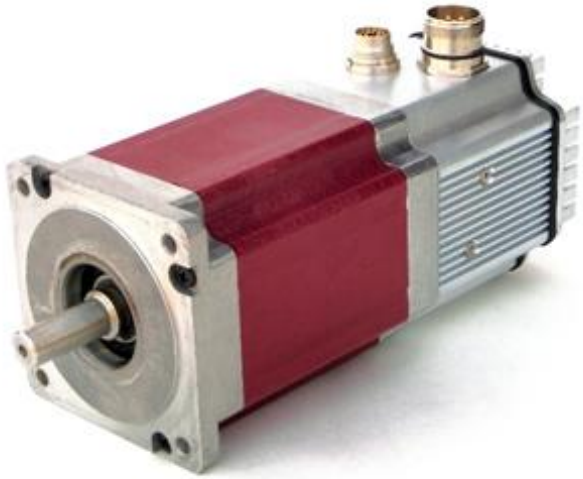
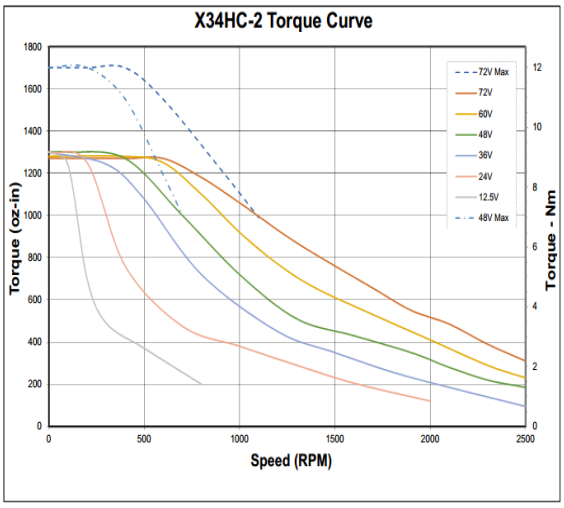
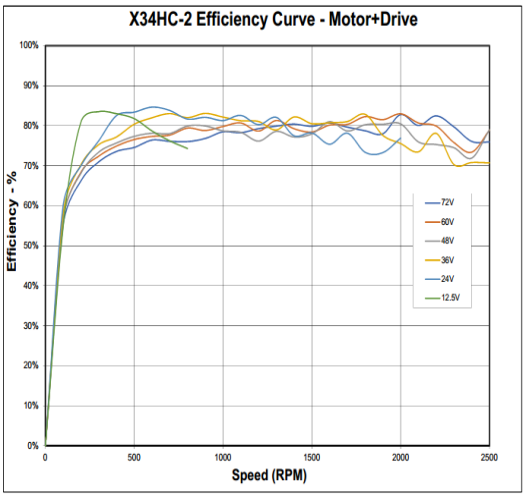
QuickSilver Controls

Product Catalog 2018





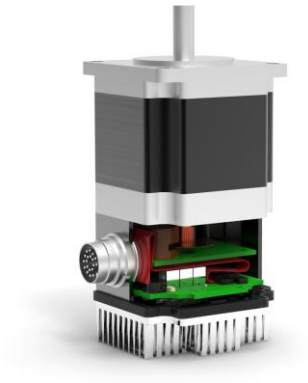


QuickSilver Controls, Inc

QuickSilver Controls, Inc. was established in 1996 to provide high performance motion control products. We focus on product flexibility and support Hybrid Servo Motors, Stepper Motors, 3 Phase,

DC motors, Voice Coils, and the patented Mosolver: A Combined Motor and Resolver

We design, build and support our products from our facility in San Dimas, California. We sell directly and through a network of Value Added Distributors. Our products support very wide inertial mismatches allowing for easy servo tuning with widely varying loads.



The SilverMax X-Series line integrates the motor, highly programmable controller, drivers, and IO all into a compact and efficient package. It is rated IP65 (needs front shaft seals for full protection).

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SilverMax® Integrated Motors

Fully Integrated Hybrid Servo Motor + Controller + Indexer + Analog and Digital I/O

NEMA 23 QCI-X23C Family

NEMA 34 QCI-X34 Family

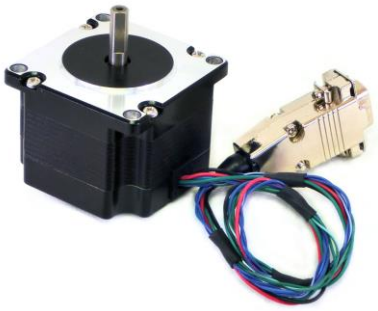
Hybrid Servo Motors

Motors with Feedback – Many Available either IP 50 and IP65

NEMA 17 QCI-A17 Family

NEMA 23 QCI-A23 Family

NEMA 34 QCI-A34 Family



NEMA 17 and 34 Mosolver
Mosolvers=Motor+Resolver

Controllers

SilverNugget™ X-Series – Supports Hybrid Servos, DC, Voice Coils

SilverNugget QCI-N2-IX

SilverNugget QCI-N3-IX

SilverNugget QCI-N2-MX

SilverSterling™ – Support Hybrid, Mosolver, 3 Phase, DC motors, Voice Coils

SilverSterling QCI-S3-IG

SilverSterling QCI-S2-IG

SilverSterling QCI-S2-X2-IG

SilverDust™ Open Frame – Supports Hybrid Servos, DC motor, Voice

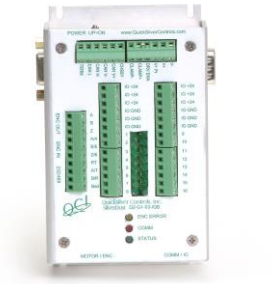
SilverDust QCI-D2-MG

SilverDust QCI-D2-MG-01

SilverDust QCI-D2-IG

Controllers

SilverDust™ Closed Frame – Supports Hybrid Servo, Stepper, DC,

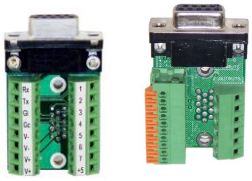


SilverDust QCI-D2-IGB

SilverDust QCI-D2-IG8

SilverDust QCI-D2-IGF

Accessories

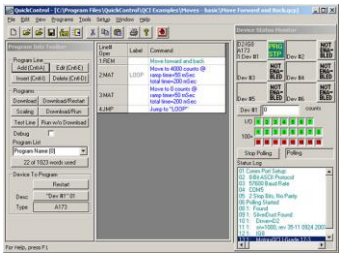


Break-Out Boards

Cables

Regenerative Clamps

Power Supplies



QuickControl® Integrated Development Environment

RS-485 Adapter

MSRP Price List is available at https://www.quicksilvercontrols.com/SL/QCIPriceList.pdf

Warnings

QuickSilver Controls' products shall not be used for Life Support applications without the explicit written permission from the President of QuickSilver Controls, Inc.

QuickSilver Controls products are high performance motion systems. As with any motion system, it can produce sufficient mechanical output to cause bodily injury and/or equipment damage if it is improperly operated or if it malfunctions. The user shall not attach the control system to any mechanism until its operation is fully understood. Furthermore, the user shall provide sufficient safety means and measures to protect any operator from misuse or malfunction of the motion system. The user assumes all liability for its use. QuickSilver disclaims any implied warranty of merchantability or of the fitness of the same for any purpose. Purchaser is solely responsible for determining the adequacy of the product for any and all uses to which the purchaser applies the product, and the application of the product by purchaser will not be subject to any implied warranty of fitness for that purpose. Under no circumstances shall QuickSilver be responsible for any incidental or consequential damages.

Full Warranty Text is available on line: https://www.quicksilvercontrols.com/SL/QCIWarranty.pdf

QuickSilver Controls, Inc., has made every effort to ensure the accuracy of the information in this catalog, but QuickSilver Controls shall not be held responsible inadvertent errors and omissions in this publication.

NOTE: IP65 is intended as a wash down specification, not a continuous wet operation specification. The IP-65 motors do not include the front shaft. The shaft must have a seal inserted (34HC), or a sealing plate must be purchased separately if the application does not provide protection from the environment.

What Makes QuickSilver Controls Different

Hybrid Servos:

Hybrid Servo is the new name for the closed loop operation of high pole-count permanent magnet synchronous motors. Hybrid servos combine the high torque capability of high-pole count AC permanent magnet synchronous motors, known as micro-stepping motors when operated open loop, with a closed loop, self-commutating driver. The result is an elimination of the wasted heat, and low- and mid-frequency resonances, by the use of a sophisticated closed loop driver and controller. The motors run cooler, quieter, and smoother. As with other servos, Hybrid Servos do not loose steps, and they provide very tight motion control.

High Torque:

Hybrid Servos have a very high torque constant for their current rating. This results in a very high motor quality $Kq = Torque/\sqrt{Power} = Nm/\sqrt{W}$ These motors also are constructed with an IPM (interior permanent magnet) design. The combination allows these motors to produce greater continuous torque per volume at low speeds while also holding higher efficiency and power over a wide operating range. When compared to similarly sized low pole count servos, the hybrid servo produces the high torque levels without overdriving the motor windings, allowing for high continuous torques, typically significantly greater than the conventional servos in the speed ranges used to directly drive belts and lead-screws.

High Damping:

Our proprietary PVIA (Position Velocity Integral Acceleration) control system, which includes synthetic (simulated) inertial dampers, allows use of the control system with very high inertial mismatches, allowing the high torque capability of the motor to be utilized, often without the need for gearheads. The increased phase margins available with PVIA allows for higher gains for tighter motions and better resistance to the effects of stiction. Wide ranges of loads are able to be accommodated with the same tuning parameters. The wide phase margins provided by our damping methods allow for higher gains for tighter control, especially in the presence of stiction, allowing significant advantages for precision pumps.

Power Saving/High Efficiency

Efficiency is key. Our servo controllers run cool, which means lower power and higher efficiency. Our patented drive technology, combined with the inherent power savings of closed loop (servo) vs. open loop (stepper) yields greater power savings. Since our motors run closed loop the driver only drives as much current into the motor as required to put the motor on target, verses a stepping drive which runs at full current most of the time. As a result, our motors run cooler and require 50%-75% less energy than the same motor used on a step drive.

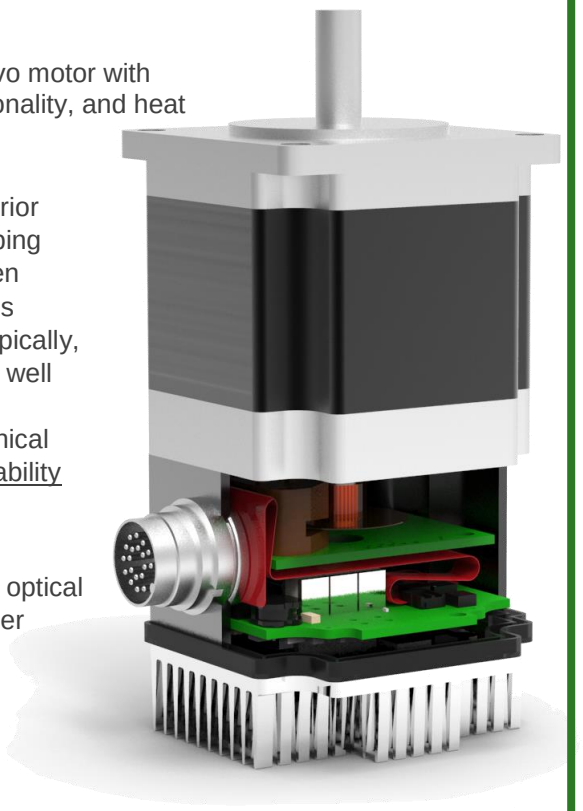
Even compared to conventional Servo Motors, Hybrid Servo motors often use significantly less energy in the direct drive speed range (200-1500RPM), making them an excellent choice in battery powered operations where lower power equates to longer runs time for the same battery or super-capacitor energy source.

High Inertial Loads

Our digital four quadrant driver and servo loop uses sophisticated motion control algorithms to take advantage of our high-torque capability, providing direct-drive of high inertia loads such as flywheels and belt drives. These load inertias may be as large as 100 times the motor inertia (100:1 inertia mismatch) while still providing smooth responsive positioning control. Traditional servo systems typically cannot exceed a 10:1 inertial mismatch.

SilverMax Overview

SilverMax X-Series is a fully integrated closed-loop hybrid servo motor with position feedback, controller/indexer, digital driver, PLC functionality, and heat sink all in a compact package.



SUPERIOR (HIGHER) CONTINUOUS TORQUE

The SilverMax X-series high pole count motor generates superior (higher) continuous torque, which is ideal in holding and clamping applications, as much less power is required to produce a given continuous holding torque. Full motor power is available across range of speeds. For belts and leadscrew that are limited to typically, no more than 1K RPM, the SilverMax X-series motor matches well with direct driving belt drives and lead screws, and in most applications, even eliminating the gear head, reducing mechanical backlash, maintenance, and cost. High Inertial Mismatch Capability

ENCODER FEEDBACK

On board the SilverMax X-series servo motor is a non-contact optical incremental encoder with 2000 lines, providing 8,000 counts per revolution of resolution. The SilverMax X-series is capable of outputting a buffered copy of the internal encoder signals to I/O's lines in either single-ended or differential format for electronic gearing applications.

PLC FUNCTIONALITY

Programs are downloaded and saved to non-volatile memory that are configured to interact with switches, sensors, analog inputs, and turn on outputs. Multiple serial communication protocols are supported, including:
8-bit ASCII, 9-bit Binary, Modbus® RTU, DMX-512, CANopen®. CANopen allows for coordination between multiple SilverMax X-series servo motors. The SilverMax X-series can handle running two threads in addition to motion and also capture/set/clear I/O's while in motion.

CLOSED-LOOP SERVO PERFORMANCE

- ✓ No Low/Mid Speed Resonances
- ✓ No "Step" Loss
- ✓ Minimized Heating, Vibration, and Noise
  - Key in Medical and Optical Applications
- ✓ Capable of Direct Driving Loads
- ✓ Handle Widely Varying Loads Including High Inertias
- ✓ Superior Continuous Torque Up to 2-3K RPM

MECHANICAL/DURABILITY

- ✓ Rugged Design Protect Electronics from Harsh Environments
- ✓ Sealed 19-pin M16 Connector
- ✓ Single Cable for Easier Routing
- ✓ Custom Machined Heat Sink for Improved Thermal Performance
- ✓ IP65 Rated (except front shaft. QCI-X34HC family available with integral front shaft seal, other sizes require a shaft seal kit.

SilverMax Features

Point-to-Point Moves
- Relative or Absolute
- Velocity or Time Based
- S-Curve

Advanced Motion Profile Moves
- Profile Move Commands
- Register Based
- Position/Accel/Decel/Vel
- Modify On-the-Fly

Multi-Axis Linear Interpolation
- XYZ Coords Contained in Text File
- CANopen® used for local bus
- 1000+ Points Stored in NV Memory

Program and Data Storage
- 32K Non-Volatile Memory:
- 2000-3000 Program Lines
- 8095 Word Execute Buffer
- 4285 User Registers
- User Data Examples
- CAM Tables
- Motion Profiles
- Lookup Tables

Electronic Slip Clutch/Brake
- Variable Torque
- Wind/Unwind Applications

Anti-Hunt™
- Optionally use Open Loop While Holding
- No Servo Dither While at Rest

Communications
- RS-485 @ up to 230K Baud
- ASCII, Binary, Modbus®, DMX512
- Host Control While Servo in Motion
- CANopen® (Rev 03 SW and higher)

Programming Language
- Easy, Menu Driven Interface
- Command Parameter Prompts
- No Syntax Errors
- User Namable I/O and Registers

Advance PVIA™ Servo Loop
- 100:1 Inertial Mismatch
- Direct Drive Oversized Inertial Loads
- Flywheels/Belt Drives
- Typically Without Gearheads
- More Stable Than PID

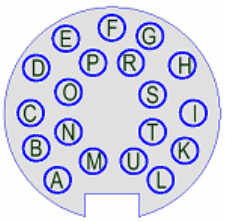
Digital 4 Quadrant Vector Drive
- DSP Driven for Reduced Noise

Multi-Task/Multi-Thread

NEMA 23 Frame
- 8000 Counts/Rev Encoder
- Up to 435 oz-in (3 Nm) (continuous)

NEMA 34 Frame
- 16000 Counts/Rev Encoder
- Up to 2450 oz-in (17.3 Nm) (continuous)

SilverMax X-Series Interface



Note: See 34 frame information for separate driver power and clamp connection information. V+ is driver and main processor power for 23 frame and main processor power for 34 frame. “Processor power” is processor backup power 8-12V DC. See data sheet for full details. All power inputs must be fused. See data sheet for more details.

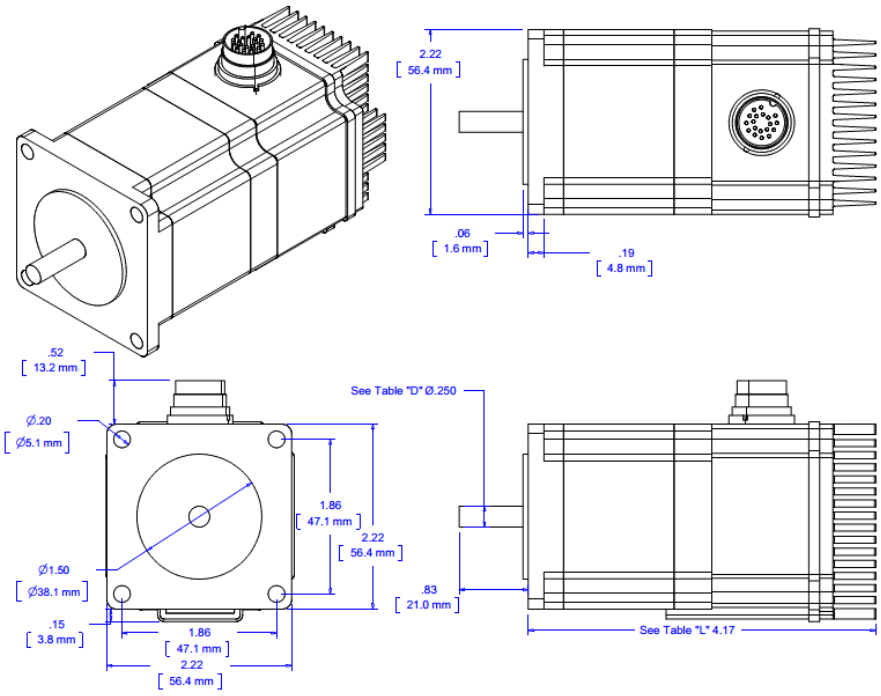
Pin	Signal
A	V+
B	V+
C	IO7
D	IO5
E	IO4
F	IO2
G	IO1
H	485A
I	CAN-L
K	PGND
L	PGND
M	Processor Power
N	Drive Enable
O	IO6
P	IO3
R	485B
S	Logic Ground
T	CAN-H
U	+5v

SilverMax QCI-X23C Family

The SilverMax™ is a fully integrated Hybrid Servo Motor with feedback, a Controller/Indexer, and a Digital Driver in a compact package. All communications and power are accessed through a single 19 pin M16 connector. The interface includes 7 I/O, all of which support both LVTTL and analog signals, and one of which also supports 0 to 10v analog input. A processor back-up power input and a hardware drive enable are also included. Communication via CANopen and RS-485 serial, which may be operated simultaneously. The driver is rated to 6A continuous per phase. The system is designed for use at +12.5 to +48 VDC. Rated IP65 except front shaft. Shaft seal kits available. See *Accessories*.

Note: Requires QuickControl v6.24 or greater to initialize and program SilverMax X-Series servos.

