NEMA 23 I-Grade Hybrid Servo Motors with Encoders

I-Grade NEMA 23 Hybrid Servo Motors

IP-65 Shaft Seal
available separately.

IP-65 I-Grade NEMA 23 Hybrid Servo Motors

Note: Motor specifications (including torque curves) are only true when the motors are used in conjunction with QuickSilver's SilverLode™ Controller/Drivers (i.e. SilverNugget™ , SilverSterling™, and SilverDust™). See the controller datasheets for more details.

General Motor Specifications

Specifications	23L-1	23CK-3	23L-3	23H-5	23H-1	23K-3	23H-3	23-5	23T-7
Maximum Speed (RPM)	4000	3000	4000	4000	4000	2000	4000	2000	1000
48v Optimal Speed (RPM)	2500	600	1900	1000	2500	600	1500	200	400
Torque (oz-in / Nm) at Optimal Speed	30 0.22	130 0.92	55 0.39	120 0.85	30 0.22	130 0.92	43 0.30	225 1.60	220 1.55
Continuous Stall Torque oz-in / Nm	40 0.28	145 1.00	84 0.59	190 1.34	40 0.28	145 1.00	70 0.51	240 1.70	300 2.1
Peak Power (Mech. Watts)	80	60	84	95	78	58	60	47	65
Rotor Inertia oz-in^2 / Kg-m^2	0.74 1.35E-5	1.50 2.7E-5	1.50 2.7E-5	2.3 4.2E-5	0.74 1.35E-5	1.50 2.7E-5	1.60 2.9E-5	2.3 4.2E-5	3.2 5.9E-5
Weight pounds / Kg	1.40 0.65	1.70 0.77	1.70 0.77	2.6 1.20	1.40 0.65	1.70 0.77	1.70 0.77	2.6 1.20	3.2 1.45
Maximum Driver Input Current (Amps - DC)	4.0	3.2	3.5	4.0	4.0	3.0	4.0	3.0	3.0
Maximum Radial Force(lbs) 0.55'' from mounting face	15	16	15	N/A	N/A	15	N/A	N/A	20
Maximum Axial Force (lbs)	13	4	13	N/A	N/A	13	N/A	N/A	6
Notes					Use 23L-1 EOL	Use 23K-3C* EOL	Use 23L-3 EOL	Use 23H-5 EOL	

Note: The grayed items are special order only. EOL = end of life, no new orders, information provided for reference only.
*QCI-A23K-3C is a QCI-A23CK-3 but programmed to read back as a QCI-A23K-3, enabling the controller to power-up through its normal power-up sequence without re-initializing the controller for a plug-and-play solution. The performance between QCI-A23K-3 and QCI-A23K-3C is identical. QCI-A23K-3C does not include flat shaft.

