forward Rotation		CW as viewed from shaft side				
Servo Drive		DC2-10-75-PS			DC2-20-75-PS	

Holding Brake Timing

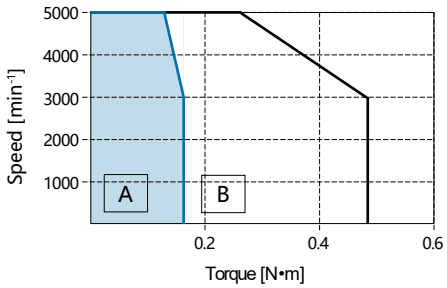
Rated Voltage		24VDC ± 5%, 90VDC ± 5%
Torque Release Time (reduced to 10%)	ms	<50
Torque Rise Time (90% applied)	ms	<70
After power loss, torque applied delay	ms	3

ModuSystems
357 Piercy Rd San Jose CA 95138
408-708-5883

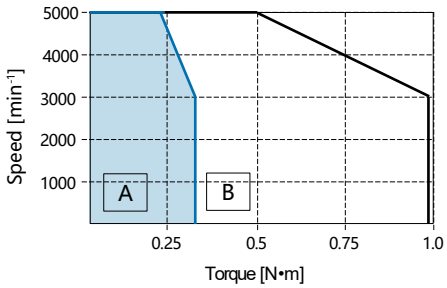
SVM Torque - Speed Curve

Measured at+60VDC Input
*Torque above 5,000rpm not rated

MV40-50

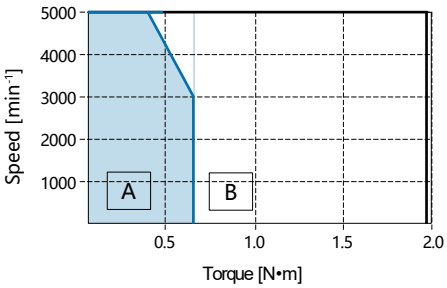


MV40-100

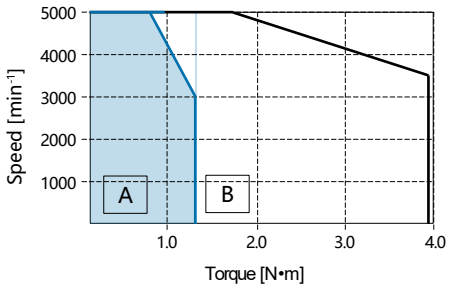


A: Continuous Duty Zone
B: Intermittent Duty Zone

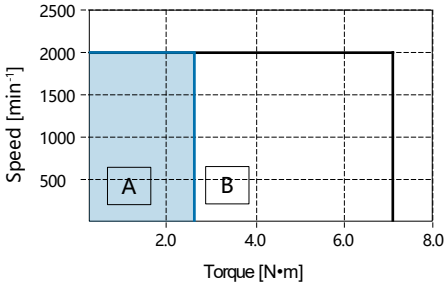
MV60-200



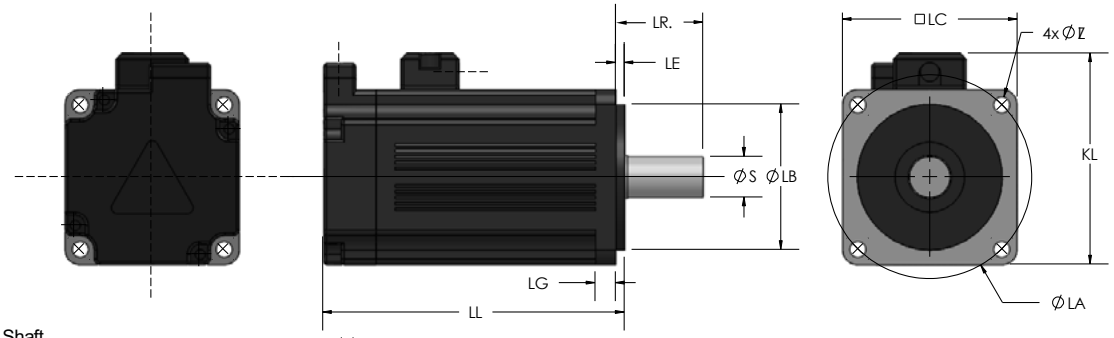
MV60-400



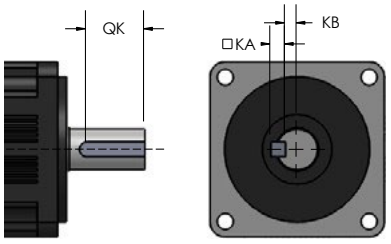
NV34-750



Dimension



Shaft



SVM Motor Model	LL	LG	KL	LA	LB	LE	LC	LZ	LR	S	QK	KA	KB
MV40-50	75.5	5	55	46	30h7	2.5	42	4.5	25	8h6	14	3	2.2
MV40-100	93.5	5	55	46	30h7	2.5	42	4.5	25	8h6	14	3	2.2
MV60-200	91	6	73	70	50h7	3	60	5.5	30	14h6	20	5	4
MV60-400	115	6	73	70	50h7	3	60	5.5	30	14h6	20	5	4
NV34-750	149	8	77	100	80h7	3	86	8	45	14h6	30	5	4

Note. 1) All dimensions for servomotor without holding brake. Contact Modusystems for dimensions with holding brake.