Full Data sheet http://www.quicksilvercontrols.com/SP/DS/QCI-DS030_QCI-X23.pdf



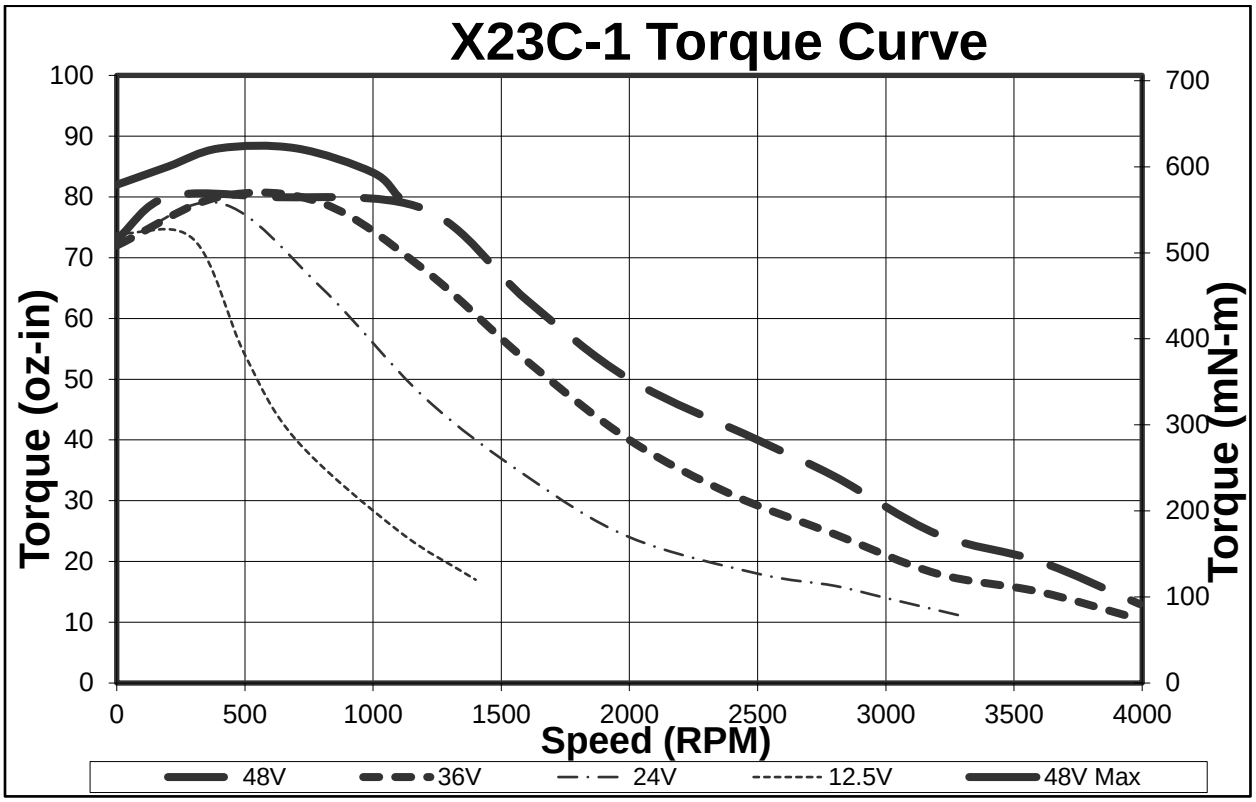
Model	Shaft Diameter "D"		Body Length "L"	
QCI-X23C-1	0.25 in	6.35mm	3.58 in	91 mm
QCI-X23C-3	0.25 in	6.35mm	4.17 in	106 mm
QCI-X23C-6	0.315 in	8 mm	5.2 in	132 mm
QCI-X23C-8	0.315 in	8 mm	6.38 in	162 mm

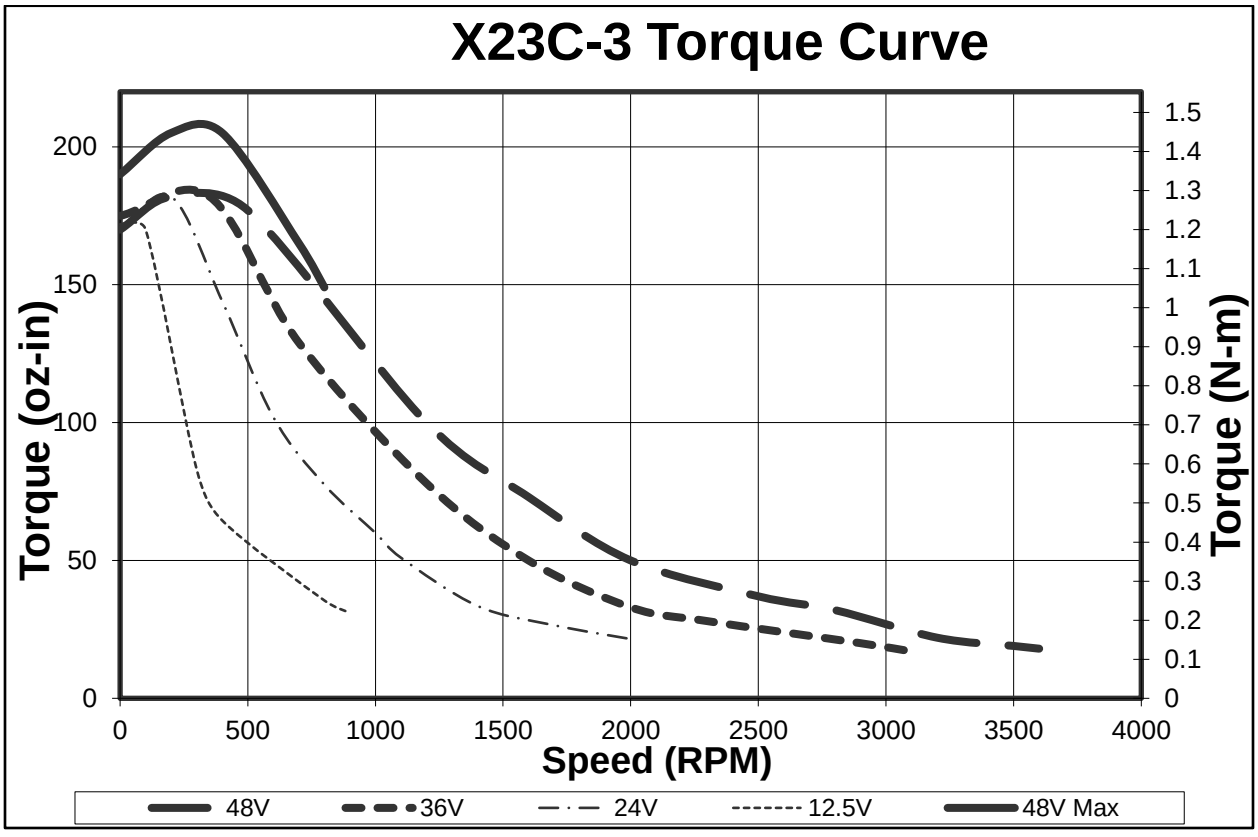
Specifications	X23C-1	X23C-3	X23C-6	X23C-8
Maximum Speed (RPM)	4000	4000	2500	1000
48v Optimal Speed (RPM)	2500	1000	600	500
Torque (oz-in / Nm) At Optimal Speed	45 0.31	90 0.65	205 1.44	225 1.59
Continuous Stall Torque oz-in / Nm	75 0.53	170 1.20	300 2.11	380 2.68
Peak Power (Mech. Watts)	84	90	90	84
Rotor Inertia $oz\text{-}in^2$ / $Kg\text{-}m^2$	0.82 1.5E-5	1.53 2.8E-5	3.28 6.00E-5	4.37 8.0E-5
Weight pounds / Kg	1.35 0.61	1.82 .82	2.97 1.35	3.41 1.55
Maximum Driver Input Current (Amps - DC)	4.0	4.0	4.0	4.5
Maximum Radial Force (lbs) / Newtons 0.79"/ 20mm from mounting face	16.8 75	16.8 75	16.8 75	16.8 75
Maximum Axial Force (lbs) / Newtons	3.4 15	3.4 15	3.4 15	3.4 15
Notes				Special Order

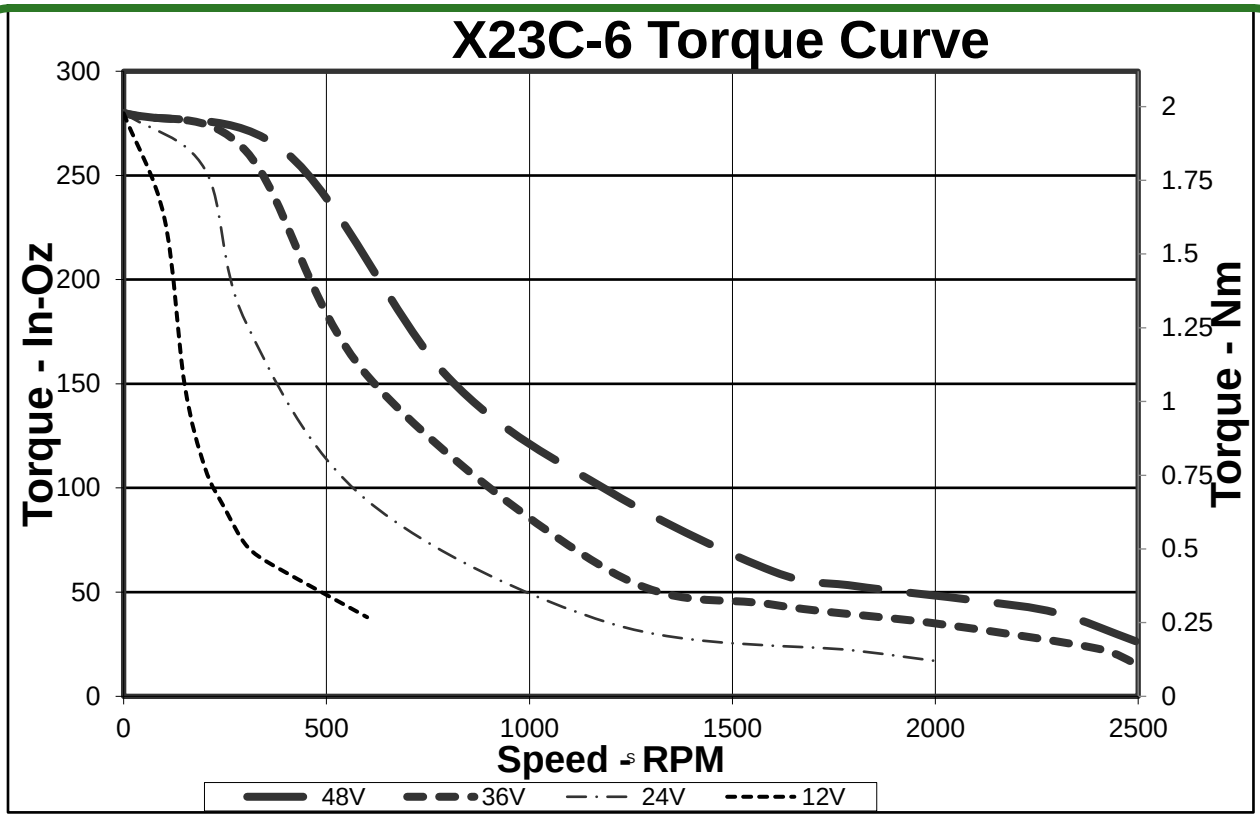
Part Numbers:

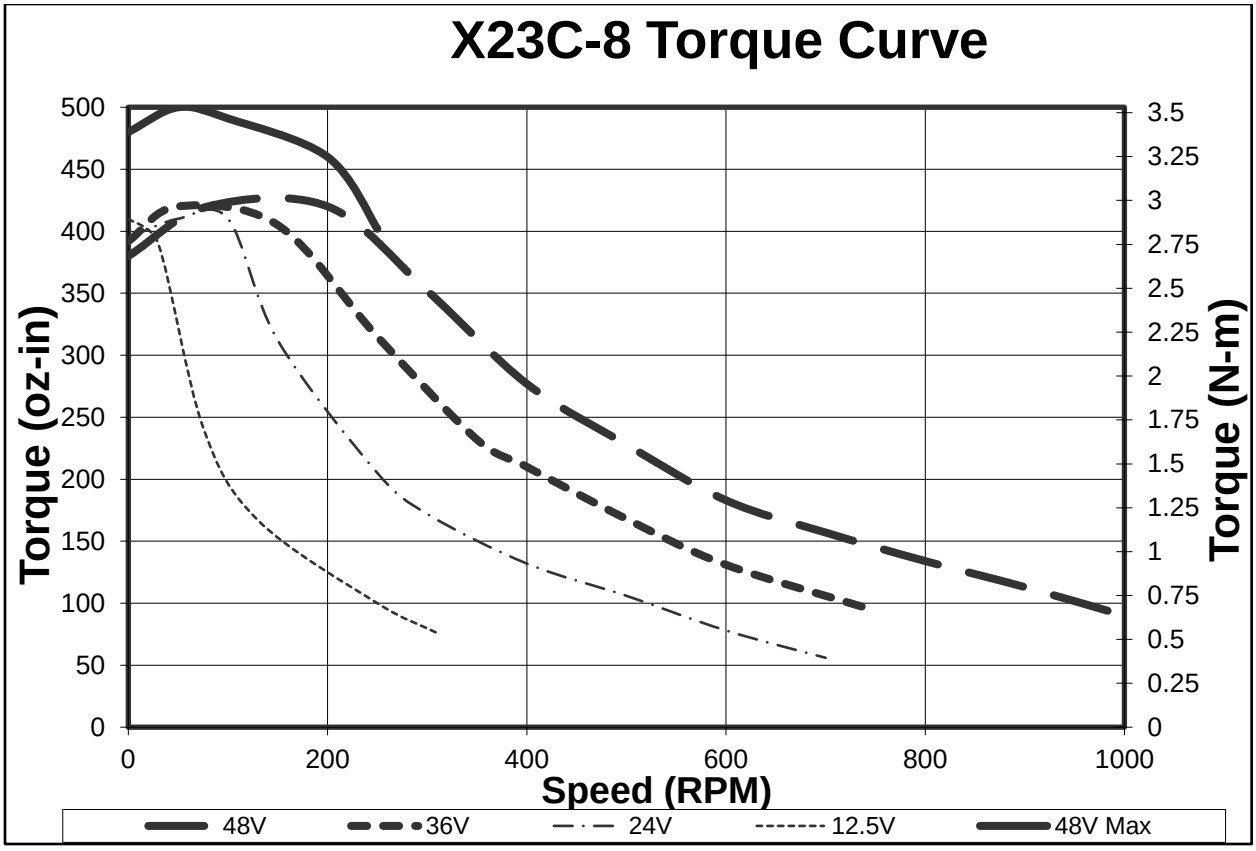
SilverMax X23- Series NEMA 23

Motor Size	Standard:
QCI-X23C-1	**8000 CPR Encoder** **12.5v to 48v** **Driver Enable** **CANopen** **RS-485 – multiple protocols** **19 pin M16 Connector**
QCI-X23C-3	
QCI-X23C-6	
QCI-X23C-8	


X23C-1 Torque Curve
Torque (oz-in)
Torque (mN-m)
Speed (RPM)
0
10
20
30
40
50
60
70
80
90
100
0
100
200
300
400
500
600
700
0
500
1000
1500
2000
2500
3000
3500
4000
48V
36V
24V
12.5V
48V Max


X23C-3 Torque Curve
Torque (oz-in)
Torque (N-m)
Speed (RPM)
0
50
100
150
200
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
0
500
1000
1500
2000
2500
3000
3500
4000
48V
36V
24V
12.5V
48V Max





**All Torque Curves in Catalog taken without shaft seal in place.

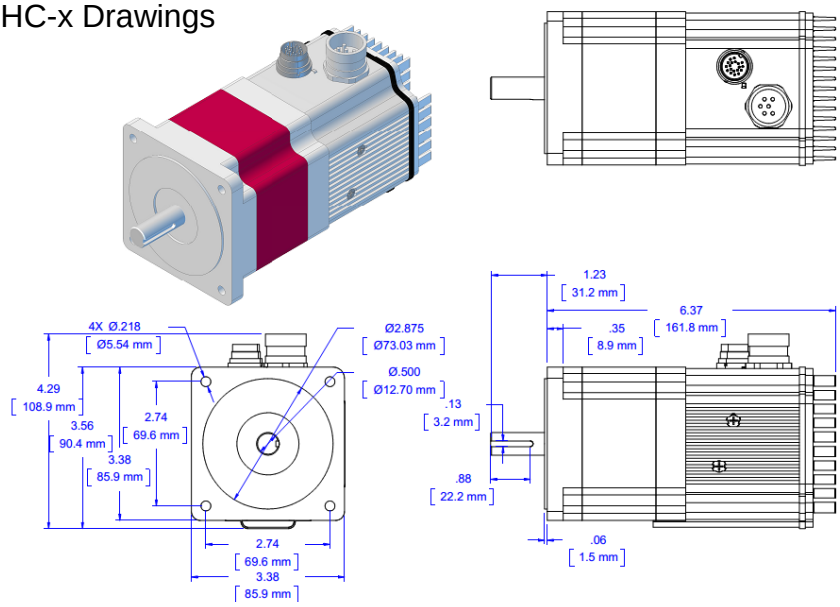
SilverMax QCI-X34 Family

The SilverMax™ is a fully integrated Hybrid Servo Motor with feedback, a Controller/Indexer, and a Digital Driver in a compact package. All communications and processor power are accessed through a 19 pin M16 connector. The interface includes 7 I/O, all of which support both LVTTL and analog signals, and one of which also supports 0 to 10v analog input. Driver Power and Clamp connections are made through a 6 pin M23 connector. A processor back-up power input and a hardware drive enable are also included. Communication via CANopen and RS-485 serial, which may be operated simultaneously. The driver is rated to 20A continuous per phase, 12.5v to 72v. The Processor section is designed for use at +12.5 to +48 VDC. Rated IP65 except front shaft. The QCI-X34HC family may be ordered with front shaft seals installed. Contact Factory.

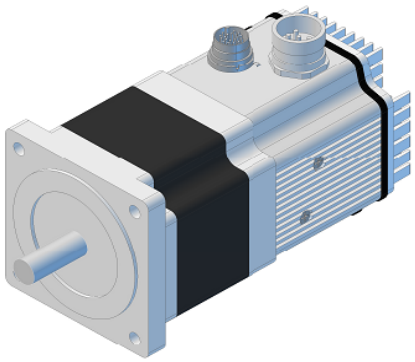
Note: Requires QuickControl v6.24 or greater to initialize and program SilverMax X-Series servos.

Full Data sheet http://www.quicksilvercontrols.com/SP/DS/QCI-DS033_QCI-X34.pdf

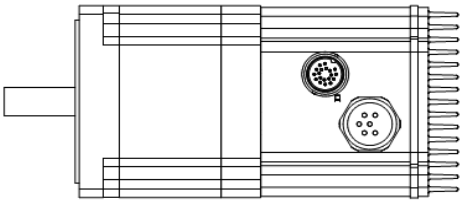
QCI-X34HC-x Drawings

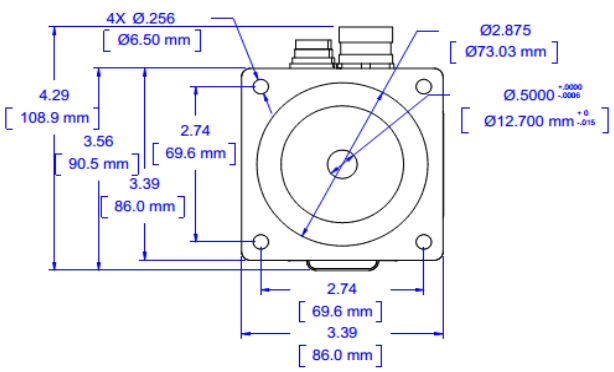


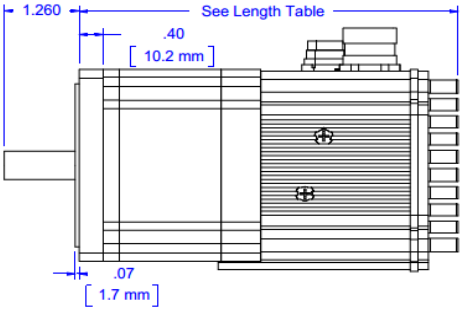
Model	Shaft Diameter		Keyway		Body Length	
X34HC-1	0.500	12.70 mm	0.125	3.175 mm	6.4	162 mm
X34HC-2	0.500	12.70 mm	0.125	3.175 mm	8.0	203 mm
X34HC-3	0.625	18.75 mm	0.1875	4.7625 mm	9.5	241 mm
X34HC-4	0.625	18.75 mm	0.1875	4.7625 mm	11.1	282 mm



QCI-X34HC-x Mechanical

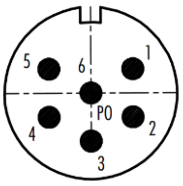






Model	Shaft Diameter		Keyway	Body Length	
X34CK-1	0.500	12.70 mm	None	6.4	162 mm
X34CT-1	0.500	12.70 mm	None	6.4	162 mm
X34CK-2	0.500	12.70 mm	None	7.6	193 mm

34 Frame Driver Power Connector



Pin	Signal	Wire color (QCI-XC-LP-xx)
1	V+ Clamp	Yellow
2	V+ Driver	Red
3	Chassis Gnd	Drain1
4	V- Clamp	Orange
5	V- Driver	Black
6	Chassis GND	Drain2

For use with internal 50W (average) clamp, connecto V+ to pin 3, and V- to V-Driver.

To use an external clamp resistor, connect between pin 1 and pin 4.

To bypass the clamp to allow regeneration to a battery, connect pins 1 and 2 to V+, and 4 and 5 to V-.

All power input connections to be fused to no more than 25A. See data sheet for details.