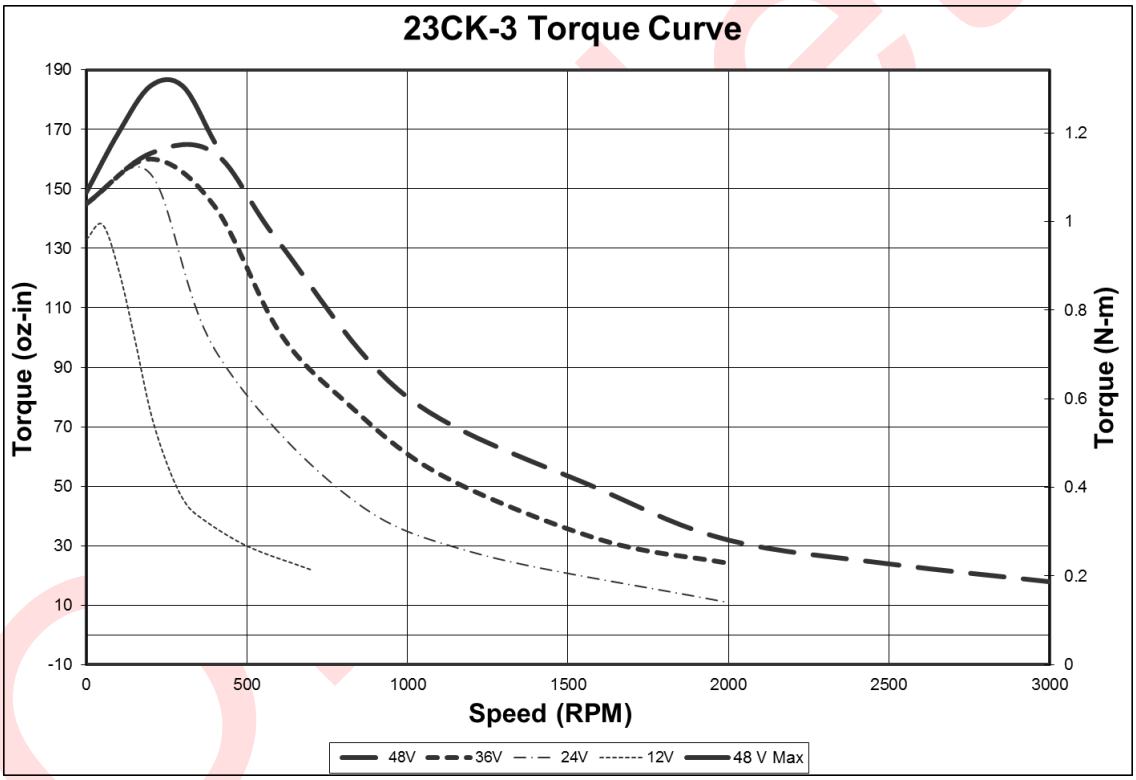
Torque Curves

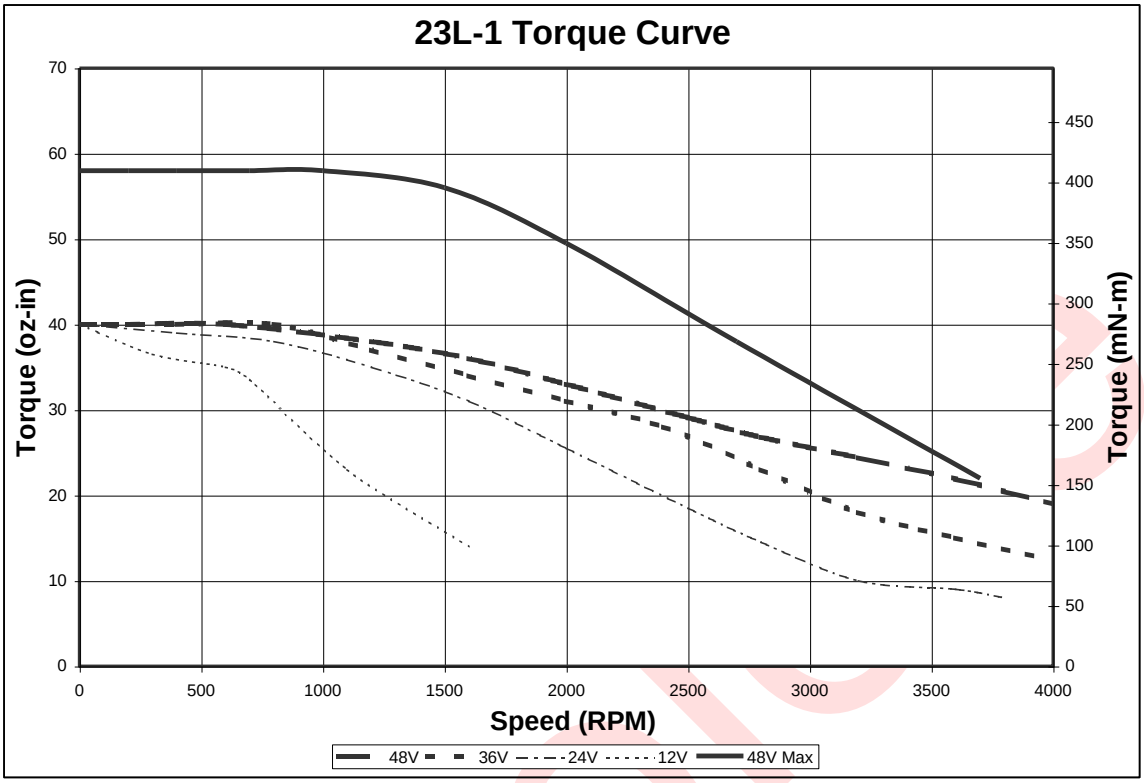
48V Max is the torque of the motor when the Torque Limits (TQL) command is set to "Max" (see SilverLode Command Reference for details on the TQL command). Operating the motor

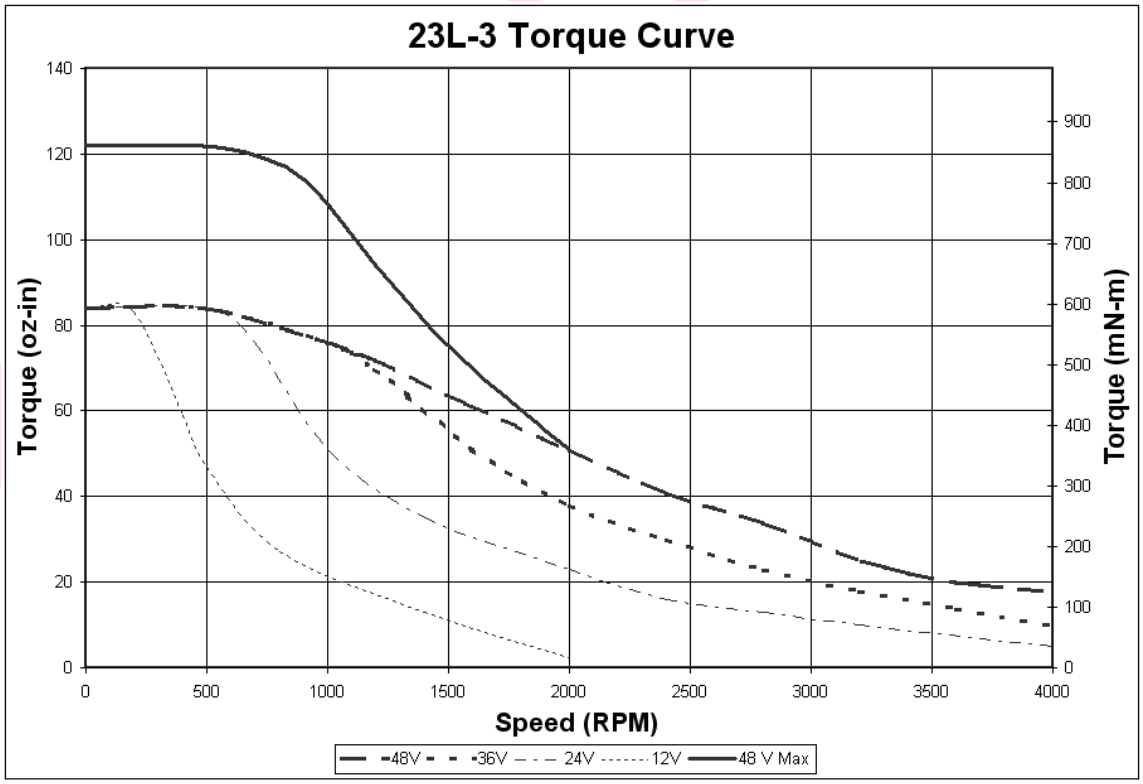
in this mode requires proper heat sinking on the Controller/Driver and motor to prevent overheating.