ModuSystems
357 Piercy Rd San Jose CA 95138
408-708-5883

Cable Specification

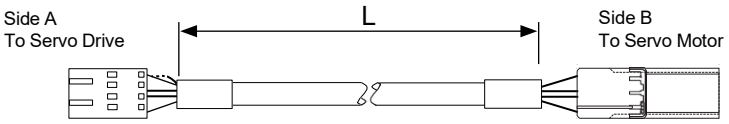
● Servomotor End Connector

Encoder
Assembly: HILP-04V-1-S
Pin Contact: SHIF-01T-P0.5
Mfg: J.S.T.

Motor Power
Assembly: VLP-04V (Retainer: VLS-02V x2)
Pin Contact: SVF-61T-P2.0
Mfg: J.S.T.

● Encoder Cable

Model	Length [L]
CBL-DCVE-3M	3m
CBL-DCVE-5M	5m
CBL-DCVE-10M	10m
CBL-DCVE-15M	15m



1. Cable shield connected on servo drive receiving end
2. All cable ends terminated with heat shrink tube

Specification:

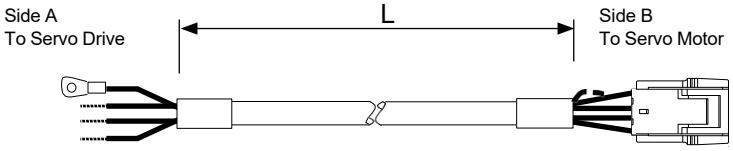
A side to servo drive	
Connector Assembly	50-57-9404 or equivalent
Pin Contact	16-02-0069 or equivalent
Mfg.	Molex.

Cable	
Rating	30V, 105°C UL20789
Conductor	0.63mm dia. AWG24
Insulator	PVC
Outer Diameter	5.6mm

B side to servomotor	
Connector Assembly	HILR-04VF-1-S
Pin Contact	SHIM-01T-P0.5
Mfg.	J.S.T.

● Motor Power Cable

Model	Length [L]
CBL-DCVM-3M	3m
CBL-DCVM-5M	5m
CBL-DCVM-10M	10m
CBL-DCVM-15M	15m



1. Cable shield connected to servomotor receiving end.
2. All cable ends terminated with heat shrink tube.

Specification:

A side to servo drive	
Connection	4 Flying Lead

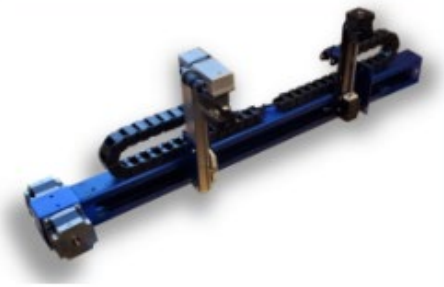
Cable	
Rating	600V, 121°C UL1581
Conductor	1.5mm dia. AWG16
Insulator	PVC
Outer Diameter	9mm

B side to servomotor	
Connector Assembly	VLR-04V
Pin Contact	SVM-61T-P2.0
Mfg.	J.S.T.

ModuSystems
357 Piercy Rd San Jose CA 95138
408-708-5883

ModuSystems Motion Family

STAGES-BELT DRIVE



DUAL BELT DRIVE

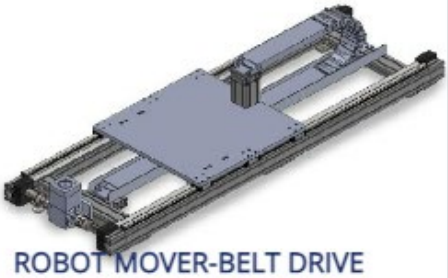
STAGES-BALL SCREW

STAGES-LEAD SCREW

STAGES-LINEAR MOTOR

LEAD SCREW STEPPER MOTORS

ROD STYLE ACTUATORS



ROBOT MOVER-BELT DRIVE

PROFILE RAIL LINEAR GUIDES

ModuSystems
357 Piercy Rd San Jose CA 95138
408-708-5883