Specifications	X34CK-1	X34CK-2	X34CT-1	X34HC-1	X34HC-2	X34HC-3	X34HC-4
Maximum Speed (RPM)	2000	1500	2500	3000	2500	2000	2000
48v Optimal Speed (RPM)	700	450	1200	1300	900	900	1000
Torque (oz-in / Nm) at Optimal Speed	295 2.1	535 3.8	320 2.3	470 3.3	800 5.65	874 6.17	750 5.29
Continuous Stall Torque oz-in / Nm	490 3.4	1050 7.4	540 3.7	690 4.8	1300 9.3	2000 14.1	2600 18.6
Peak Power (Watts) @ 48v (Watts) @ 72v	150 230	175 250	285 390	420 650	596 850	585 850	555 850
Rotor Inertia oz-in^2 / Kg-m^2	7.65 1.4e-4	14.8 2.7e-4	7.65 1.4e-4	7.8 1.4e-4	14.7 2.7e-4	21.9 4.0e-4	29.0 5.3e-4
Weight pounds / Kg	6.1 2.8	9.25 4.2	6.1 2.8	5.9 2.7	9.4 4.3	13 5.9	16 7.25
Maximum Driver Input Current (Amps - DC)	5	6.5	10	14	16	16.5	14
Maximum Radial Force (lbs) / Newtons 0.79"/ 20mm from mounting face	49 220	49 220	49 220	65 290	65 290	110 490	110 490
Maximum Axial Force (lbs) / Newtons	13.5 60	13.5 60	13.5 60	305 1300	305 1300	305 1300	305 1300
Shaft Diameter in/mm	.5 12.7	.5 12.7	.5 12.7	.500 12.70	.500 12.70	.625 15.88	.625 15.88

SilverMax X34- Series NEMA 34

Motor Size
QCI-X34CK-1
QCI-X34CK-2
QCI-X34CT-1
QCI-X34HC-1
QCI-X34HC-2
QCI-X34HC-3
QCI-X34HC-4

Standard:

16000 CPR Encoder

12.5v to 72v for driver, 12-48v for processor

Driver Enable

CANopen

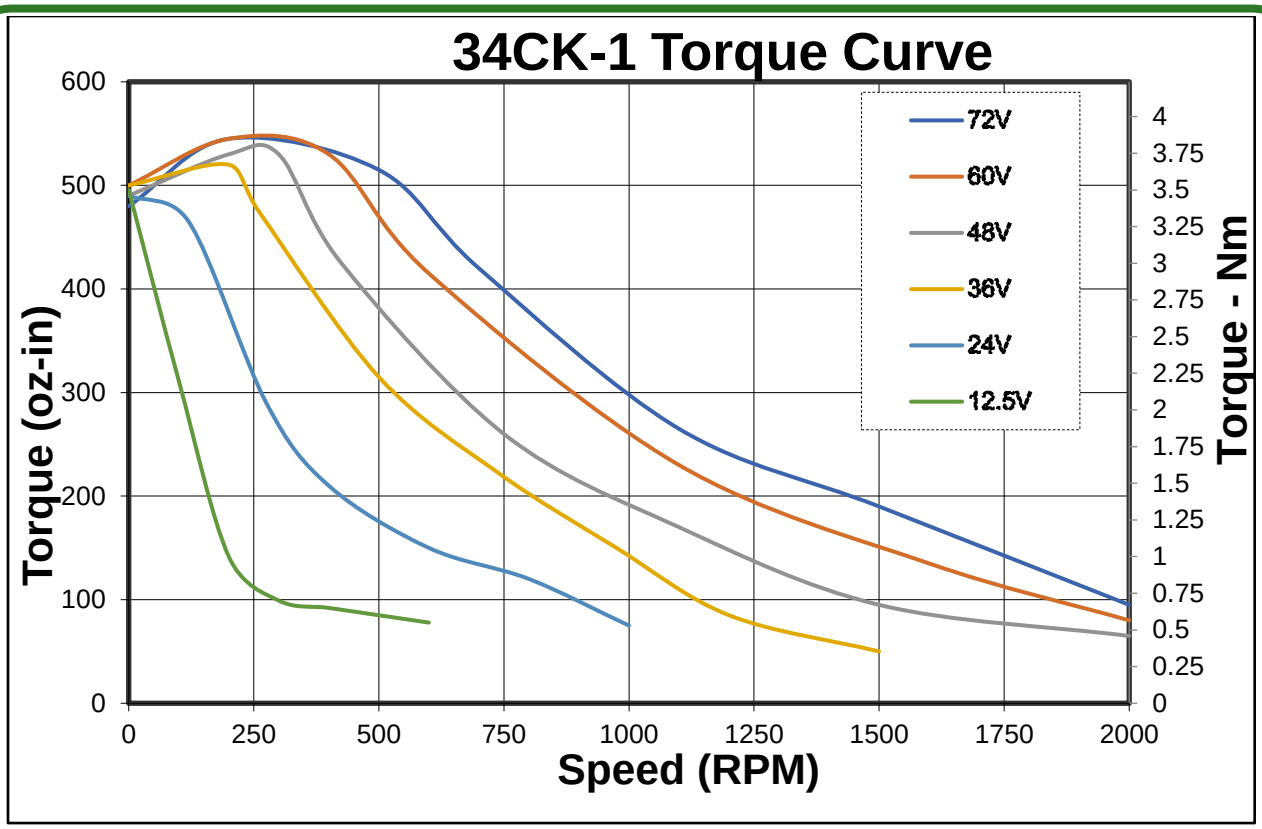
RS-485 – multiple protocols

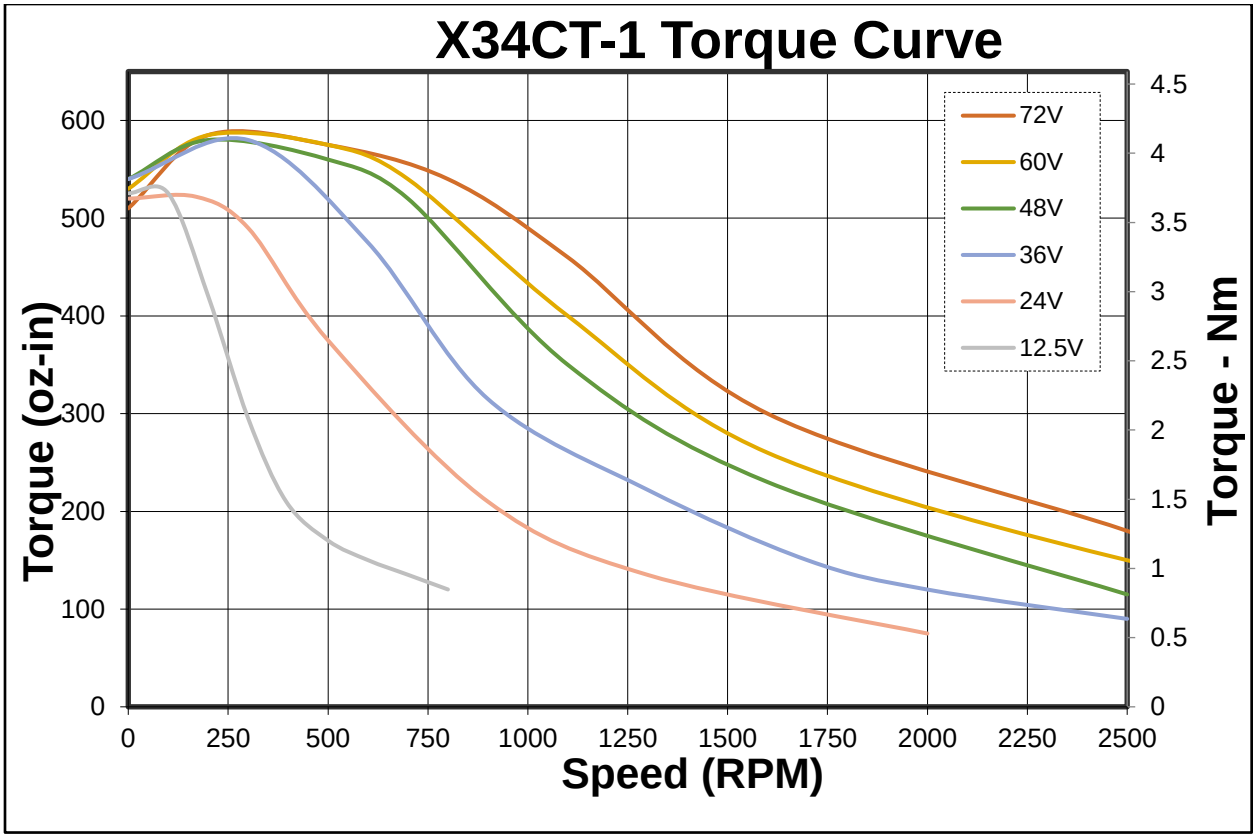
19 pin M16 Connector

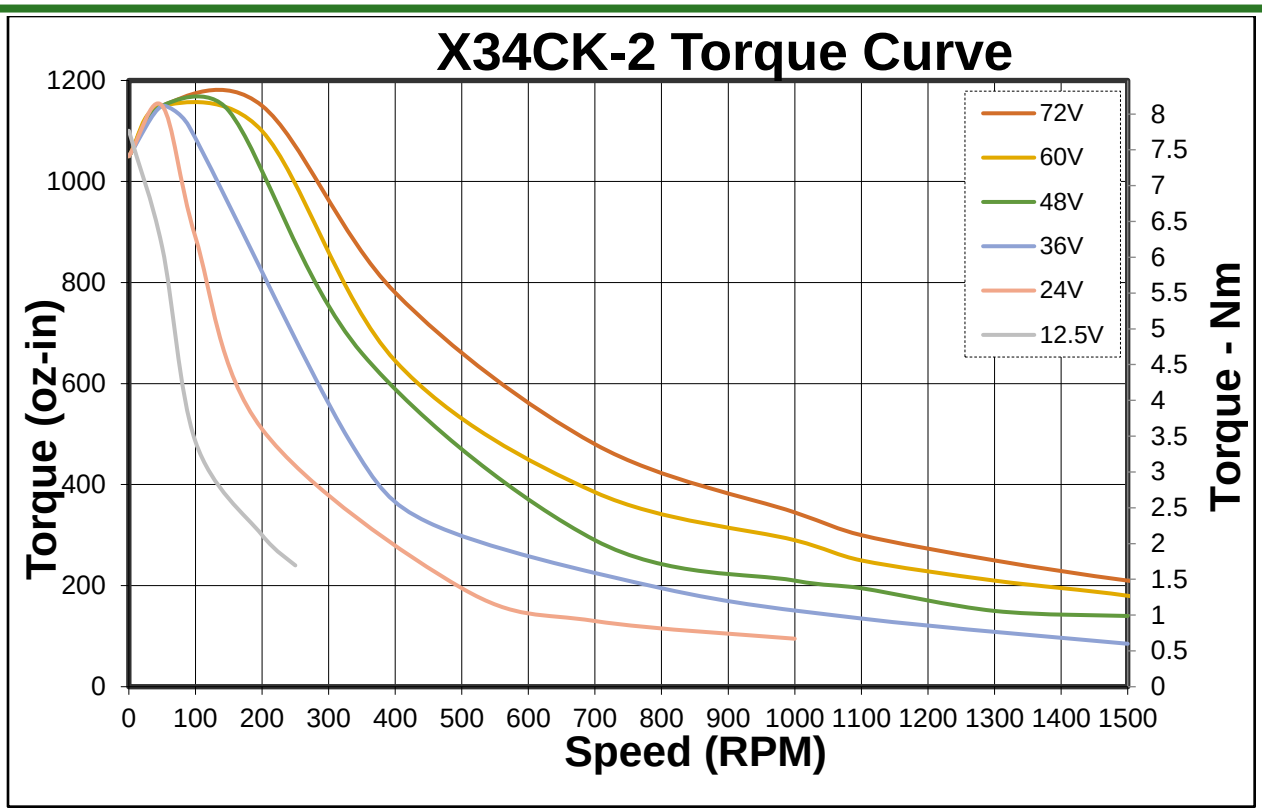
6 pin M23 Power Connector

IP65 except for front motor shaft.

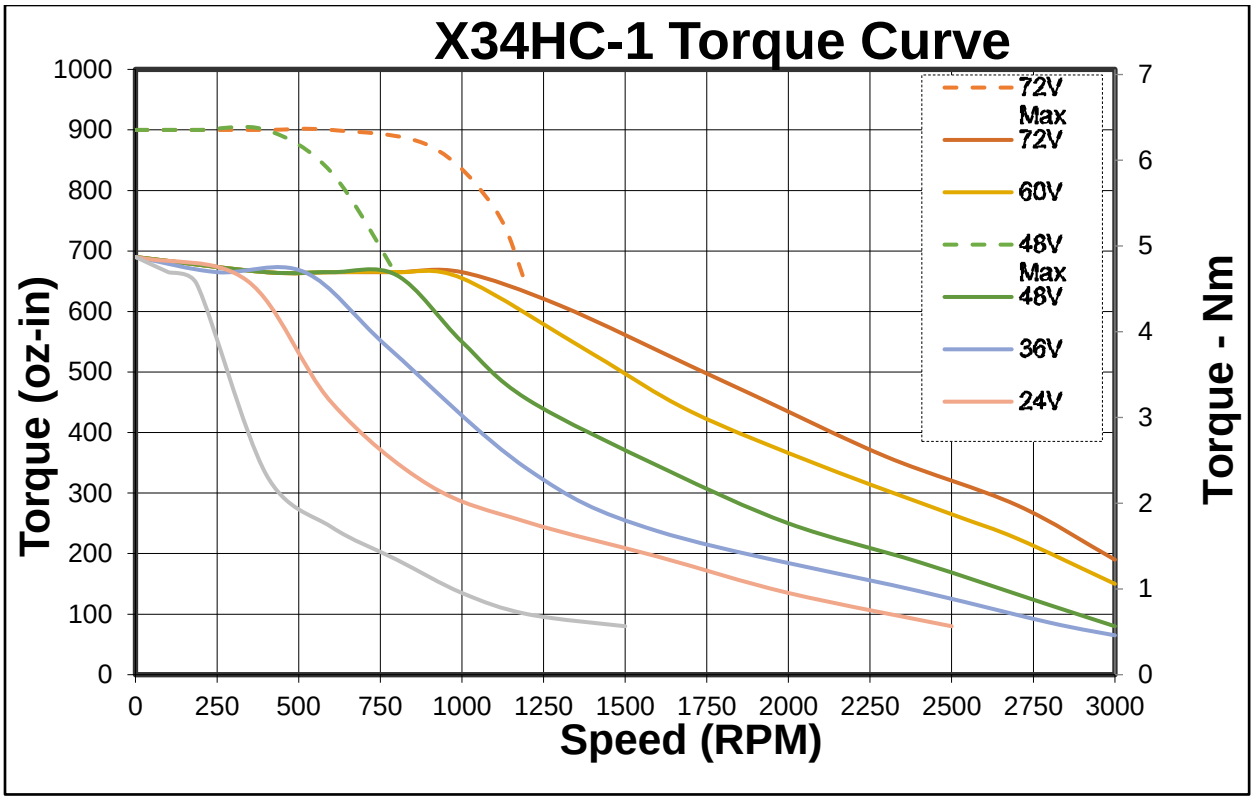
- **X34HC-x optional shaft seal order with an "S" suffix**
- **X34Cx-x require shaft seal or attachment to sealed gearhead or mechanism for IP65**

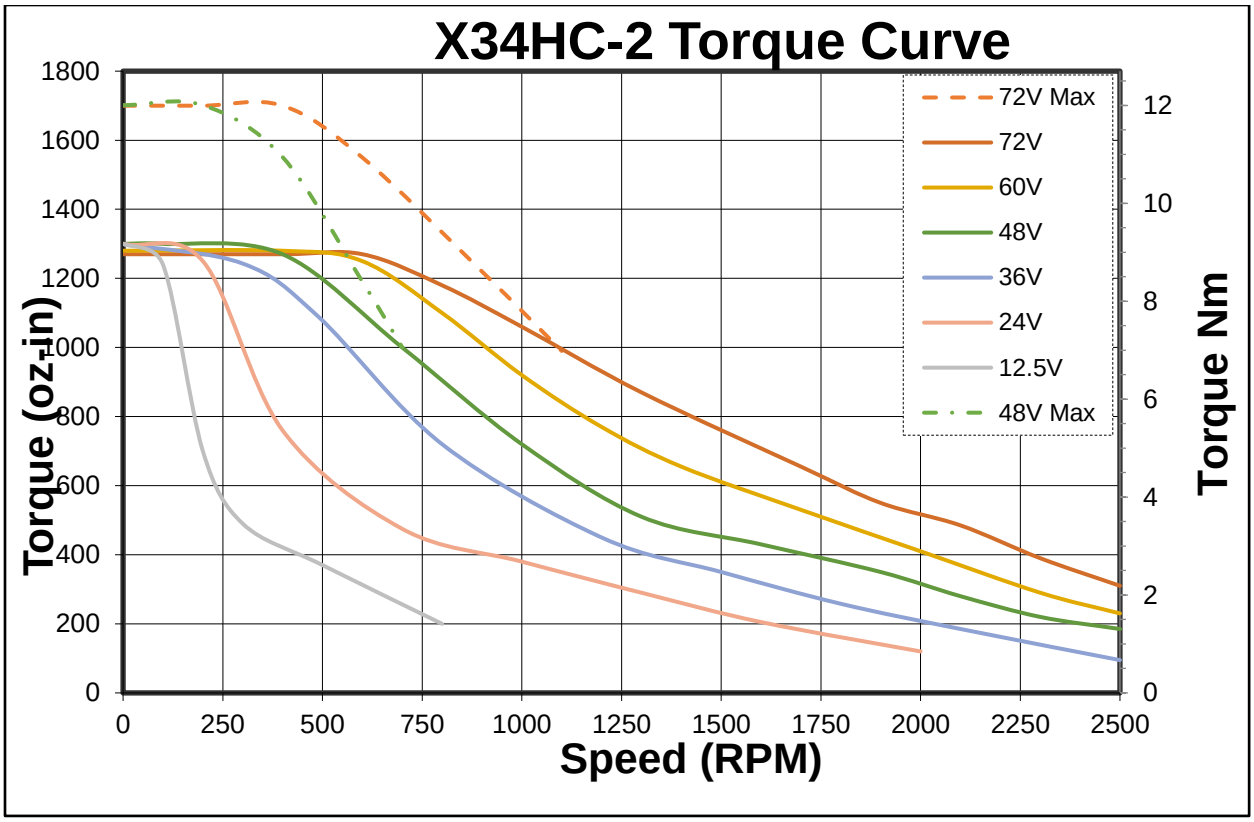

34CK-1 Torque Curve
Torque (oz-in)
Torque - Nm
Speed (RPM)
72V
60V
48V
36V
24V
12.5V
0
100
200
300
400
500
600
0
0.25
0.5
0.75
1
1.25
1.5
1.75
2
2.25
2.5
2.75
3
3.25
3.5
3.75
4
0
250
500
750
1000
1250
1500
1750
2000

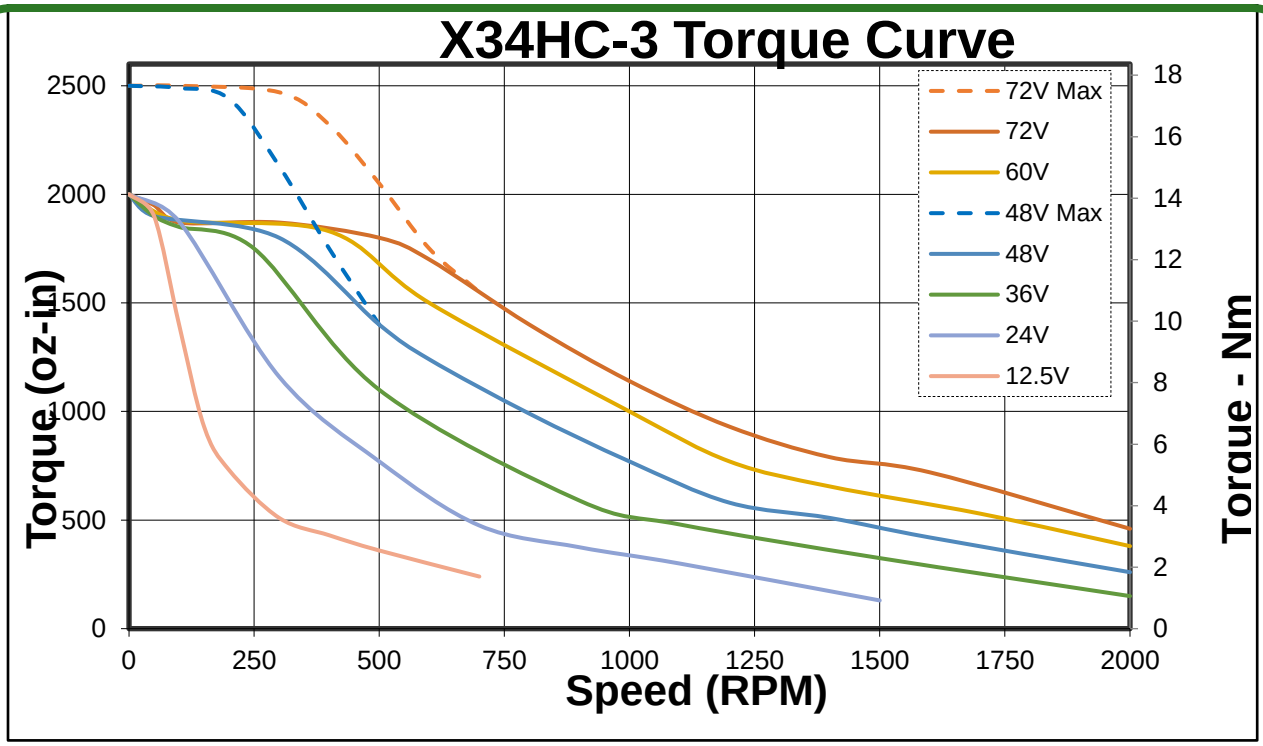

X34CT-1 Torque Curve
Torque (oz-in)
Torque - Nm
Speed (RPM)
72V
60V
48V
36V
24V
12.5V
0
100
200
300
400
500
600
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
0
250
500
750
1000
1250
1500
1750
2000
2250
2500

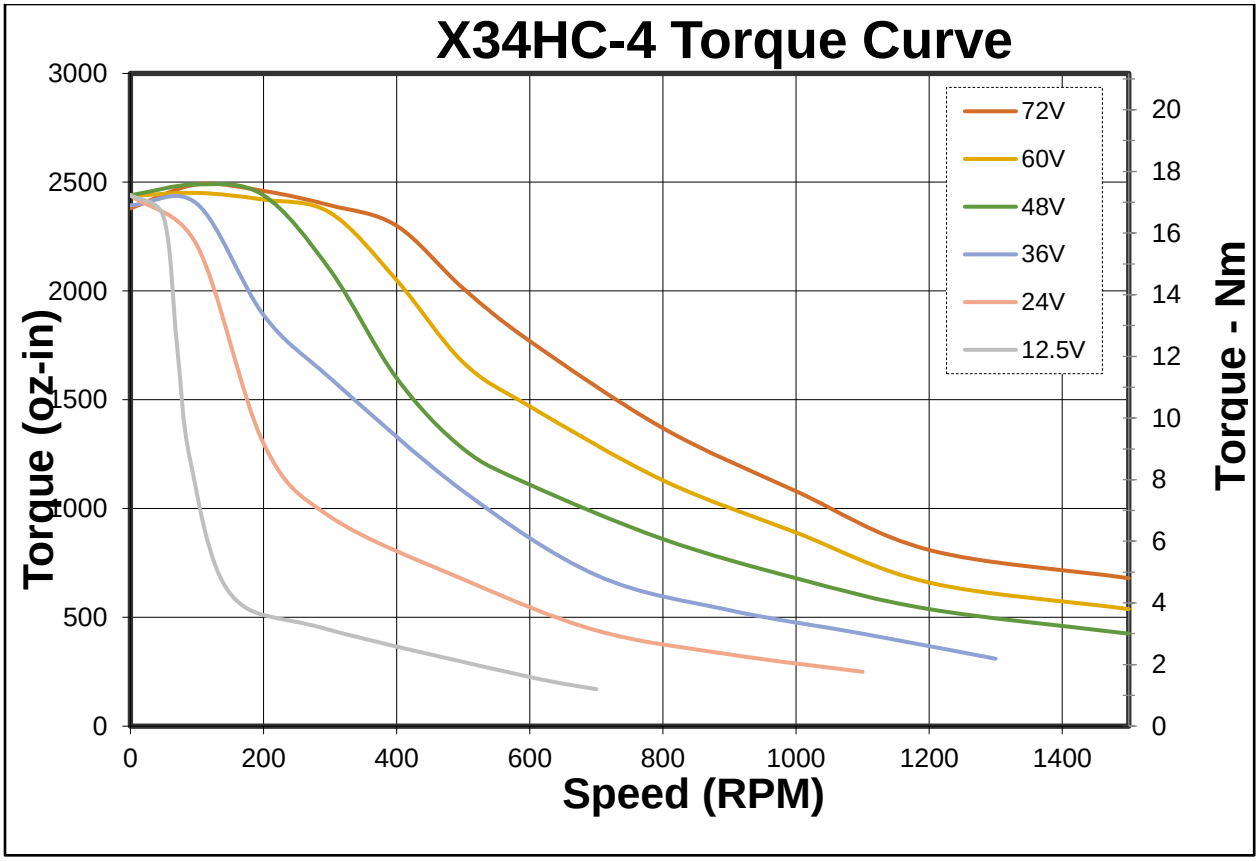


Note: All torque curves taken with 2' power cable; voltage measured entering power cable.