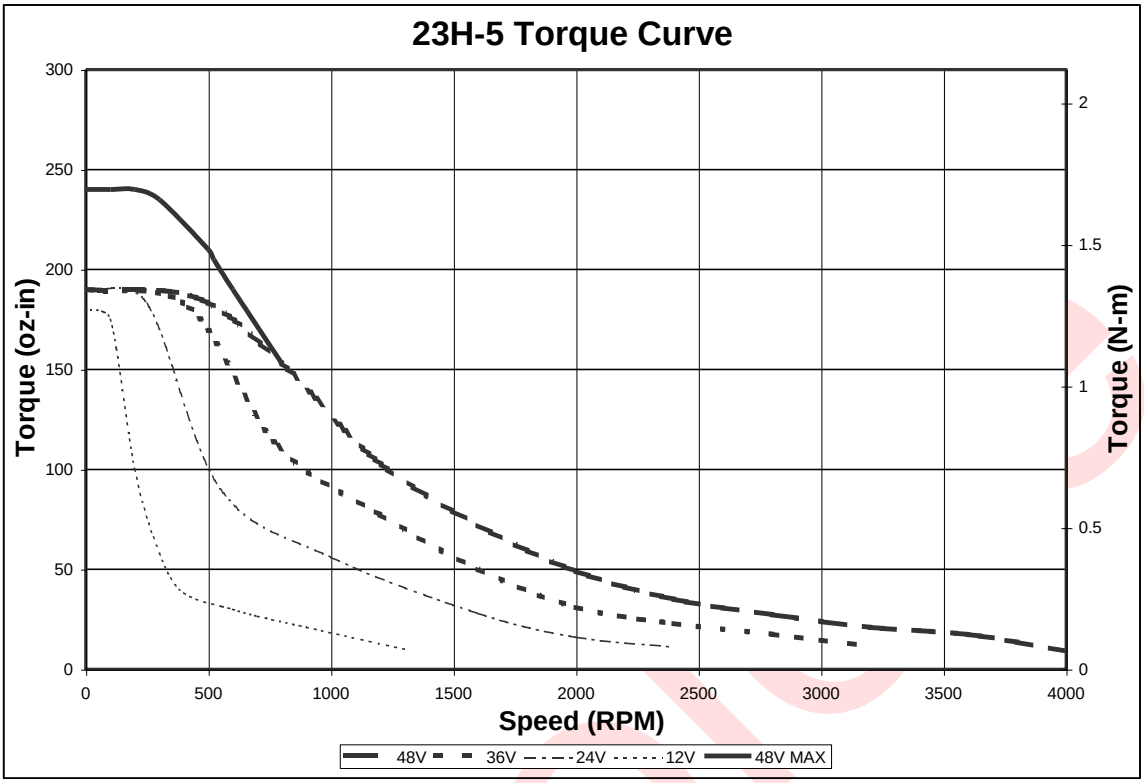
All other torque curves represent motor torque at the specified voltage when the TQL command is set to “100%”. These curves represent torque up to 100% duty cycle depending on ambient temperature, heat sinking and air flow.

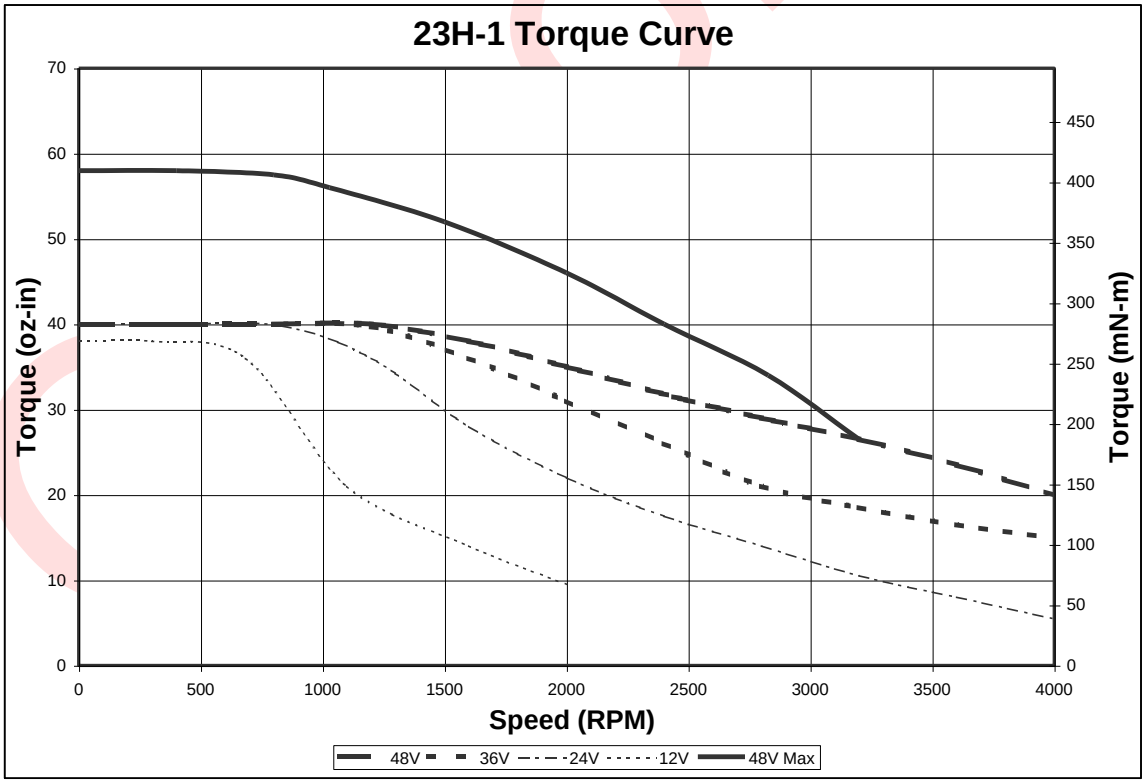
Important: There is a slight reduction in available torque if the shaft seal (sold separately) is used due to the drag of the quad seal around the shaft.
“Optimal Speed” point provides the maximum available power at “100%” torque setting, which is usually the maximum efficiency point as well. If these two points differ, the “Optimal speed” is approximately the average of the two speeds.