X34HC-1 Torque Curve
Torque (oz-in)
Torque - Nm
Speed (RPM)
72V Max
72V
60V
48V
48V Max
36V
24V
0
100
200
300
400
500
600
700
800
900
1000
0
1
2
3
4
5
6
7
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
2750
3000


X34HC-2 Torque Curve
Torque (oz-in)
Torque Nm
Speed (RPM)
72V Max
72V
60V
48V
36V
24V
12.5V
48V Max
0
200
400
600
800
1000
1200
1400
1600
1800
0
2
4
6
8
10
12
0
250
500
750
1000
1250
1500
1750
2000
2250
2500

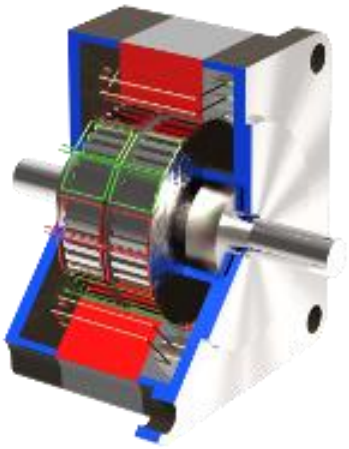

X34HC-3 Torque Curve
Torque (oz-in)
Torque - Nm
Speed (RPM)
72V Max
72V
60V
48V Max
48V
36V
24V
12.5V
0
500
1000
1500
2000
2500
0
2
4
6
8
10
12
14
16
18
0
250
500
750
1000
1250
1500
1750
2000


X34HC-4 Torque Curve
Torque (oz-in)
Torque - Nm
Speed (RPM)
72V
60V
48V
36V
24V
12.5V
0
500
1000
1500
2000
2500
3000
0
2
4
6
8
10
12
14
16
18
20
0
200
400
600
800
1000
1200
1400

Mosolver

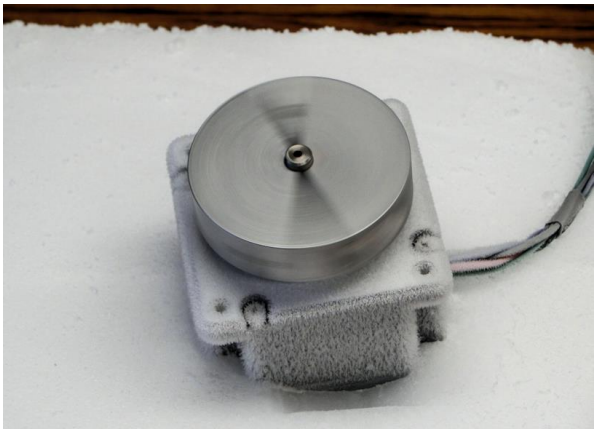
The Mosolver is a patented combination of a Hybrid Motor and Resolver = Mosolver.

The result is a motor with its own internal feedback with a resolution up to 32,000 counts per revolution, and that does not need a start-up motion to align the feedback to the motor. And this is done in the same envelope as the motor without the sensor!.



The Mosolver adds a small flex circuit in between the teeth of the stator to intercept the magnetic flux linking between the rotor and the stator teeth. A time varying magnetic field is generated by the PWM drive feeding the stator. As the rotor position changes, the coupling between different teeth of the rotor and stator varies. This results in sine and cosine shaped signals being detected by the sensor coils as the rotor position varies. The signal remains approximately constant amplitude regardless of whether the rotor is stationary or moving, thus this method provides true position feedback, even when stationary, without any additonal feedback elements. Competing Back-EMF methods work poorly as the speed is reduced and typically require some motion before they can initially identify the motor phasing at start-up.

The sensor is comprised of a thin polyamide strip encapsulating two sets of conductors. The sensor is not sensitive to oil or dust, has a very wide temperature rating range. The material is also resistant to even high radiation dosages (with a motor that has been made with suitable materials (special order)). Mechanically, the strip is burried withing the motor and so is physically protected. Our SilverSterling line of controllers work with our line of Mosolvers. Contact the factory if you need other sizes.



The Mosolver works over a wide range of temperatures. The picture shows a 23 frame Mosolver operating in a block of Dry Ice. For high temperatures, the Mosolver should be able to match the ratings of the motor as well.

Note: For best operation, the grease in the motor bearings must be selected to cover extreme temperatures.

Specifications	MV17L-1	MV23L-1
Maximum Speed (RPM)	2300	3000
48v Optimal Speed (RPM)	1700	2000
Torque (oz-in / Nm) at Optimal Speed	18.5 0.135	22 .15
Continuous Stall Torque oz-in / Nm	28 0.20	40 .28
Peak Power (Mech. Watts)	27	44
Rotor Inertia oz-in^2 / Kg-m^2	.18 3.29e-6	.74 1.35e-5
Weight lb / Kg	.61 0.27	1.05 0.48
Maximum Driver Input Current (Amps - DC)	1.1A @ 48V 1.5A @24v	2.5
Shaft Diameter in / mm	.1968 5.00mm	0.25 6.35 mm
Maximum Axial Force lbs N	6 26	13 57
Maximum Radial Force lbs/N @ .62" (15mm) from face	6 26	15 27

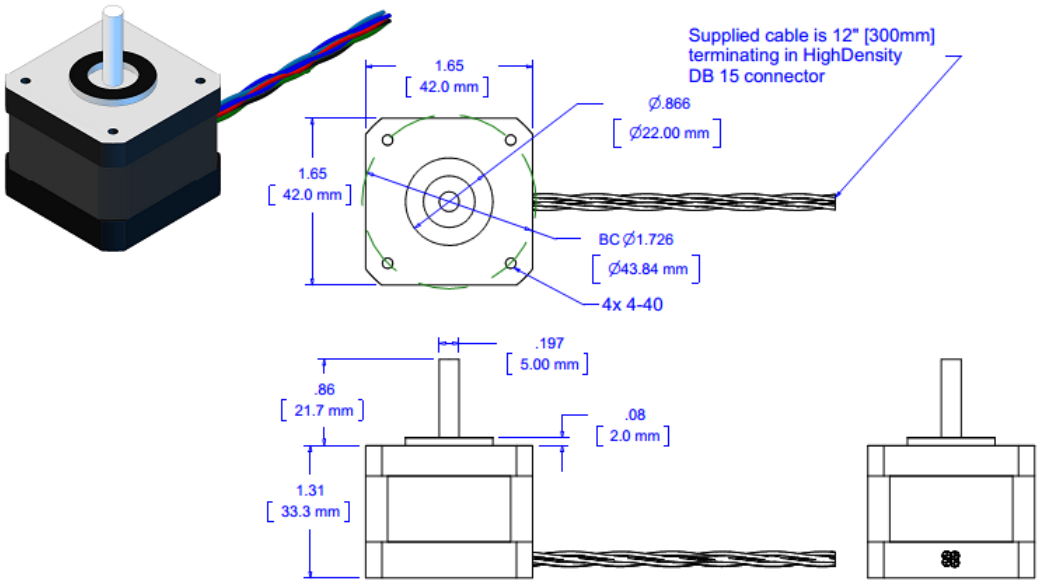
Mosolver NEMA MV17 / MV23

MOTOR TYPE/SIZE	MOTOR INTERFACE
• **QCI-MV17L-1**	**Blank** – Standard • DB15HD Motor Interface Connector
• **QCI-MV23L-1**	

http://www.quicksilvercontrols.com/SP/DS/QCI-DS036_QCI-MV17L-1.pdf

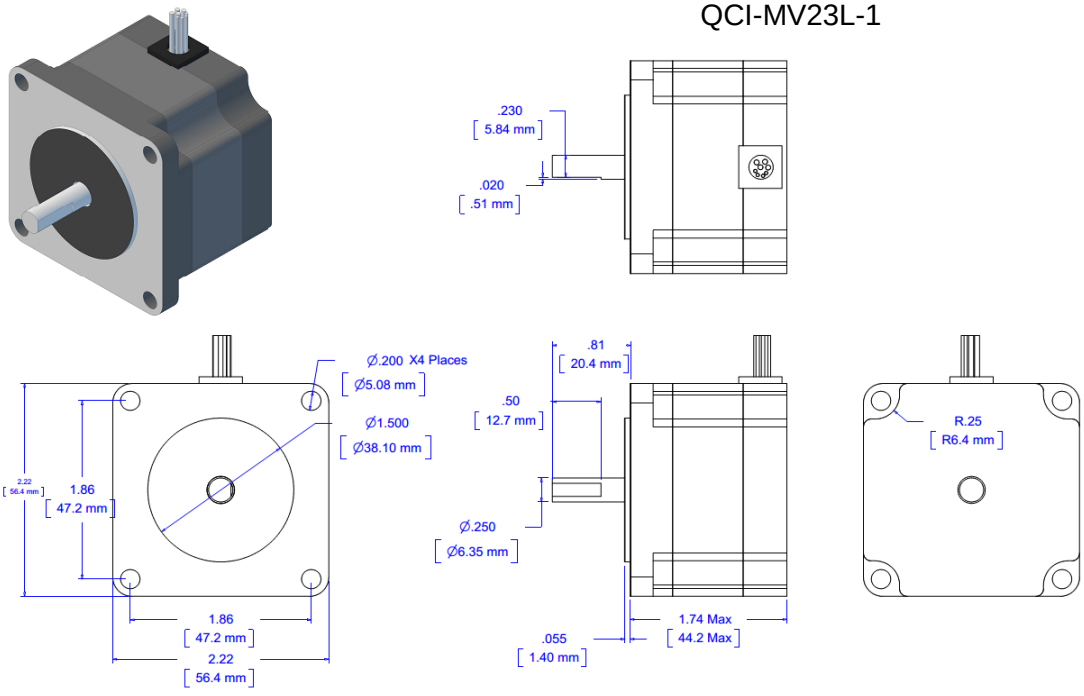
http://www.quicksilvercontrols.com/SP/DS/QCI-DS029_QCI-MV23.pdf

QCI-MV17L-1

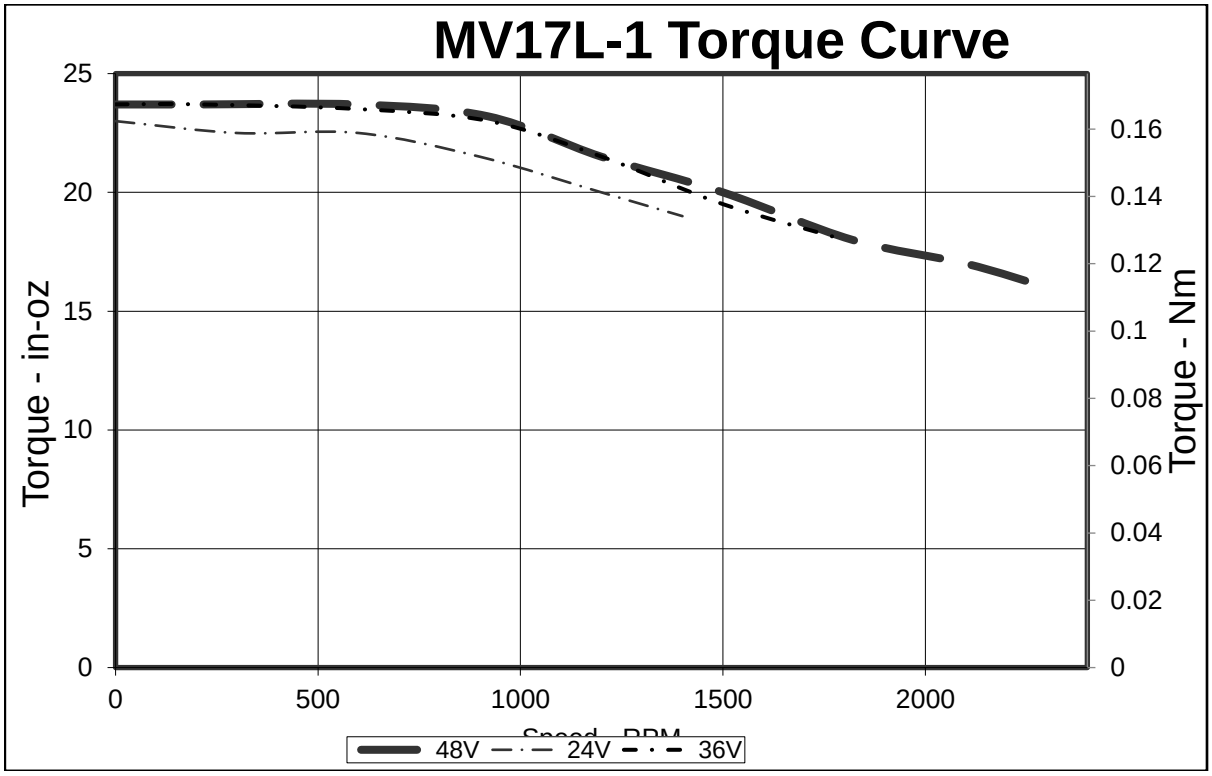


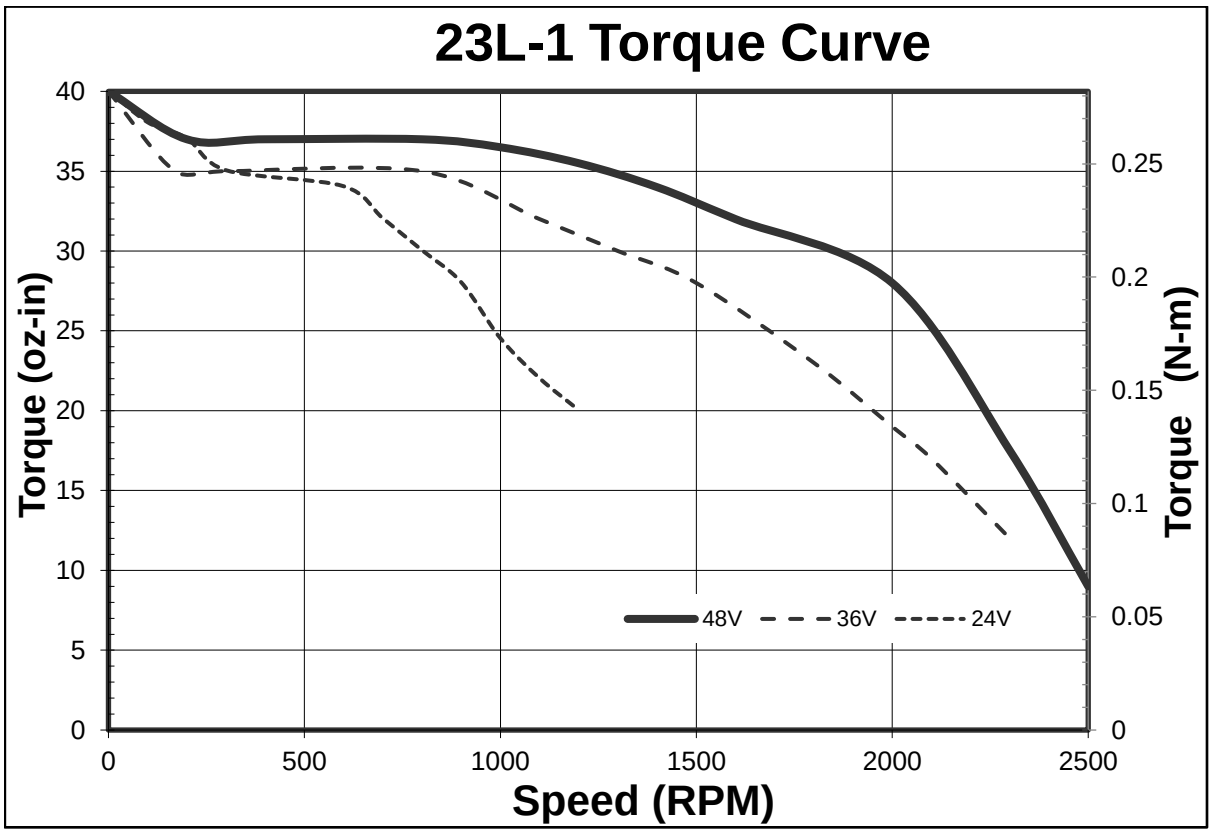
Motor Series	Body Length	Shaft diameter	Notes
MV17L-1	1.31 [33.3 mm]	0.197 [5.00 mm]	Shaft is round

QCI-MV23L-1



Motor Series	Body Length	Shaft diameter	Notes
MV23L-1	1.61 [41 mm]	0.250 [6.35 mm]	Shaft has .020 [.5 mm] flat


MV17L-1 Torque Curve
Torque - in-oz
Torque - Nm
25
20
15
10
5
0
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0
500
1000
1500
2000
48V
24V
36V


23L-1 Torque Curve
Torque (oz-in)
Torque (N-m)
40
35
30
25
20
15
10
5
0
0.25
0.2
0.15
0.1
0.05
0
0
500
1000
1500
2000
2500
Speed (RPM)
48V
36V
24V

NEMA 17 QCI-A17 Servo Motor Family

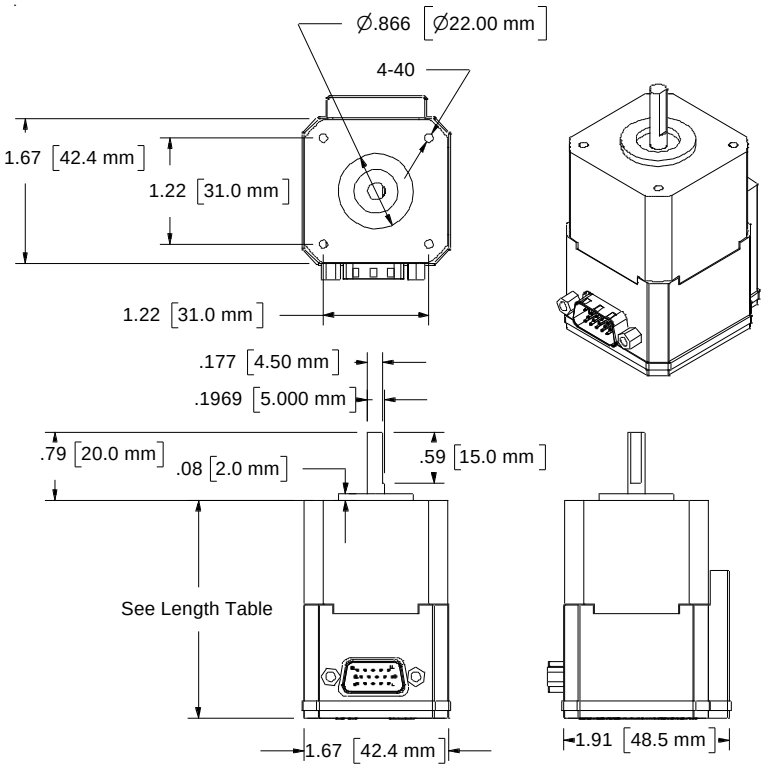
The NEMA 17 frame Hybrid Servo I-Grade Motors include a 8000 count per revolution encoder, and internal memory device holding the motor type and alignment information.

These servo motors are available as IP54 or IP65. IP65 is for the motor except the shaft. Full IP65 requires an optional shaft seal. See *Accessories*.

Note: Torque curves only apply when using a compatible QuickSilver Controller, and do not include the effects of the drag of the seal.

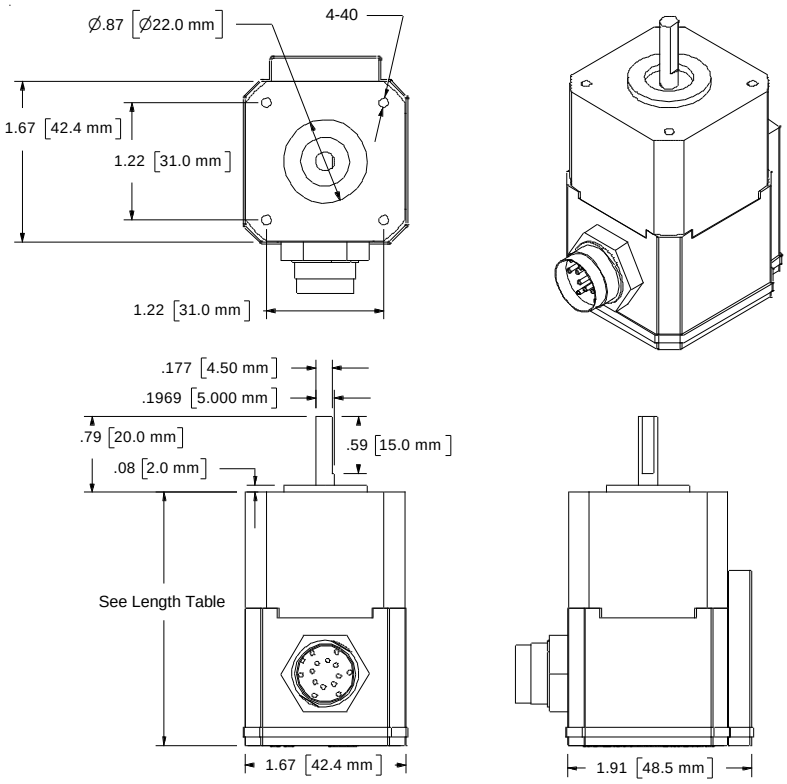
IP65 style shown with cable and shaft seal sold separately

Full Data Sheet http://www.quicksilvercontrols.com/SP/DS/QCI-DS007_QCI-A17.pdf



Part Number	Length	
QCI-A17-1	2.6 inch	66 mm
QCI-A17H-3	3.1 inch	78 mm

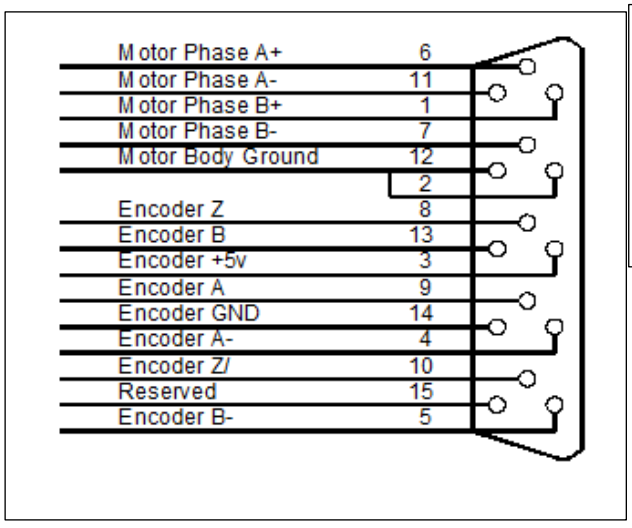
IP65 -6T Option

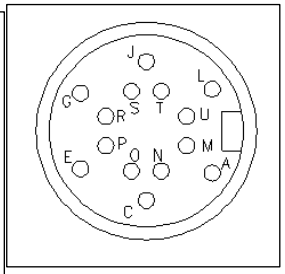


Part Number	Length	
QCI-A17-1-6T	2.7 inch	69 mm
QCI-A17H-3-6T	3.2 inch	81 mm

Note: These servo motors are IP65 except front shaft. If not otherwise protecting the front shaft, a Shaft seal (QCI-17M-65) is required for full IP65 (sold separately).

Connections for the Standard and -6T (IP65) versions:



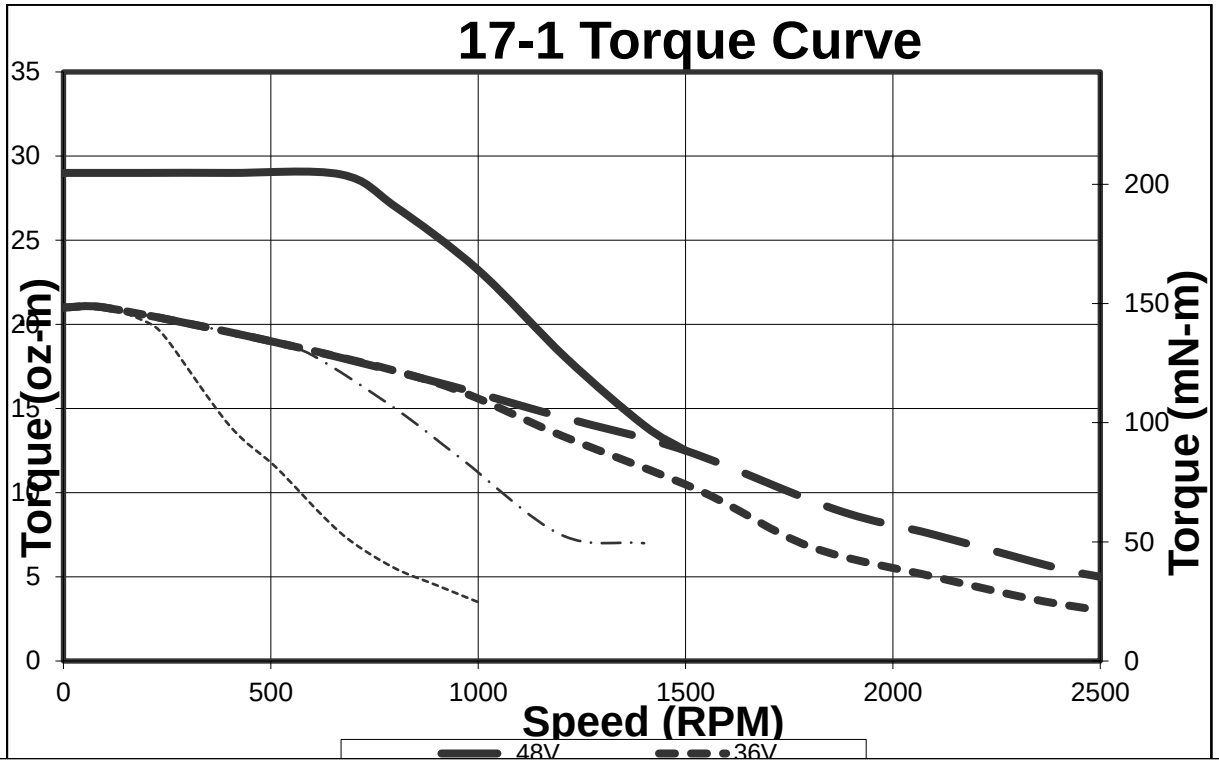


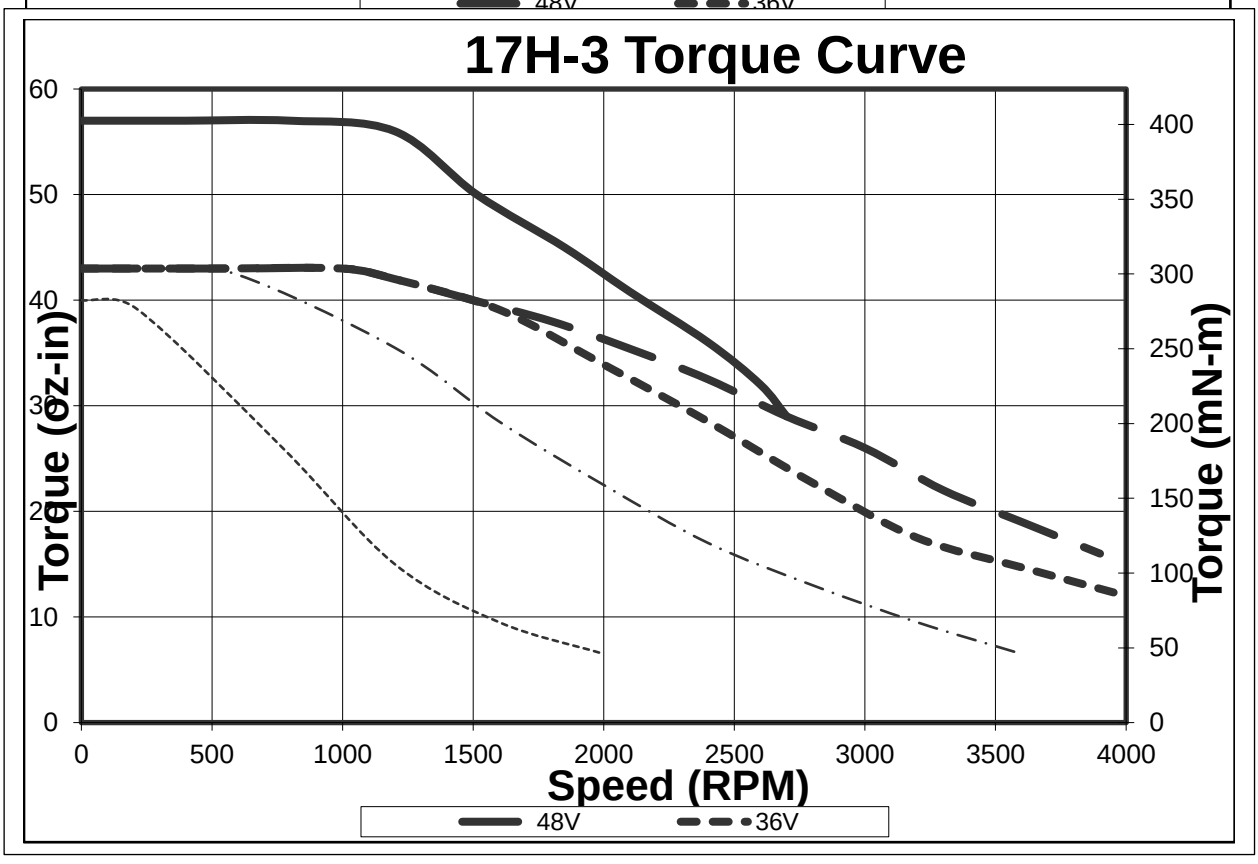
Pin	Signal
A	Motor A -
C	+5V
E	Memory
G	Motor B+
J	Motor B -
L	Motor A+
M	Z+
N	Z -
O	A+
P	B -
R	B+
S	GND
T	A-
U	Motor GND

Specifications	17-1	17H-3
Maximum Speed (RPM)	2500	4000
Optimal Speed (RPM) (best power and efficiency)	1600	2700
Torque at Optimal Speed oz-in / Nm	12 0.08	30 0.21
Continuous Stall Torque oz-in / Nm	21 0.15	43 0.30
Peak Power (Mech. Watts)	16	69
Rotor Inertia oz-in^2 / Kg-m^2	0.19 3.5E-6	0.37 6.8E-6
Weight pounds / Kg	0.60 0.27	0.90 0.40
Maximum Current (amps) (drawn from power supply)	1.3	4.0
Maximum Radial Force (lbs)	5	5
Maximum Axial Force (lbs)	3	3

I-Grade NEMA A17 Motors/Encoders

MOTOR TYPE/SIZE	MOTOR INTERFACE
• **QCI-A17-1** • **QCI-A17H-3**	**Blank –** Standard • DB15HD Motor Interface Connector
• **QCI-A17-1** • **QCI-A17H-3**	**6T** – IP65 • 14 Pin Round Connector • Shaft seal required for full IP65 rating. ○ QCI-17M-65 • Extra coating on motor exterior.


17-1 Torque Curve
Torque (oz-in)
Torque (mN-m)
Speed (RPM)
0
5
10
15
20
25
30
35
0
50
100
150
200
0
500
1000
1500
2000
2500
48V
36V


17H-3 Torque Curve
Torque (oz-in)
Torque (mN-m)
Speed (RPM)
0
10
20
30
40
50
60
0
50
100
150
200
250
300
350
400
0
500
1000
1500
2000
2500
3000
3500
4000
48V
36V

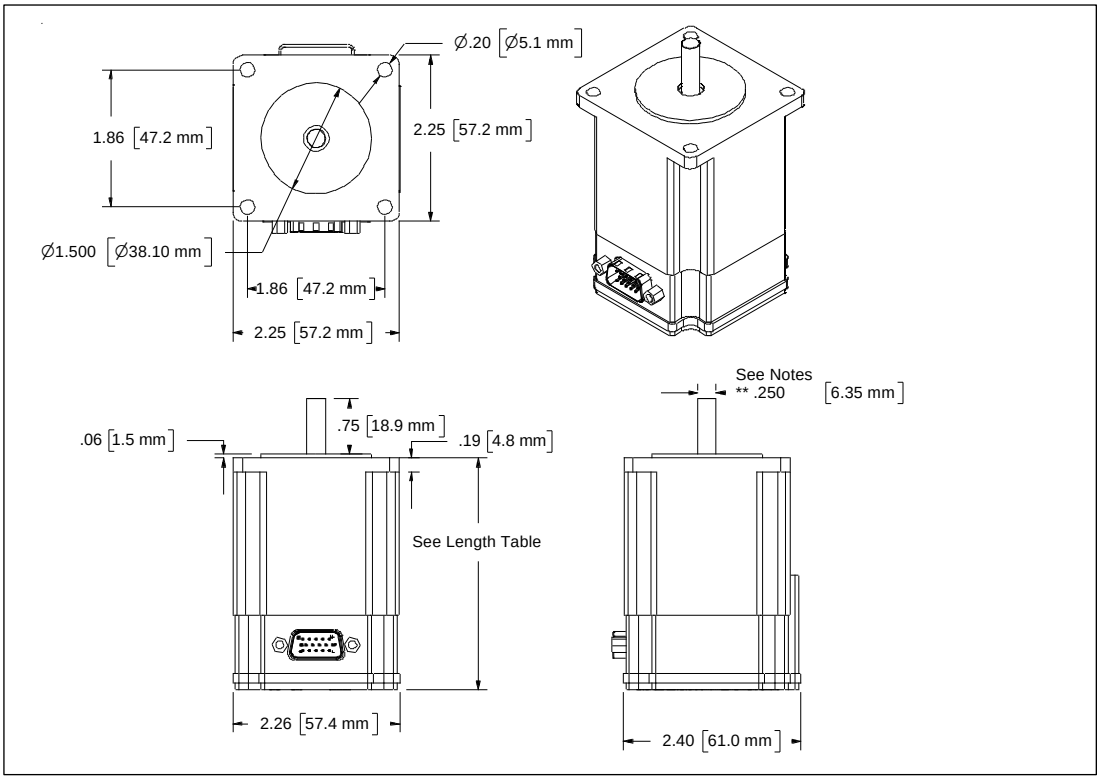
NEMA 23 QCI-A23 Servo Motor Family

The NEMA 23 frame Hybrid Servo I-Grade Motors include a 8000 count per revolution encoder, and internal memory device holding the motor type and alignment information.

These servo motors are available as IP54 or IP65. IP65 is for the motor except the shaft. Full IP65 requires an optional shaft seal. See *Accessories*.

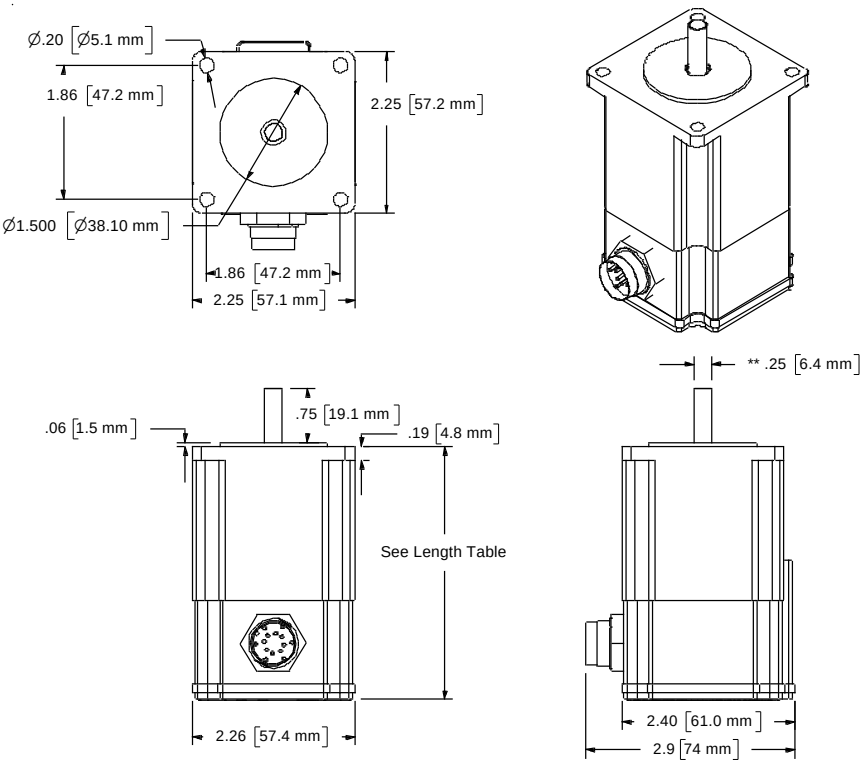
Note: Torque curves only apply when using a compatible QuickSilver Controller, and do not include the drag of a seal.

Full Data Sheet http://www.quicksilvercontrols.com/SP/DS/QCI-DS008_QCI-A23.pdf



Part Number	Length		Shaft Dia	Notes
QCI-A23L-1	2.7 inch	68 mm	.25 [6.35mm]	Shaft has .020 [.5 mm] flat
QCI-A23K-3C	3.2 inch	81 mm	.25 [6.35mm]	
QCI-A23L-3	3.2 inch	81 mm	.25 [6.35mm]	Shaft has .020 [.5 mm] flat
QCI-A23H-5	4.0 inch	101 mm	.25 [6.35mm]	

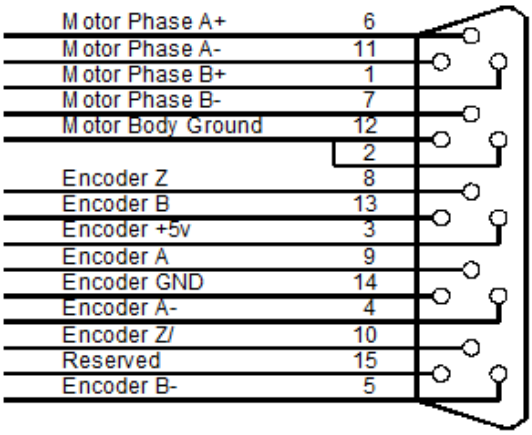
IP65 -6T Option

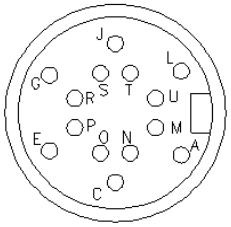


Part Number	Length		Shaft Dia	Notes
QCI-A23L-1-6T	2.7 inch	68 mm	.25 [6.35mm]	Shaft has .020 [.5 mm] flat
QCI-A23K-3-6TC	3.2 inch	81 mm	.25 [6.35mm]	
QCI-A23L-3-6T	3.2 inch	81 mm	.25 [6.35mm]	Shaft has .020 [.5 mm] flat
QCI-A23H-5-6T	4.0 inch	101 mm	.25 [6.35mm]	

Note: These servo motors are IP65 except front shaft. If not otherwise protecting the front shaft, a Shaft seal (QCI-23M-65) is required for full IP65 (sold separately).