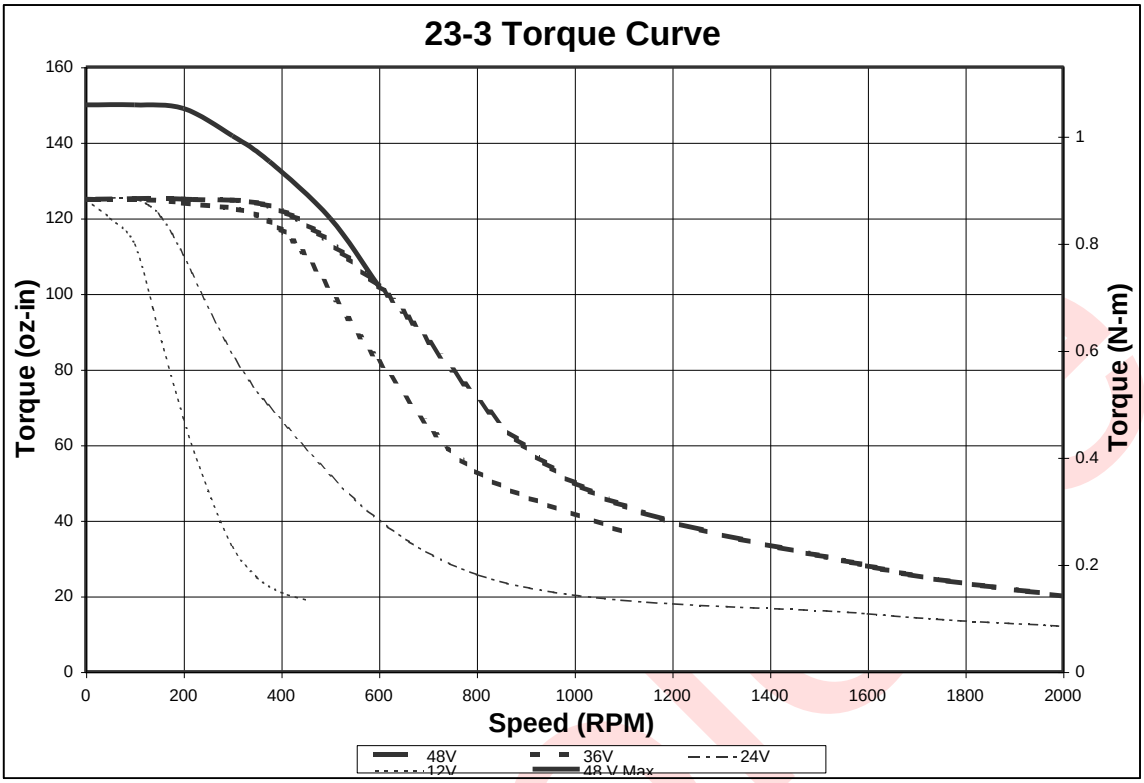


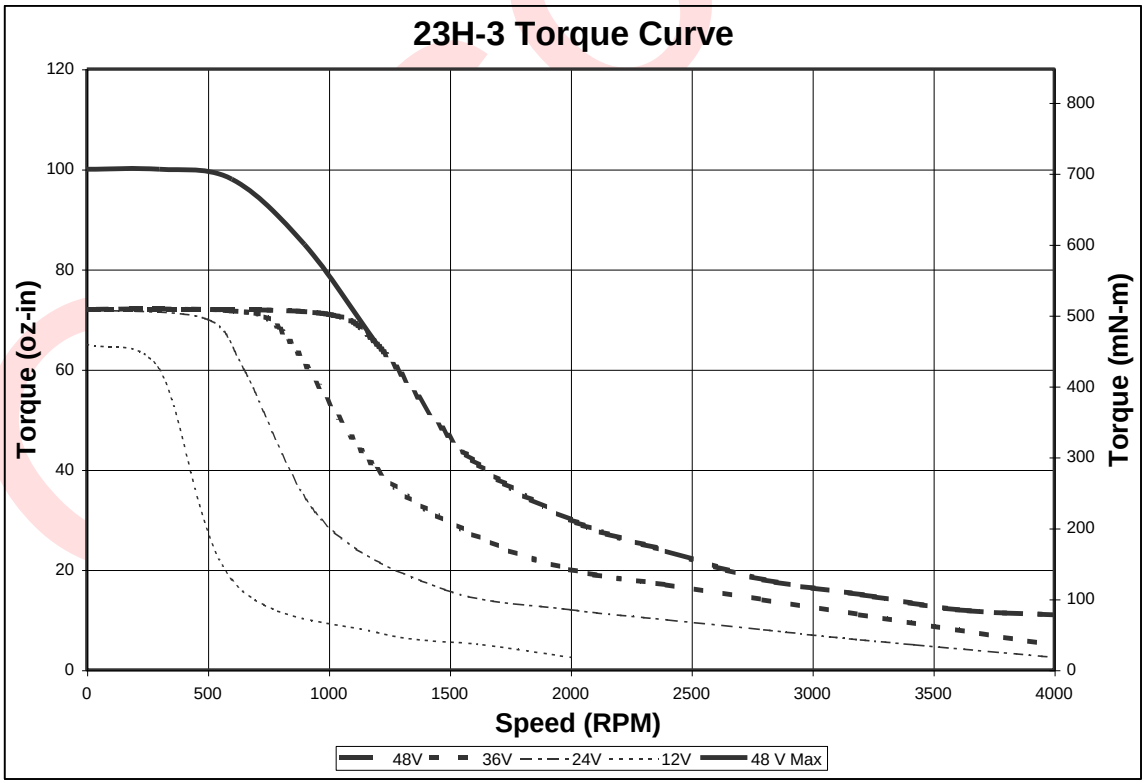


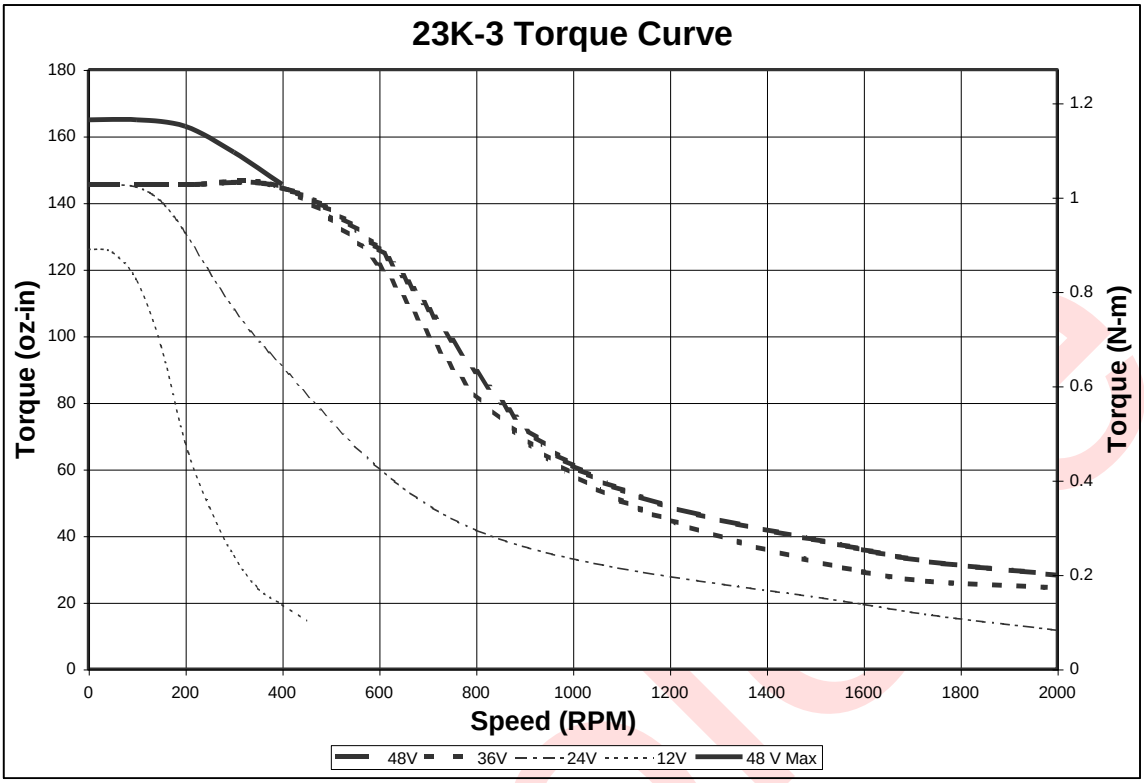


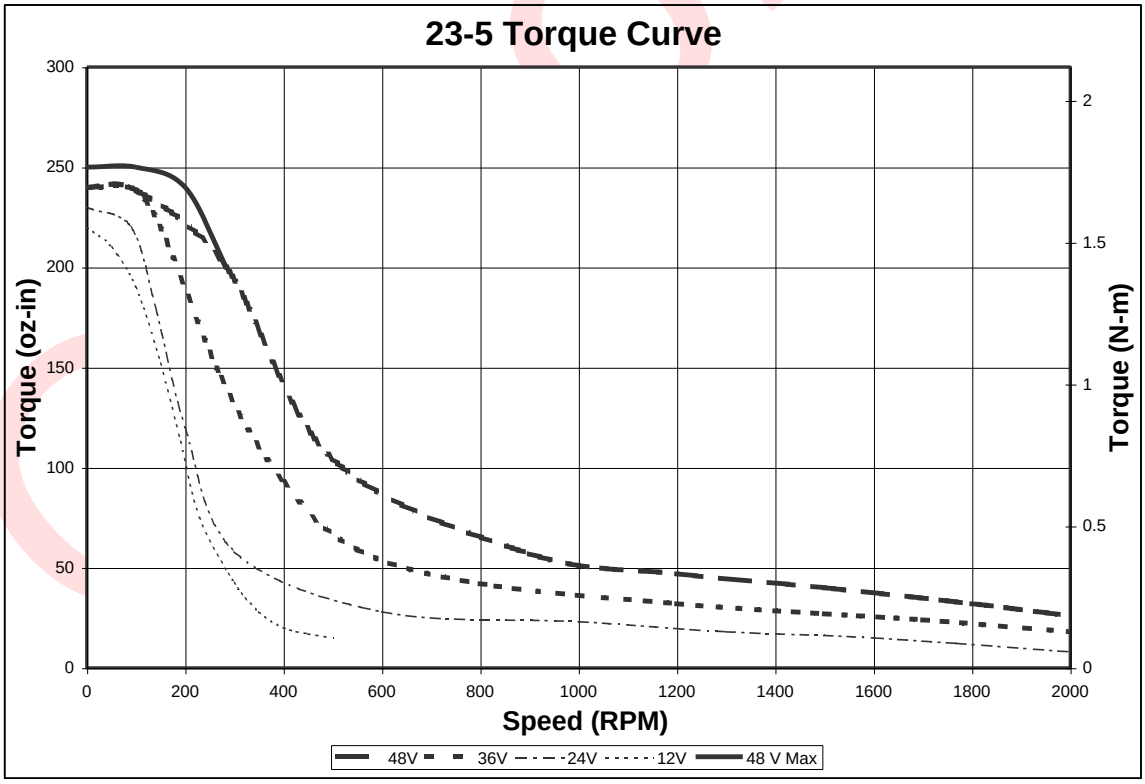


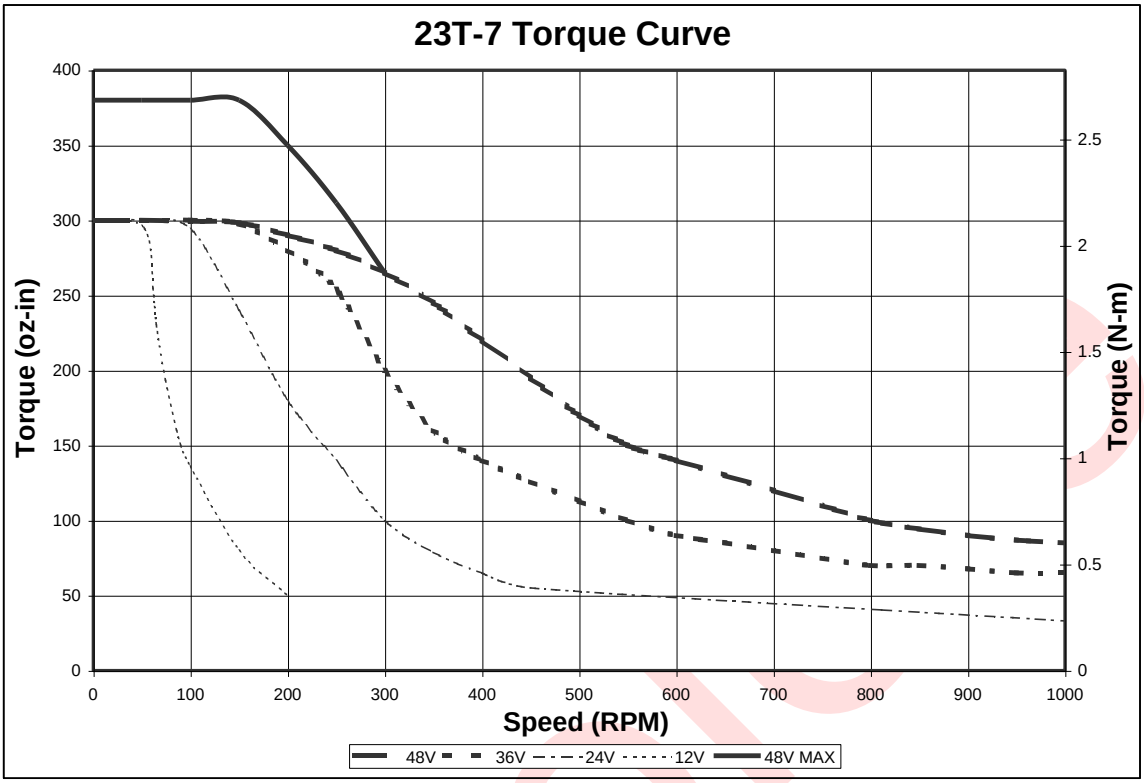












Electrical Specifications

Encoder Interface

Encoder Count Per Revolution: 8000
Index Pulse: 49 - SilverLode controller/drivers internally translate to a single index pulse.

Motor Memory

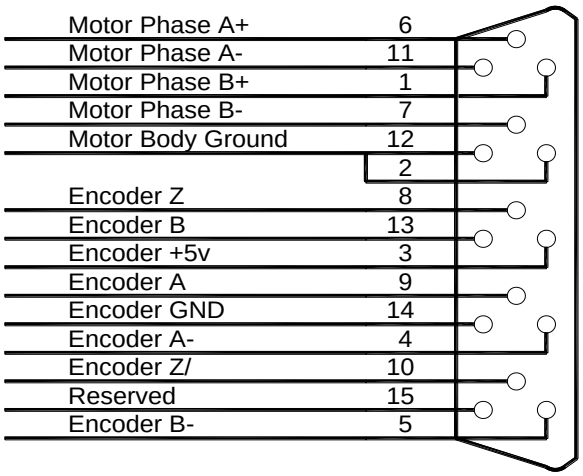
I-Grade motors come from the factory with a memory chip containing encoder and motor information. This information is automatically uploaded by the SilverDust IG/IGB controller/driver to simplify the initialization process.

Temperature Sensor

All QCI IP65 motors contain a sensor to read motor temperature. This sensor automatically reads in the background when controlled by a SilverDust IG/IGB controller/driver. Temperature can be read from a dedicated register and/or used to halt the servo in the case of an over temperature condition.