Connections for the Standard and -6T (IP65) versions:



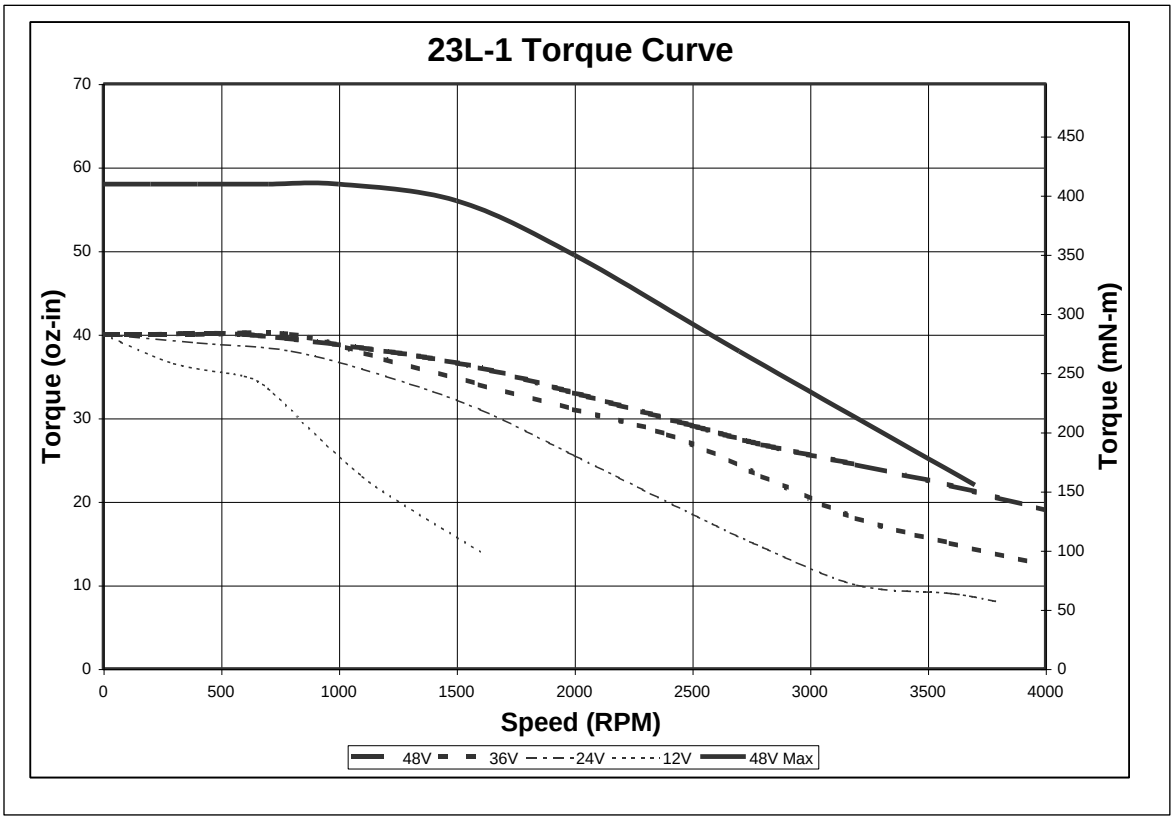


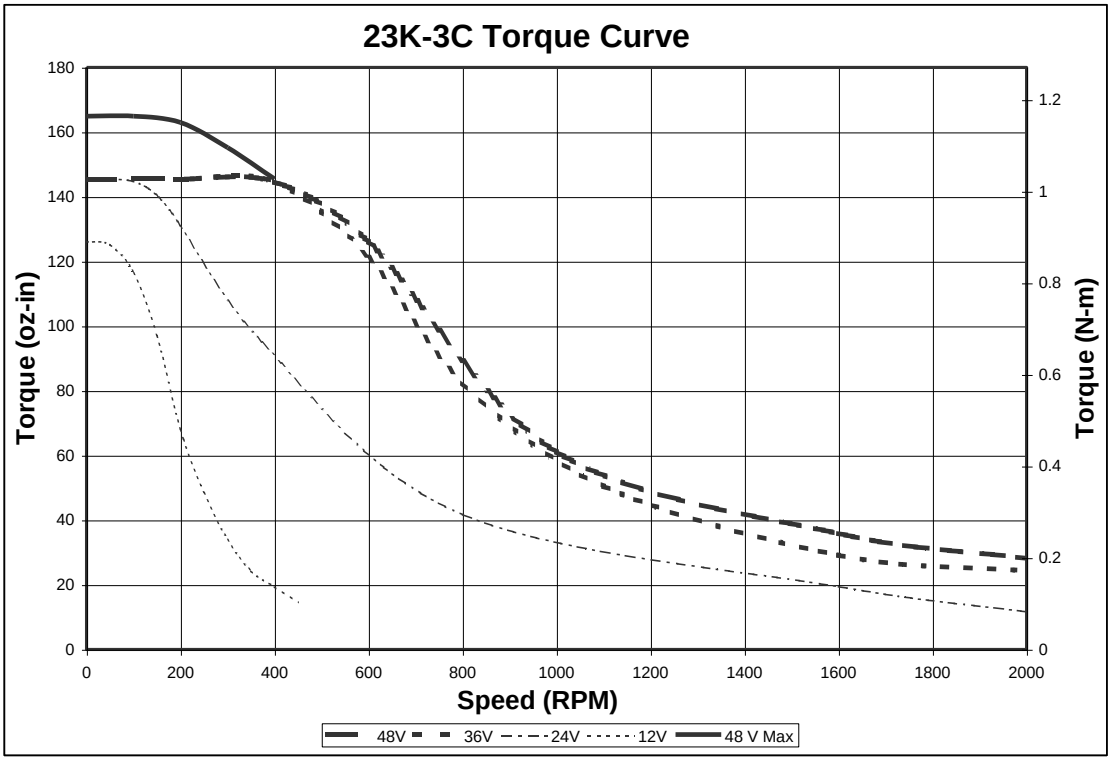
Pin	Signal
A	Motor A -
C	+5V
E	Memory
G	Motor B+
J	Motor B -
L	Motor A+
M	Z+
N	Z -
O	A+
P	B -
R	B+
S	GND
T	A-
U	Motor GND

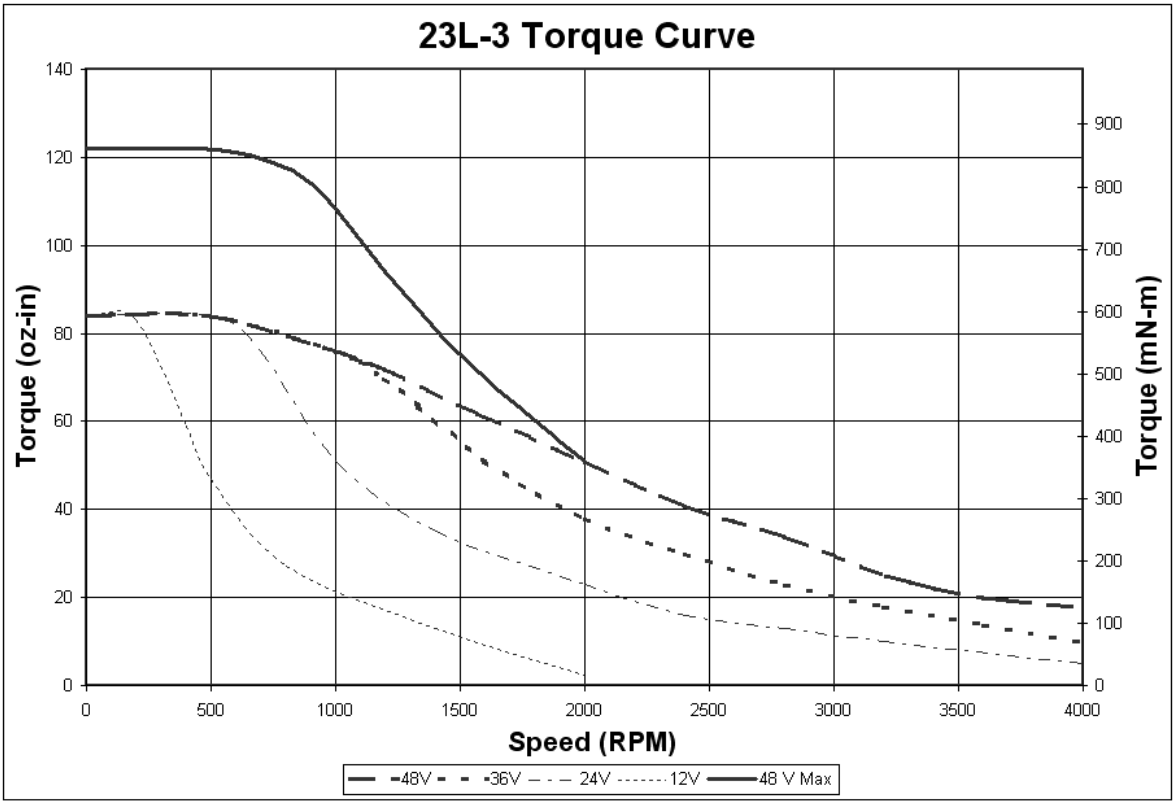
Specifications	23L-1	23CK-3	23L-3	23H-5
Maximum Speed (RPM)	4000	3000	4000	4000
48v Optimal Speed (RPM)	2500	600	1900	1000
Torque (oz-in / Nm) at Optimal Speed	30 0.22	130 0.92	55 0.39	120 0.85
Continuous Stall Torque oz-in / Nm	40 0.28	145 1.00	84 0.59	190 1.34
Peak Power (Mech. Watts)	80	60	84	95
Rotor Inertia $oz\text{-}in^2$ / $Kg\text{-}m^2$	0.74 1.35E-5	1.50 2.7E-5	1.50 2.7E-5	2.3 4.2E-5
Weight pounds / Kg	1.40 0.65	1.70 0.77	1.70 0.77	2.6 1.20
Maximum Driver Input Current (Amps - DC)	4.0	3.2	3.5	4.0
Maximum Radial Force(lbs) 0.55'' from mounting face	15	16	15	N/A
Maximum Axial Force (lbs)	13	4	13	N/A

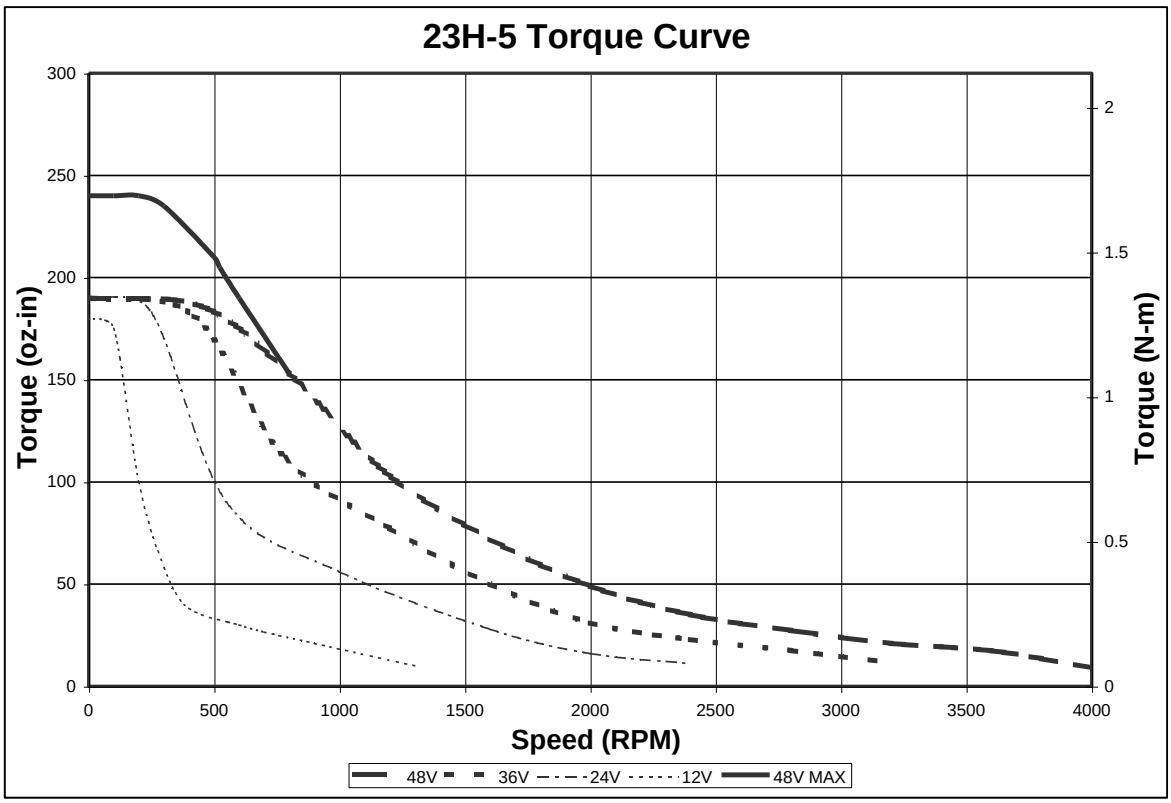
I-Grade NEMA A23 Motors/Encoders

MOTOR TYPE/SIZE	MOTOR INTERFACE
QCI-A23L-1	**Blank** – Standard DB15HD Motor Interface Connector
QCI-A23CK-3	
QCI-A23L-3	
QCI-A23H-5	
QCI-A23L-1-6T	**6T** – IP6514 Pin Round Connector Shaft seal required for full IP65 rating. ○ QCI-23M-65 Extra coating on motor exterior.
QCI-A23CK-3-6T	
QCI-A23L-3-6T	
QCI-A23H-5-6T	


23L-1 Torque Curve
Torque (oz-in)
Torque (mN-m)
Speed (RPM)
0
10
20
30
40
50
60
70
0
50
100
150
200
250
300
350
400
450
0
500
1000
1500
2000
2500
3000
3500
4000
48V
36V
24V
12V
48V Max


23K-3C Torque Curve
Torque (oz-in)
Torque (N-m)
Speed (RPM)
0
20
40
60
80
100
120
140
160
180
0
0.2
0.4
0.6
0.8
1
1.2
0
200
400
600
800
1000
1200
1400
1600
1800
2000
48V
36V
24V
12V
48 V Max


23L-3 Torque Curve
Torque (oz-in)
Torque (mN-m)
Speed (RPM)
0
20
40
60
80
100
120
140
0
100
200
300
400
500
600
700
800
900
0
500
1000
1500
2000
2500
3000
3500
4000
48V
36V
24V
12V
48 V Max


23H-5 Torque Curve
Torque (oz-in)
Torque (N-m)
Speed (RPM)
0
50
100
150
200
250
300
0
0.5
1
1.5
2
0
500
1000
1500
2000
2500
3000
3500
4000
48V
36V
24V
12V
48V MAX

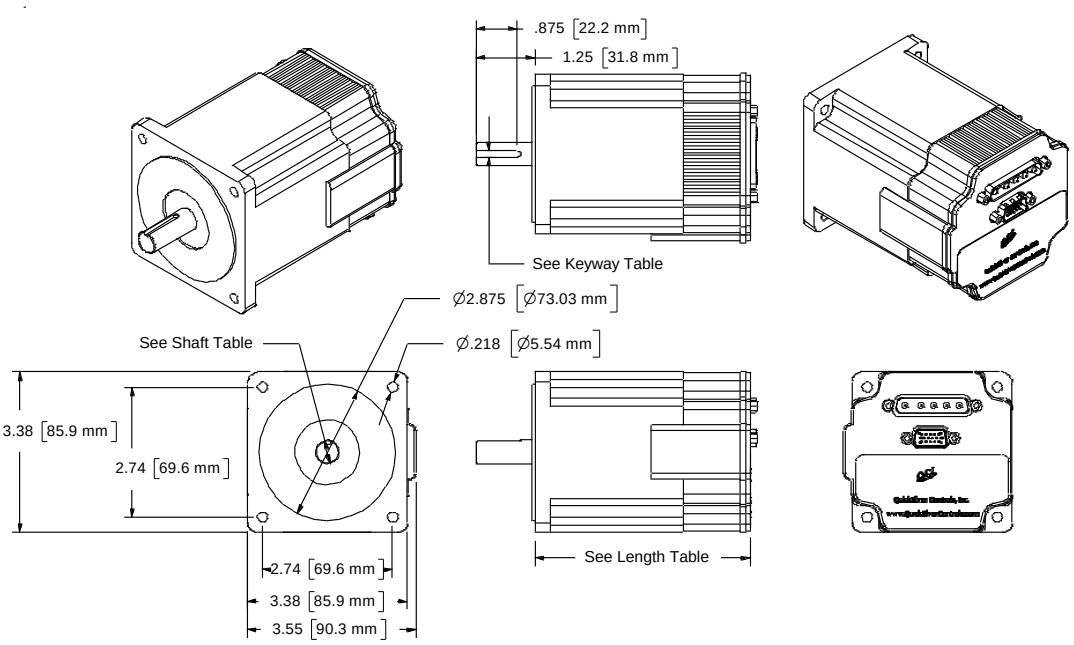
NEMA 34 QCI-A34 Servo Motor Family

NEMA 34 Hybrid Servo I-Grade Motors include a 16000 count per revolution encoder, and internal memory device holding the motor type and alignment information.

These servo motors are available as IP54 or IP65. IP65 is for the motor except the shaft. Full IP65 requires an optional shaft seal. Contact factory.

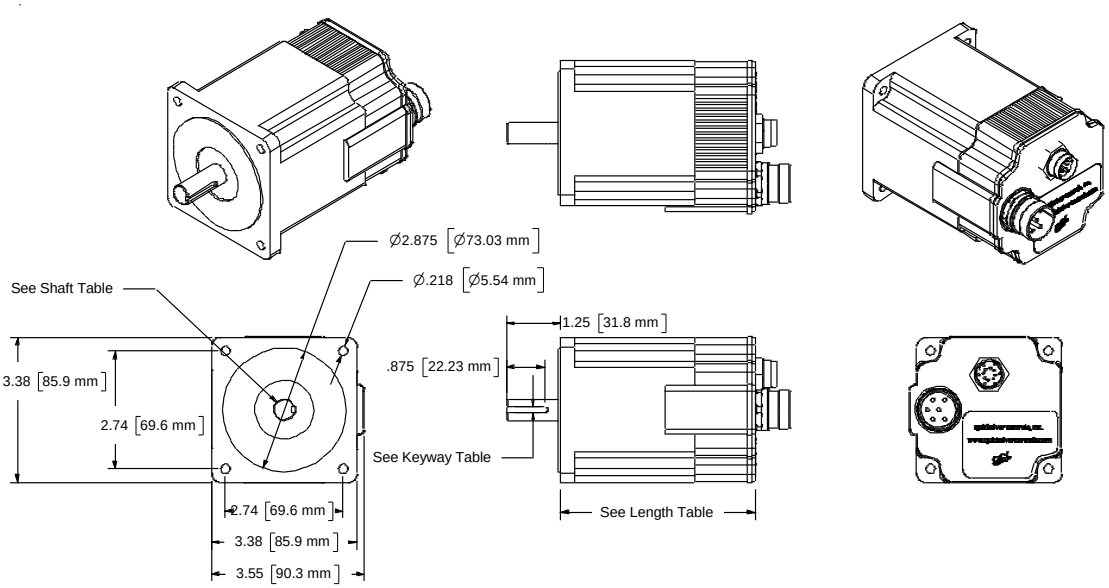
Note: Torque curves only apply when using a compatible QuickSilver Controller and do not include the effects of a seal.

Full Data Sheet http://www.quicksilvercontrols.com/SP/DS/QCI-DS009_QCI-A34.pdf



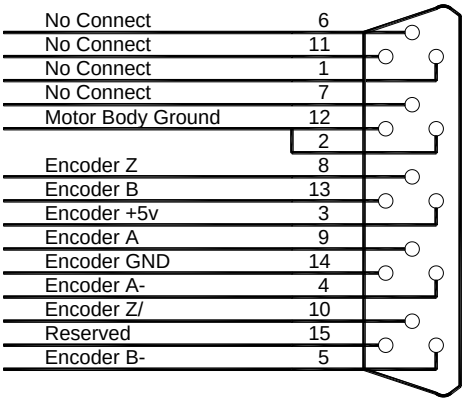
Model	Length	Shaft Diameter	Keyway Width
QCI-A34HC-1	4.5 [115 mm]	.500 [12.70 mm]	0.125 [3.175 mm]
QCI-A34HC-2	6.1 [155 mm]	.500 [12.70 mm]	0.125 [3.175 mm]
QCI-A34HC-3	7.6 [193 mm]	.625 [15.875 mm]	0.1875 [4.7625 mm]
QCI-A34HC-4	9.2 [232 mm]	.625 [15.875 mm]	0.1875 [4.7625 mm]

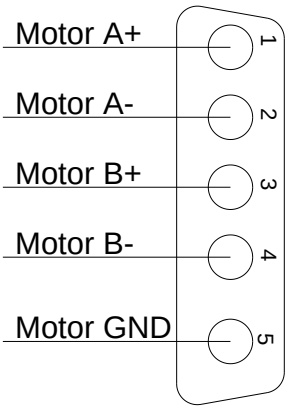
IP65 -6T Option



Model	Length	Shaft Diameter	Keyway Width
QCI-A34HC-1-6T	4.5 [115 mm]	.500 [12.70 mm]	0.125 [3.175 mm]
QCI-A34HC-2-6T	6.1 [155 mm]	.500 [12.70 mm]	0.125 [3.175 mm]
QCI-A34HC-3-6T	7.6 [193 mm]	.625 [15.875 mm]	0.1875 [4.7625 mm]
QCI-A34HC-4-6T	9.2 [232 mm]	.625 [15.875 mm]	0.1875 [4.7625 mm]

Standard IP54 Wiring

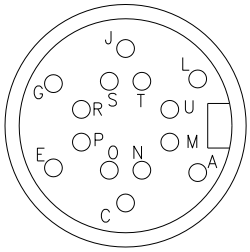




IP65 -6T Wiring

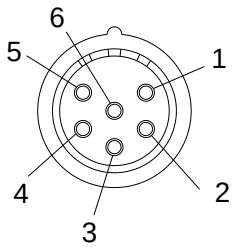
Pin	Signals
A	NC
C	+5V
E	Memory
G	NC
J	NC
L	NC
M	Z+
N	Z -
O	A+
P	B -
R	B+
S	GND
T	A-
U	GND

EXPOSED FRONT VIEW OF MOTOR CONNECTOR



IP65 -6T Motor Power Connector

Pin	Signals
1	Motor A-
2	Motor A+
3	Chassis GND
4	Motor B-
5	Motor B+
6	Chassis GND