Connector Data

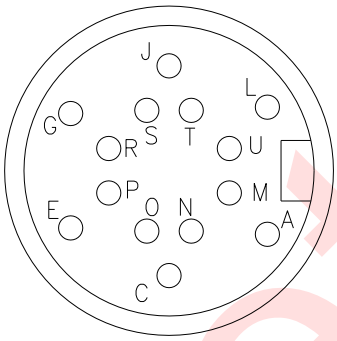
Standard



-6T Option

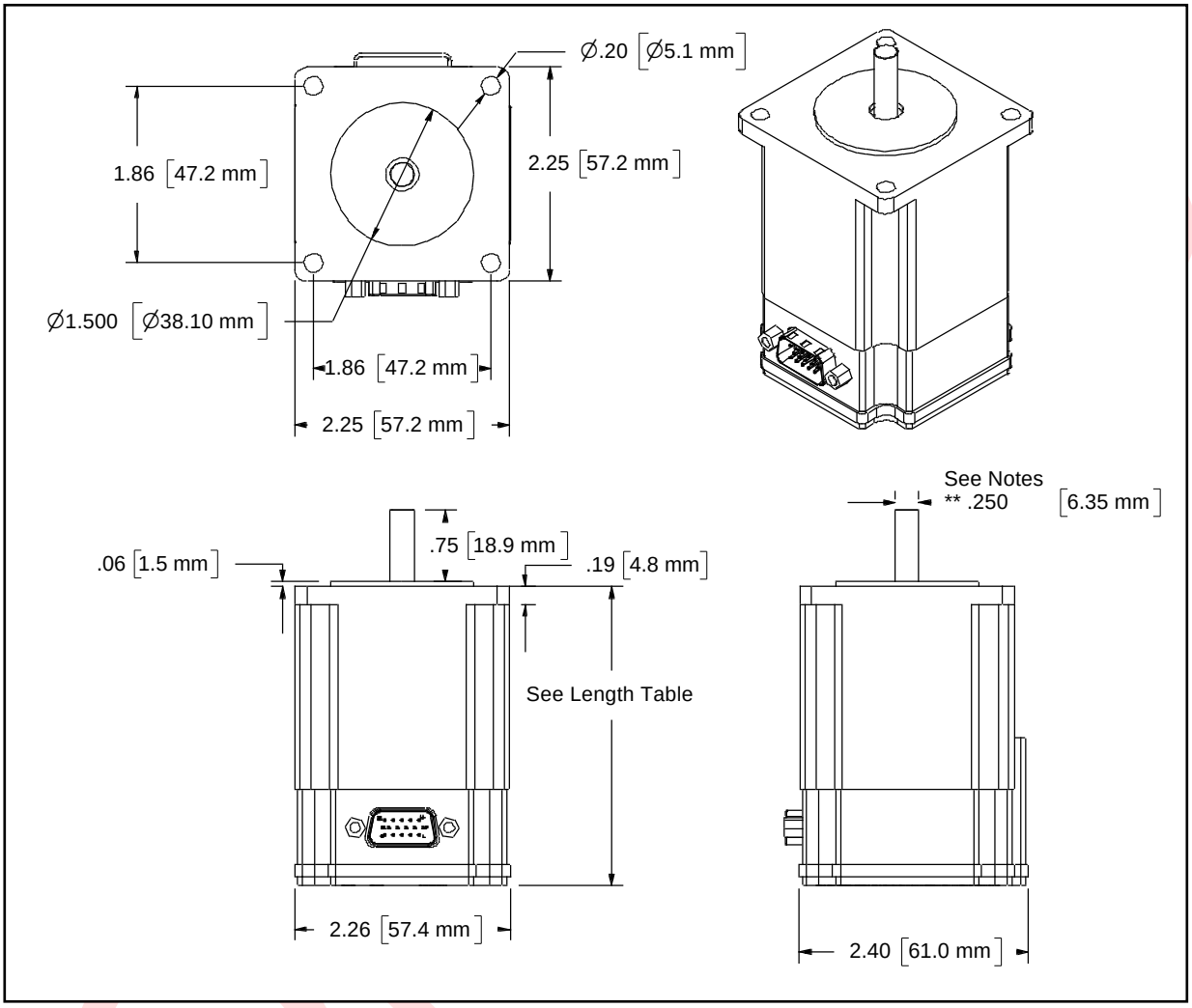
Pin	Signals
A	Motor A -
C	+5V
E	Memory
G	Motor B+
J	Motor B -
L	Motor A+
M	Z+
N	Z -
O	A+
P	B -
R	B+
S	GND
T	A-
U	Motor GND

EXPOSED FRONT VIEW OF MOTOR CONNECTOR



Mechanical Specifications

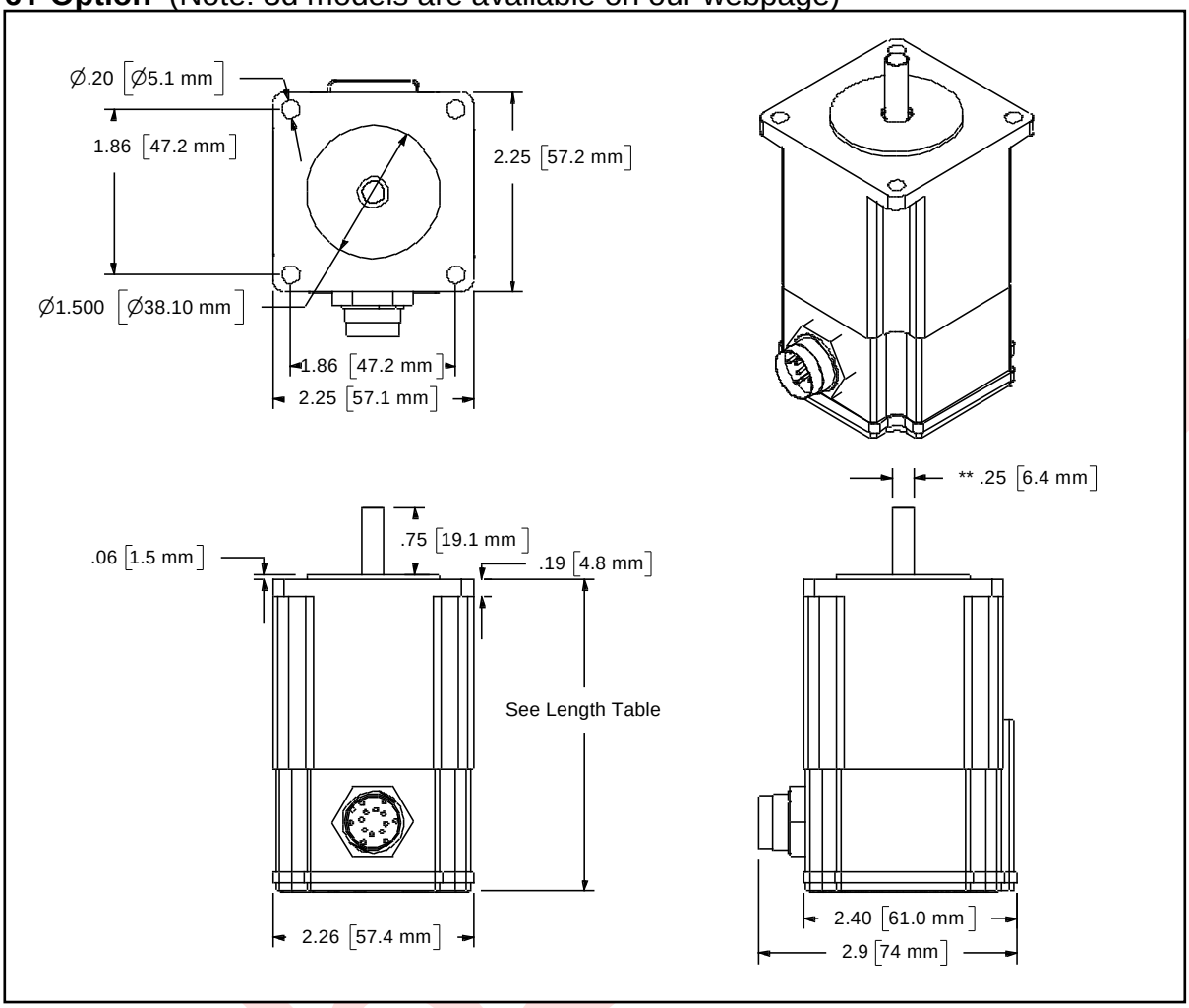
Standard (Note: 3d models are available on our webpage)