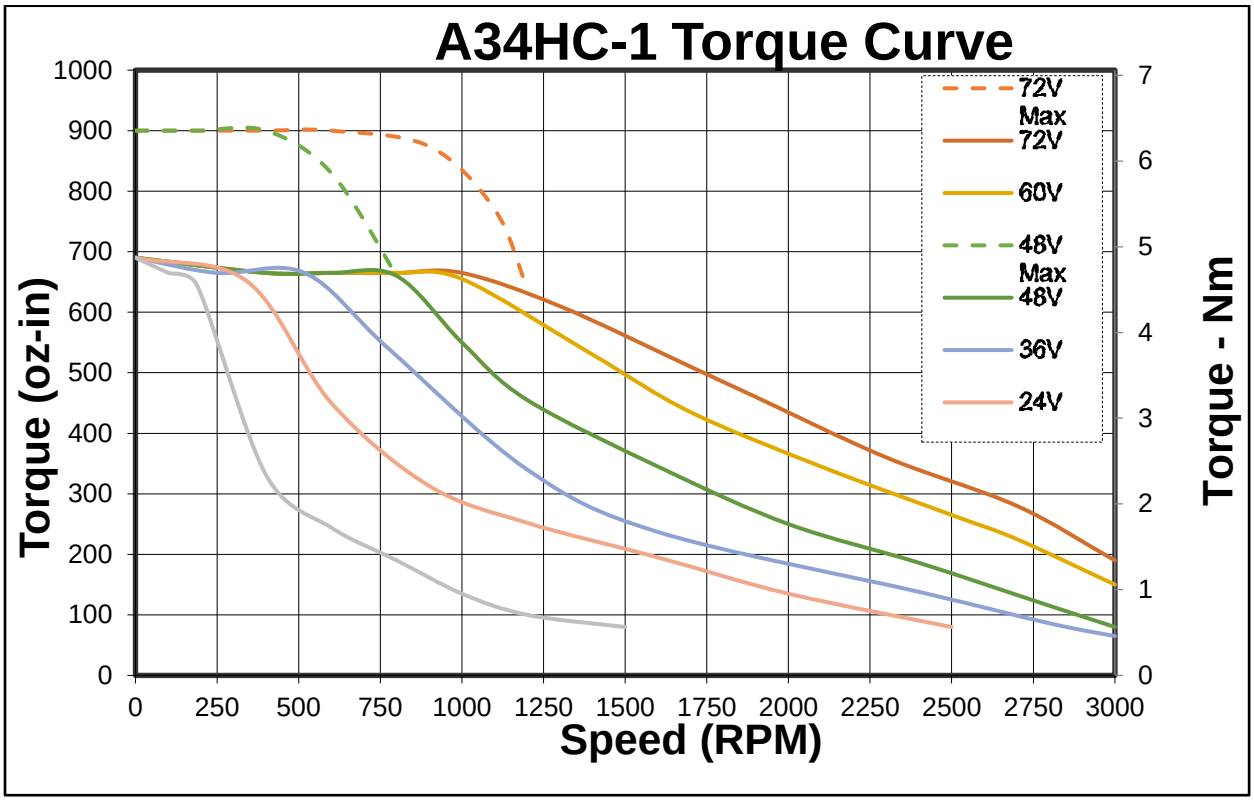


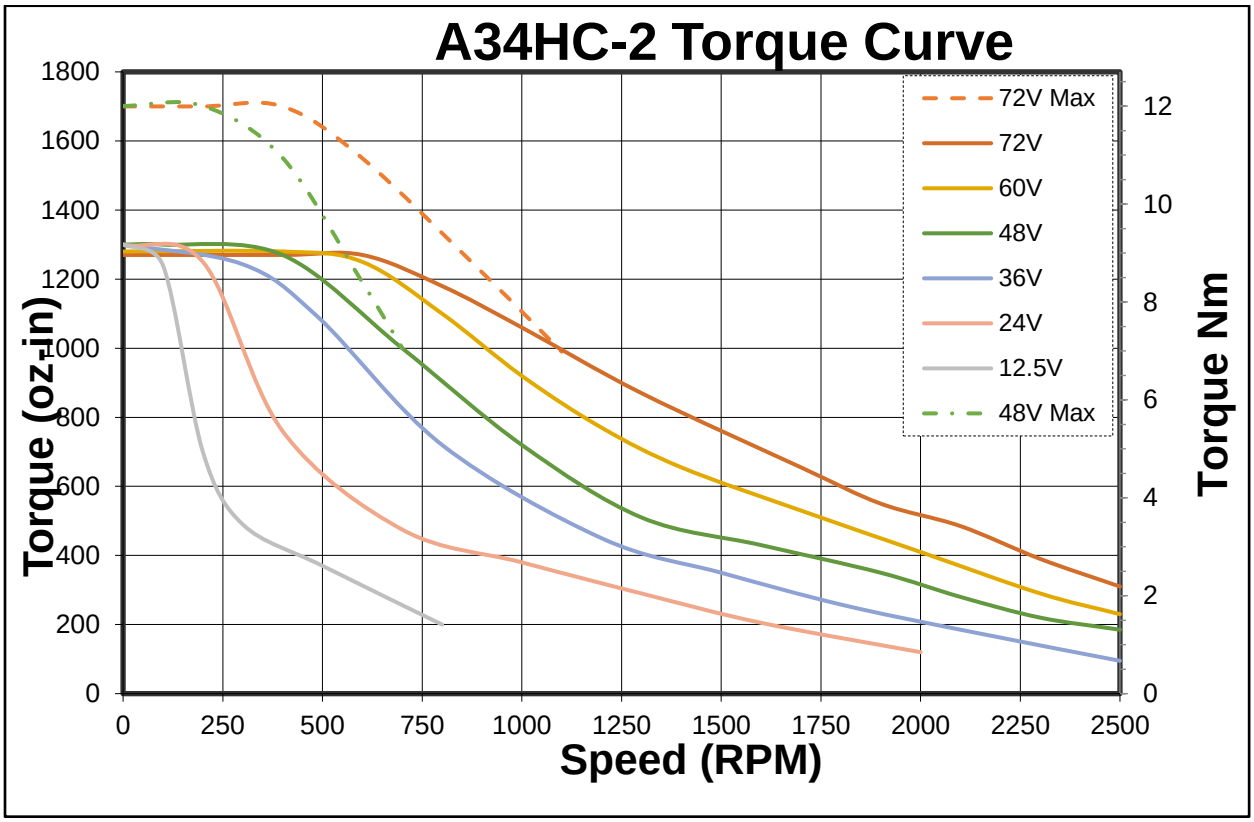
Specifications	A34HC-1	A34HC-2	A34HC-3	A34HC-4
Maximum Speed (RPM)	3000	2500	2000	2000
48v Optimal Speed (RPM)	1300	900	900	1000
Torque (oz-in / Nm) at Optimal Speed	470 3.3	800 5.65	874 6.17	750 5.29
Continuous Stall Torque oz-in / Nm	690 4.8	1300 9.3	2000 14.1	2600 18.6
Peak Power (Watts) @ 48v (Watts) @ 72v	420 650	596 850	585 850	555 850
Rotor Inertia oz-in^2 / Kg-m^2	7.8 1.4e-4	14.7 2.7e-4	21.9 4.0e-4	29.0 5.3e-4
Weight pounds / Kg	5.7 2.6	9.1 4.1	12.6 5.7	15.8 7.2
Maximum Driver Input Current (Amps - DC)	14	16.5	16.5	14.5
Maximum Radial Force (lbs) / Newtons 0.79"/ 20mm from mounting face	65 290	65 290	110 490	110 490
Maximum Axial Force (lbs) / Newtons	305 1300	305 1300	305 1300	305 1300
Shaft Diameter in/mm	.500 12.70	.500 12.70	.625 15.88	.625 15.88

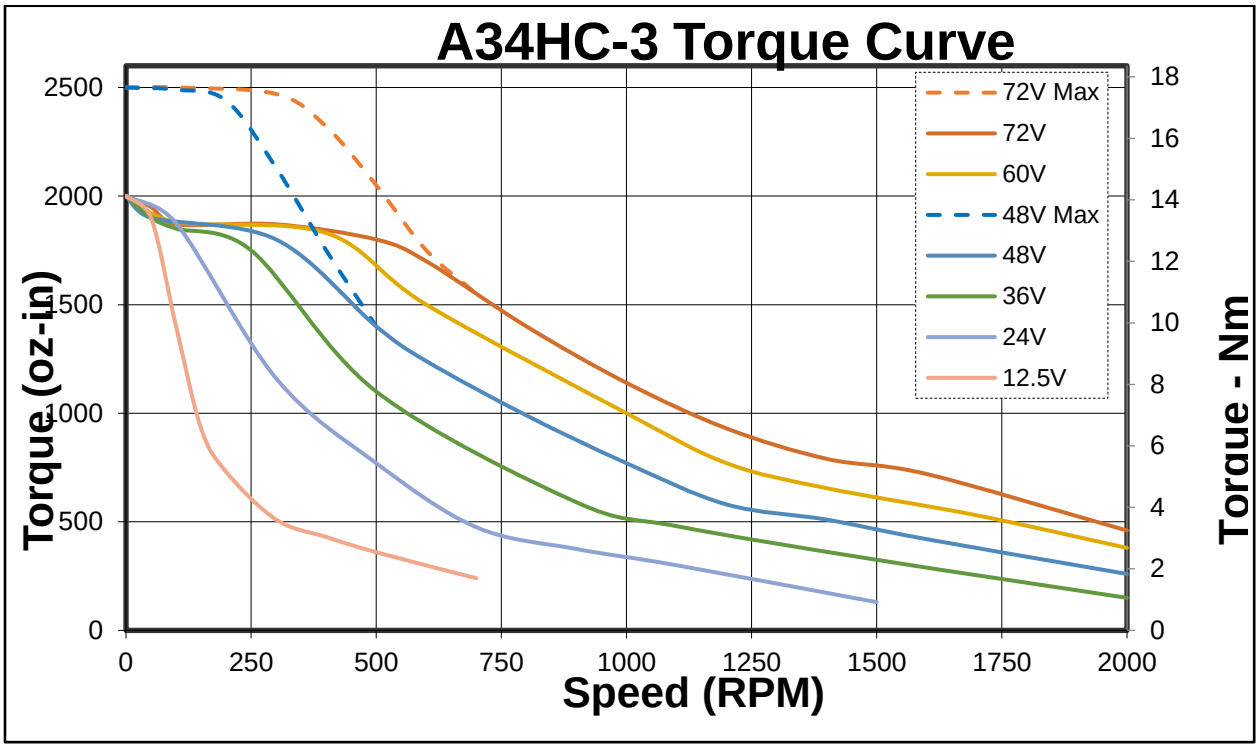
Note: Power and Speed information measured with QCI-N3-IX controller with 2' Power Cable

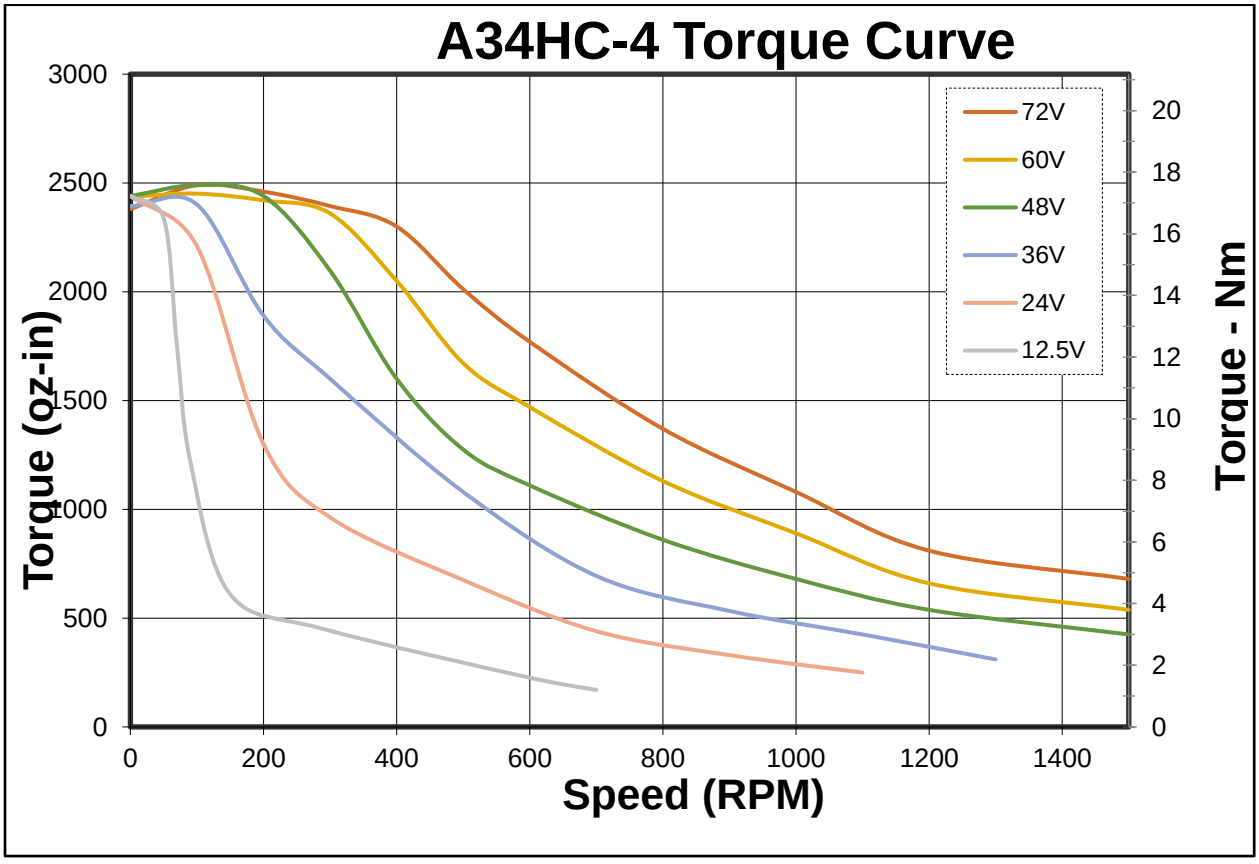
I-Grade NEMA A34 Motors/Encoders

MOTOR TYPE/SIZE	MOTOR INTERFACE
QCI-A34HC-1 **QCI-A34HC-2** **QCI-A34HC-3** **QCI-A34HC-4**	**Blank** – Standard • DB15HD + DB5W5
QCI-A34HC-1-6T **QCI-A34HC-2-6T** **QCI-A34HC-3-6T** **QCI-A34HC-4-6T**	**6T** – IP65 14 Pin Round Connector + 6 pin round **6TS** - Shaft seal installed for full IP65 rating . Extra coating on motor exterior.


A34HC-1 Torque Curve
Torque (oz-in)
Torque - Nm
Speed (RPM)
72V Max
72V
60V
48V
48V Max
36V
24V
0
100
200
300
400
500
600
700
800
900
1000
0
1
2
3
4
5
6
7
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
2750
3000


A34HC-2 Torque Curve
Torque (oz-in)
Torque Nm
Speed (RPM)
72V Max
72V
60V
48V
36V
24V
12.5V
48V Max
0
200
400
600
800
1000
1200
1400
1600
1800
0
2
4
6
8
10
12
0
250
500
750
1000
1250
1500
1750
2000
2250
2500


A34HC-3 Torque Curve
Torque (oz-in)
Torque - Nm
Speed (RPM)
72V Max
72V
60V
48V Max
48V
36V
24V
12.5V
0
500
1000
1500
2000
2500
0
250
500
750
1000
1250
1500
1750
2000
0
2
4
6
8
10
12
14
16
18


A34HC-4 Torque Curve
Torque (oz-in)
Torque - Nm
Speed (RPM)
72V
60V
48V
36V
24V
12.5V
0
500
1000
1500
2000
2500
3000
0
200
400
600
800
1000
1200
1400
0
2
4
6
8
10
12
14
16
18
20

SilverNugget X-Series Controllers

The X-Series Controllers are based on the same controller and driver technology as are used in the SilverMax integrated controllers but configured for use with separate Hybrid motors.

Point-to-Point Moves
- Relative or Absolute
- Velocity or Time Based
- S-Curve

Advanced Motion Profile Moves
- Profile Move Commands
- Register Based
- Position/Accel/Decel/Vel
- Modify On-the-Fly

Multi-Axis Linear Interpolation
- XYZ Coords Contained in Text File
- CANopen® used for local bus
- 1000+ Points Stored in NV Memory

Program and Data Storage
- 32K Non-Volatile Memory:
- 2000-3000 Program Lines
- 8095 Word Execute Buffer
- 4285 User Registers
- User Data Examples
- CAM Tables
- Motion Profiles
- Lookup Tables

Electronic Slip Clutch/Brake
- Variable Torque
- Wind/Unwind Applications

Anti-Hunt™
- Optionally use Open Loop While Holding
- No Servo Dither While at Rest

Communications
- RS-485 @ up to 230K Baud
- ASCII, Binary, Modbus®, DMX512
- Host Control While Servo in Motion
- CANopen® (Standard on N3 X-series)

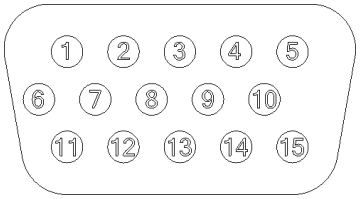
Programming Language
- Easy, Menu Driven Interface
- Command Parameter Prompts
- No Syntax Errors
- User Namable I/O and Registers

Advance PVIA™ Servo Loop
- 100:1 Inertial Mismatch
- Direct Drive Oversized Inertial Loads
- Flywheels/Belt Drives
- Typically Without Gearheads
- More Stable Than PID

Digital 4 Quadrant Vector Drive
- DSP Driven for Reduced Noise

Multi-Task/Multi-Thread

SMI port:



N2: V+, N3: Controller V+. and Drive Enable rated +12.5 to +48 VDC.

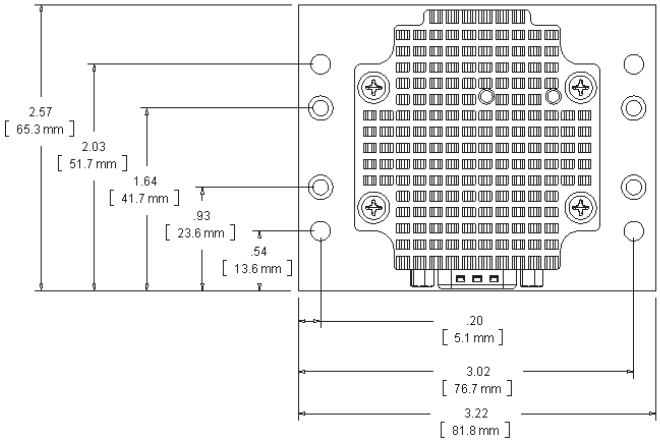
SMI port	
Pin	Signal
1	V+ (Drive Enable for N3)
2	RS-485-A (D+)
3	+5v Out (100mA)
4	I/O-#3
5	I/O-#6
6	Power Ground
7	V+ (Controller V+ for N3)
8	Logic Ground
9	I/O-#2
10	I/O-#5
11	Power Ground
12	RS-485-B (D-)
13	I/O-#1
14	I/O-#4
15	I/O-#7

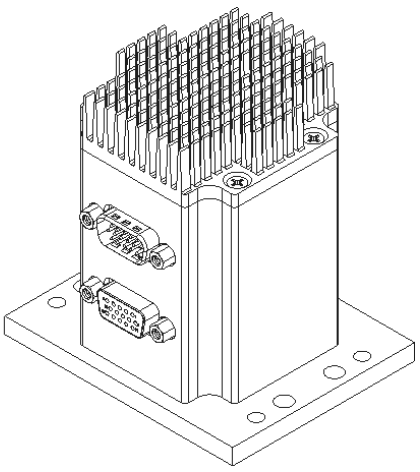
SilverNugget QCI-N2-IX and QCI-N2-MX

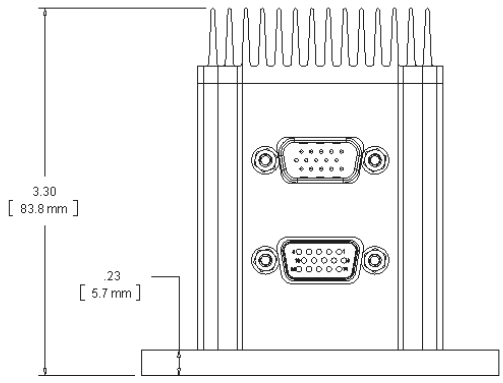
The SilverNugget N2 Family shares the same controller technology as used in our X-Series SilverMax controllers. These controllers have been optimized for 2 phase hybrid servo motors. The QCI-N2-IX is connectorized for use with QCI I-Grade motors. The QCI-N2-MX has cables built in for the Motor and encoder signals.