Motor Series	Length	Shaft diameter	Notes **
23L-1	2.7 [68 mm]	.250 [6.35 mm]	Shaft has .020 [.5 mm] flat
23CK-3 & 23K-3C	3.2 [81 mm]	.250 [6.35 mm]	
23L-3	3.2 [81 mm]	.250 [6.35 mm]	Shaft has .020 flat
23H-5	4 [101 mm]	.250 [6.35 mm]	
23H-3	3.2 [80 mm]	.250 [6.35 mm]	* Special order item
23-5	4.1 [103 mm]	.250 [6.35 mm]	* Special order item
23-3	3.2 [80 mm]	.250 [6.35 mm]	* Special order item
23K-3	3.2 [81 mm]	.250 [6.35 mm]	* Special order item Shaft has .020 flat
23T-7	5.1 [129 mm]	.3125 [7.94 mm]	* Special order item

23H-1	2.7 [68 mm]	.250 [6.35 mm]	* Special order item

-6T Option (Note: 3d models are available on our webpage)



Motor Series	Length	Shaft diameter	Notes **
23L-1	3.1 [78 mm]	.250 [6.35 mm]	Shaft has .020 [.5 mm] flat
23CK-3 & 23K-3C	3.6 [91 mm]	.250 [6.35 mm]	
23L-3	3.6 [91 mm]	.250 [6.35 mm]	Shaft has .020 flat
23H-5	4.4 [111 mm]	.250 [6.35 mm]	
23H-3	3.6 [90 mm]	.250 [6.35 mm]	* Special order item
23-5	4.5 [113 mm]	.250 [6.35 mm]	* Special order item
23-3	3.6 [90 mm]	.250 [6.35 mm]	* Special order item
23K-3	3.6 [91 mm]	.250 [6.35 mm]	* Special order item Shaft has .020 flat
23T-7	5.5 [139 mm]	.3125 [7.94 mm]	* Special order item
23H-1	3.1 [78 mm]	.250 [6.35 mm]	* Special order item

⚠**Note: The motor construction uses a wave spring to compensate for mechanical tolerances and thermal expansion in the axial shaft direction. It is important to not push the shaft into the motor in operation or when mounting gears or pulleys as this may damage the encoder disk.**

Environmental Specifications

Operational Temperature
-10 C to +80 C

Storage Temperature
-40 C to +85 C

Humidity
Continuous specification is 95% RH non-condensing.

Shock
Limitation is approximately 50g/11ms.

IP Rating - Standard
IP50

IP Rating – 6T Option
IP65 is achieved if both a shaft seal and IP65 Motor Interface Cable (QCI-C-D15P-T14S-nn) are used.

NOTE: The IP65 rating is for applications with occasional wash downs. It is not meant for continuous wet applications or high-pressure wash downs. See IP65 spec for more details (CEI IEC 529).

Recommended Components

Start-Up Kit
There are several start-up kits available, each based off a servo controller/driver. With a Start-Up kit, power supply and motor/encoder, you will have everything you need to get started. See the Start-Up Kit technical documents on our website for more details.

If you would rather buy the components individually, QCI recommends the following:

SilverNugget N2-IX Controller/Driver or
SilverDust D2 IG/IGB/IG8/IGF Controller/Drivers or
SilverSterling S2-IG Controller Driver

The motors will work with any of the following controller/drivers. See the indicated datasheets for details:

SilverDust D2 IGB (QCI-DS003)
SilverNugget QCI-N2-IX (QCI-DS031)
SilverDust D2 IG8 (QCI-DS018)
SilverDust D2 IG (QCI-DS019)
SilverDust D2 IGF (QCI-DS021)
SilverSterling S2-IG (QCI-DS026)

Motor Interface Cable (QCI-C-D15P-D15S-nn)
This cable goes between the motor and the QuickSilver Controller/Driver (SilverNugget). Replace the last two digits “nn” with length of cable in feet (i.e. – 10 for 10 feet).

Shaft Seal (QCI-23M-65)
The shaft seal (sold separately) is required for an IP65 rating on the shaft end of the motor. The shaft seal consists of an o-ring seal for the motor’s pilot and a quad ring seal for the shaft. The shaft seal needs periodical inspections, lubrication, and replacement if worn out.

IP65 Motor Interface Cable (QCI-C-D15P-T14S-nn)
This cable goes between the motor and the SilverLode™ Controller/Driver (SilverDust D2 or SilverNugget N2). Replace the last two digits “nn” with length of cable in feet (i.e. –10 for 10 feet).

SilverLode Manuals (QCI-SLM) QuickControl Software (QCI-QC)
The SilverLode User Manual, SilverLode Command Reference and QuickControl Software are also available on our website. We recommend first time users reading chapter 1 of the User Manual.

Power Supply (i.e. SP-240-48)
A 12-48V power supply producing the amps specified above (see General Motor Specifications) is required. QuickSilver recommends:

- SP-240-48 (48V, 5A, 240W)

Part Numbers

NEMA 23 I-Grade Motors/Encoders	
MOTOR TYPE/SIZE	**MOTOR INTERFACE**
• **A23H-1** • **A23L-1** • **A23-3** • **A23H-3** • **A23CK-3** • **A23K-3** • **A23L-3** • **A23-5** • **A23H-5** • **A23T-7**	**Blank** – Standard • DB15HD Motor Interface Connector **6T** – IP65 • 14 Pin Round Connector • Shaft seal required for full IP65 rating. ○ QCI-23M-65 ○ QCI-23T-65 • Extra coating on motor exterior.
To create a part number, choose one from each column above. For example: 23CK-3	
QCI-A23CK-3	
This selection creates the part number: **QCI-A23CK-3**	

Standard Stocked Items

QCI-23L-1
QCI-23CK-3
QCI-23L-3
QCI-23H-5

Special Orders

QCI-23H-1
QCI-23H-3
QCI-23-3
QCI-23K-3
QCI-23-5
QCI-23T-7
All 6T Options

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