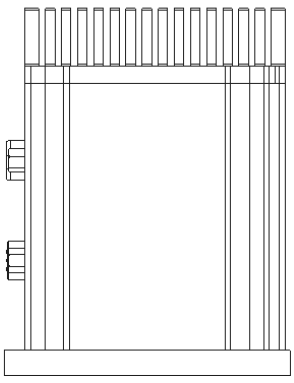
Power, communications, and I/O are accessed through a single DB15 high density interface connector. The interface includes 7 I/O, all of which support both LVTTL and analog signals, and one of which also supports 0 to 10v analog. A hardware drive enable is available as a factory option (Special order). All 7 I/O also have soft configurable pull-up/pull-down resistors, which may also be disabled, for more flexibility

QCI-N2-IX Dimensions

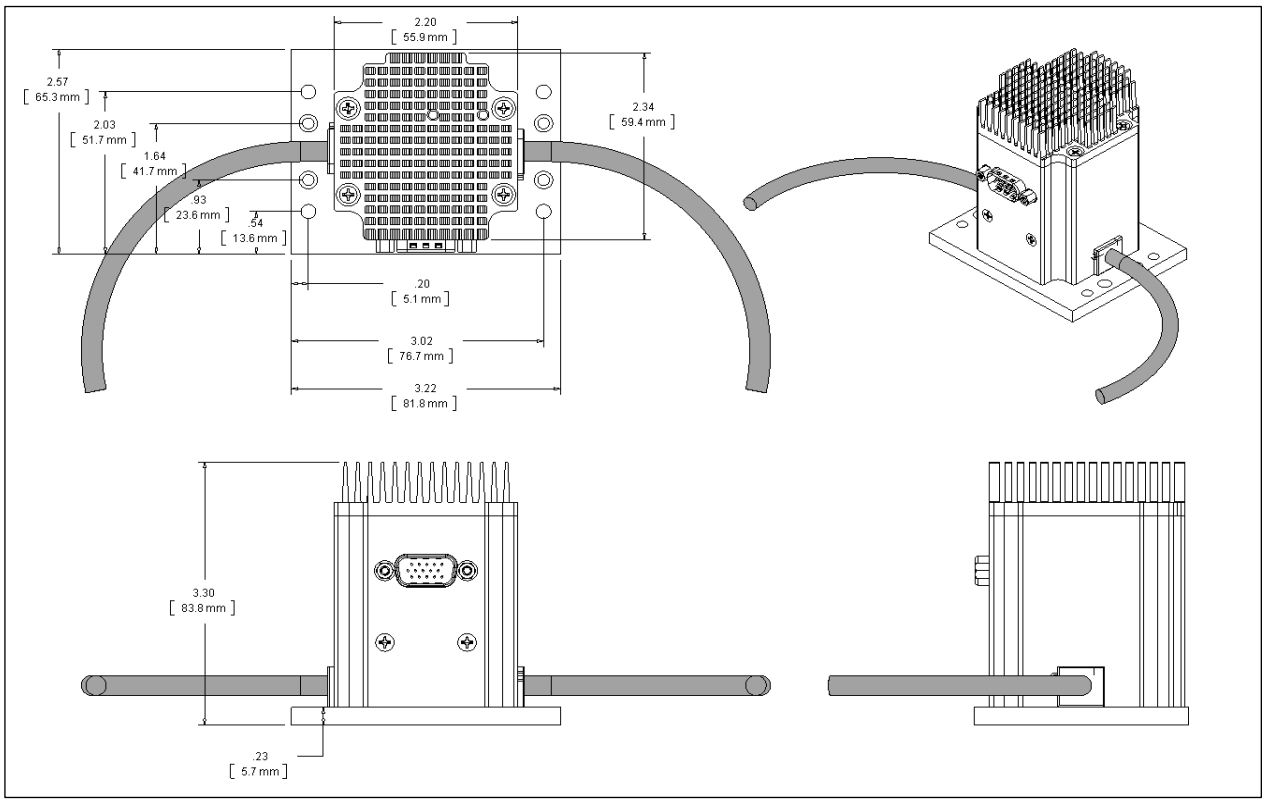








QCI-N2-MX Dimensions



Power:

Input power is 12.5v to 48 VDC, regulated. An external clamp may be required if rapid deceleration of large loads present. Power to be externally fused at not more than 8A. Input Current is 5.5A Max. Output current is 5A continuous per phase. Maximum 200W continuous (electrical) power out. May require derating dependent upon ambient temperature and air flow.

I/O:

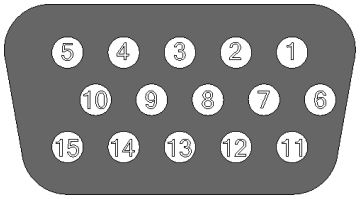
0 to +3.3 VDC. LVTTL level compatible. All inputs have a light pull-up (~100k ohm to 3.3v). All I/O have an optional programmable pull-up/pull-down of 2.2 k ohm; the source to these resistors may also be floated if no pull-up or pull-down is needed. The seven IO are protected to +/- 40v. Sinking or Sourcing current: 2mA

All 7 I/O may be used as Analog Inputs: 0 to +3.3 VDC input signal range. IO7 has an additional circuit to handle 0 to +10v input signal range; the input protection will isolate the normal 3.3 v input channel allowing the 0 to 10v operation. Resolution: 12 bits (before filtering), interpolated to 15 bits via filtering.

Serial Interface:

RS-485 multi-drop, Reduced unit load accommodates up to 254 nodes. Protected up to +/- 60v. Note: RS-485 requires a nominal 120-ohm ½ W termination resistor at each end of the network for longer runs. This termination is not provided onboard and must be provided by the user. Simple termination is sufficient, biased termination is not needed with this device.

QCI-N2-IX Motor connector



I-Grade Motor Port	
Pin	Signal
1	Motor Phase B+
2	Motor Body Ground
3	Encoder +5V
4	Encoder A-
5	Encoder B-
6	Motor Phase A+
7	Motor Phase B-
8	Encoder Z+
9	Encoder A+
10	Encoder Z-
11	Motor Phase A
12	Motor Body Ground
13	Encoder B+
14	Encoder Ground
15	Motor Memory**

** Motor Memory supports QCI I-Grade Motors. Stores motor type, encoder resolution, alignment and runout calibration information.

QCI-N2-MX Encoder and Motor wiring

Designation	Wire Color		Wire Gauge
Encoder +5V	Red		26 AWG
Encoder Gnd	Black		26 AWG
Encoder A+	White		26 AWG
Encoder A-	Yellow		26 AWG
Encoder B+	Green		26 AWG
Encoder B-	Blue		26 AWG
Z+ (index +)	Orange		26 AWG
Z- (index -)	Brown		26 AWG

Designation	Wire Color		Wire Gauge
Winding A+	Red		20 AWG
Winding A-	Blue		20 AWG
Winding B+	Yellow		20 AWG
Winding B-	White		20 AWG
Drain †	Bare Wire		2x22 AWG ‡

QCI-N2-MX also available with Connectors with the -BB option.

See Data sheet for pinouts.

Full Datasheets available on line:

http://www.quicksilvercontrols.com/SP/DS/QCI-DS031_QCI-N2-IX.pdf

http://www.quicksilvercontrols.com/SP/DS/QCI-DS032_QCI-N2-MX.pdf

SilverNugget N2-IX Controller/Driver

CONTROLLER/DRIVER	OPTION

QCI-N2-IX	**Blank** - Standard
	• 8-bit ASCII, Modbus® RTU, DMX512, 9-bit
	• 12.5v to 48v
	• RS-485 – multiple protocols
	• 7 LVTTL I/O
	  ○ All configurable as 0-3.3v analog inputs
	• 1 Output supports PWM Out
	  ○ Use QCI-BO-B1A to amplify to 0-5v
	• SilverLode Multi-Function Interface (SMI) Port
	  ○ DB15 High Density (Pin)
	• Motor Interface Port
	  ○ DB15 High Density (Socket)

QCI-N2-IX-E	**E -** Drive Enable • Same as Standard with drive enable input on IO#3 • Refer to Technical Document TD088 for more information

SilverNugget N2-MX Controller/Driver

CONTROLLER/ DRIVER	OPTION	MOTOR CONNECTOR	ENCODER CONNECTOR	CABLE LENGTH (FT)

QCI-N2-MX	**Blank** - Standard
	• 8-bit ASCII, Modbus® RTU, DMX512, 9-bit
	• 12.5v to 48v
	• RS-485 – multiple protocols
	• 7 LVTTL I/O
	  ○ All configurable as 0-3.3v analog inputs
	• 1 Output supports PWM Out
	  ○ Use QCI-BO-B1A to amplify to 0-5v
	• SilverLode Multi-Function Interface (SMI) Port
	  ○ DB15 High Density (Pin)
	E - Drive Enable
	  ○ Same as Standard with drive enable input on IO#3
	  ○ Refer to Technical Document TD088 for more information
		A – Flying Lead
		B – TE or Molex Compatible Connector
			A – Flying Lead
			B – Molex Compatible Connector
				nn – length in feet

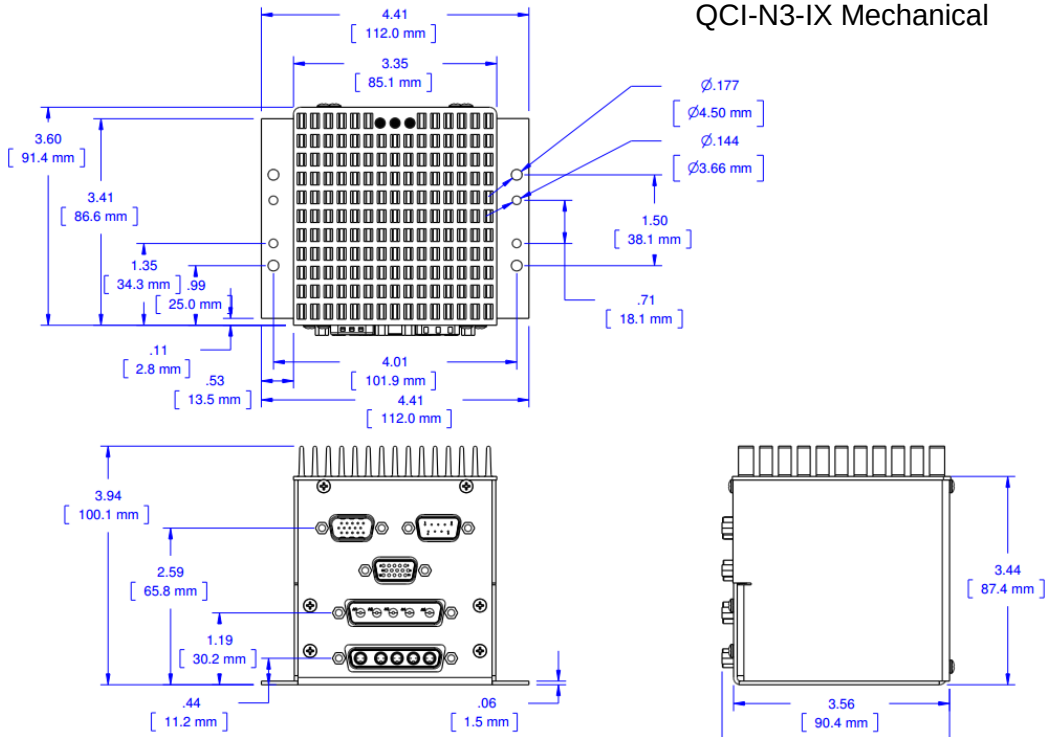
To create a part number, choose one from each column above.				
QCI-N2-MX	**E**	**B**	**B**	**01**
This selection creates the part number: **QCI-N2-MX-E-BB01**				

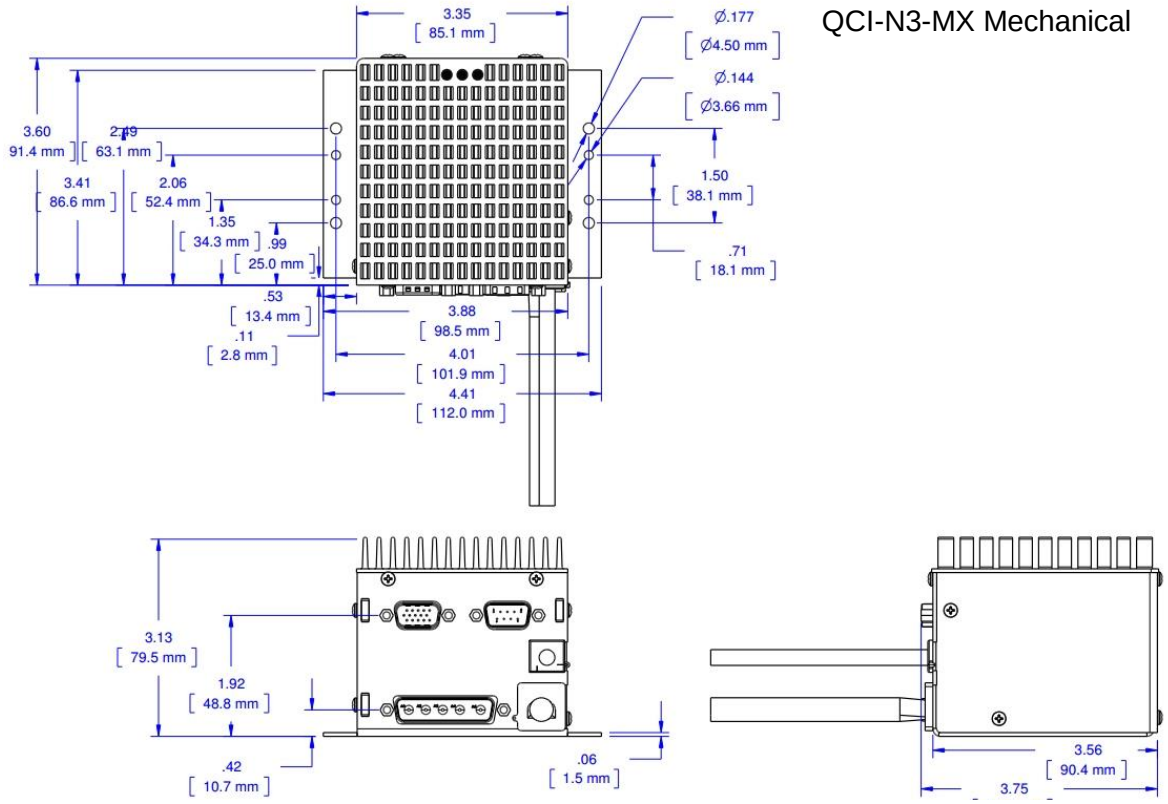
SilverNugget QCI-N3-IX and QCI-N3-MX

The SilverNugget N3 Family shares the same controller technology as used in our X-Series SilverMax controllers. These controllers have been optimized for 2 phase hybrid servo motors. The QCI-N3-IX is connectorized for use with QCI I-Grade motors. The QCI-N3-MX has cables built in for the Motor and encoder signals. Processor Power, Drive Enable, communications, and I/O are accessed through a single DB15 high density interface connector. The interface includes 7 I/O, all of which support both LVTTL and analog signals, and one of which also supports 0 to 10v analog. A hardware drive enable is available as a factory option (Special order). All 7 I/O also have soft configurable pull-up/pull-down resistors, which may also be disabled, for more flexibility. A separate 9 pin Dsub is provided for CANopen signals. Driver Power and Clamp signals are brough out through a DB5W5 connector. A 50W internal clamp is included, with a second external clamp inluded to allow for higher power external resistors. The external clamp is designed to trigger at a lower voltage than the internal clamp.

The -IX version has a connector for Encoder signals/motor memory and a 5W5 connector for Motor power. The -MX version has cables for both the encoder and Motor power signals, and may be ordered with optional connectors.

QCI-N3-IX Mechanical



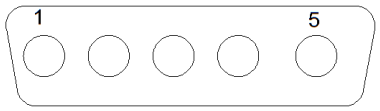


QCI-N3-MX Mechanical

QCI-N3-IG Datasheet: http://www.quicksilvercontrols.com/SP/DS/QCI-DS034_QCI-N3-IX.pdf

QCI-N3-MX Datasheet: http://www.quicksilvercontrols.com/SP/DS/QCI-DS035_QCI-N3-MX.pdf

Drive Power Connector



Externally fuse power at no more than 25A. Drive power is isolated from logic power.

Pin	Signal	Color QCI-EC-P10	Connection
1	V+ Clamp	Yellow	External Resistor
2	V+ Driver	Red	V+ Power input
3	V- Clamp	Orange	External Resistor
4	V- Driver	Black	Power Ground
5	Chassis Gnd	Drain 1,2	V- at Power Supply/Chassis

Drive Power 12.5 to 72 VDC (note processor power is 12.5 to 48 VDC)

The internal clamp is rated 50W average. If using the internal clamp, apply driver power to pin 2 and return to pin 4. Do not connect pins 1 and 3.

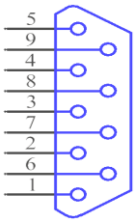
If using the external clamp, connect the clamp resistor (calculate for 20A max at operating voltage) between pins 1 and 3.

To disable both clamps when using a battery to allow regeneration, connect pins 1 and 2 to battery V+, and pins 2 and 3 to battery V-.

CAN interface

The CAN bus connection is not isolated but does include transceivers which have an extended +/- 70v fault protection range.

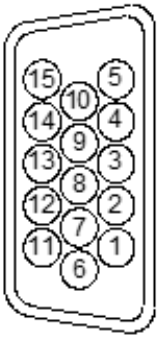
Note that a 120-ohm ½ W termination resistor is required at each end of the CAN network (only two per system). This termination is not provided onboard the controller and must be provided by the user. For the CAN bus operation, this termination is **not** optional.



Pin 2 = CAN-L
Pin 3 = GND
Pin 6 = GND
Pin 7 = CAN-H

The CANopen connections are made via a 9-pin male DSub connector.

QCI-N3-IX Motor interface:



1	Hall Sensor 2
2	Chassis Ground
3	+ 5V Encoder Power
4	Encoder A -
5	Encoder B -
6	Hall Sensor 3
7	Hall Sensor 1
8	Encoder Z +
9	Encoder A +
10	Encoder Z -
11	Hall Sensor 4
12	Chassis Ground
13	Encoder B+
14	Encoder Ground
15	Motor Memory Access

Pin	Signal Name
1	Phase A-
2	Phase A+
3	Phase B-
4	Phase B+
5	Chassis Gnd/Shield

QCI-N3-MX Motor Interface:

Designation	Wire Color		Wire Gauge
Encoder +5V	Red		26 AWG
Encoder Gnd	Black		26 AWG
Encoder A+	White		26 AWG
Encoder A-	Yellow		26 AWG
Encoder B+	Green		26 AWG
Encoder B-	Blue		26 AWG
Z+ (index +)	Orange		26 AWG
Z- (index -)	Brown		26 AWG

Designation	Wire Color		Wire Gauge
Winding A+	Red		14 AWG
Winding A-	Yellow		14 AWG
Winding B+	Black		14 AWG
Winding B-	Orange		14 AWG
Drain †	Bare Wire		2x16 AWG ‡

QCI-N3-MX-BB option

SilverNugget IX	
QCI-N3-IX	SilverNugget N3 X-Series I-Grade controller/driver for QCI NEMA 34 I-Grade Motor. A single firmware version handles varying encoder division (including none) and different encoder index styles; these are configured at initialization time. The single version firmware also handles ASCII, Modbus, 9Bit, DMX, CANopen.

SilverNugget MX	
	X-Series M-Grade controller with cables for encoder and Motor. A single firmware version handles varying encoder division (including none) and different encoder index styles; these are configured at initialization time. The single version firmware also handles ASCII, Modbus, 9Bit, DMX, CANopen.
QCI-N3-MX-BB01	1-foot cables, Encoder cable has a locking 10 pin connector compatible with differential US-Digital™ style encoders. Motor cable has 5 pin Molex/TE style connector
QCI-N3-MX-BB04	4-foot cables, Encoder cable has a locking 10 pin connector compatible with differential US-Digital™ style encoders. Motor cable has 5 pin Molex/TE style connector
QCI-N3-MX-S0001	1-foot cables. Encoder cable has a locking 10 pin connector compatible with differential US-Digital™ style encoders. Motor cable is flying lead only. Processor power is internally connected to Driver power (voltage limited to 48v).

SilverSterling Controllers

The SilverSterling Controllers are designed to handle 2 phase Hybrid Servos, 3 Phase Brushless Servo Motors, DC brush Servos, Voice Coil actuators, and Mosolver Motor-Resolvers. They are available both boxed and as separate boards to allow compact integration into final systems. The SilverSterling controllers also feature CANopen and RS-485 communications.

Point-to-Point Moves
- Relative or Absolute
- Velocity or Time Based
- S-Curve

Advanced Motion Profile Moves
- Profile Move Commands
- Register Based
- Position/Accel/Decel/Vel
- Modify On-the-Fly

Multi-Axis Linear Interpolation
- XYZ Coords Contained in Text File
- CANopen® used for local bus
- 1000+ Points Stored in NV Memory

Program and Data Storage
- 32K Non-Volatile Memory:
- 2000-3000 Program Lines
- 1023 Word Execute Buffer
- 1214 User Registers
- User Data Examples
- CAM Tables
- Motion Profiles
- Lookup Tables

Electronic Slip Clutch/Brake
- Variable Torque
- Wind/Unwind Applications

Anti-Hunt™
- Optionally use Open Loop While Holding
- No Servo Dither While at Rest

Communications
- RS-485 @ up to 230K Baud
- ASCII, Binary, Modbus®, DMX512
- Host Control While Servo in Motion
- CANopen®

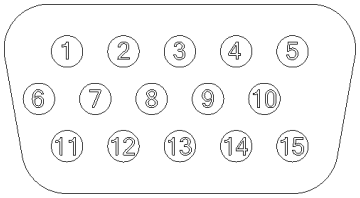
Programming Language
- Easy, Menu Driven Interface
- Command Parameter Prompts
- No Syntax Errors
- User Namable I/O and Registers

Advance PVIA™ Servo Loop
- 100:1 Inertial Mismatch
- Direct Drive Oversized Inertial Loads
- Flywheels/Belt Drives
- Typically Without Gearheads
- More Stable Than PID

Digital 4 Quadrant Vector Drive
- DSP Driven for Reduced Noise

Multi-Task/Multi-Thread

SMI port:



S2: V+, S3: Controller V+. and Drive Enable rated +12.5 to +48 VDC. All Power connections must be externally fused. See data sheet for details.

S3: connect pins 1 to a 12-48v source, or connect to pin 7 for a current limited source. See manual for more information.

SMI port	
Pin	Signal
1	V+ (Drive Enable+ for S3)
2	RS-485-A (D+)
3	+5v Out (100mA)
4	I/O-#3
5	CAN_H
6	Power Ground (Drive Enable- for S3)
7	V+ (Drive enable current source for S3)
8	Logic Ground
9	I/O-#2
10	Logic Ground (CAN GND)
11	Power Ground
12	RS-485-B (D-)
13	I/O-#1
14	I/O-#4
15	CAN_L

SilverSterling S2 Family

The SilverSterling S2 Family is designed to handle a wide variation of motor and actuator types. SilverSterling includes a motor regeneration clamp and is available both as boxed and bare-board varieties. The QCI-S2-X2-IG has dual controllers. The QCI-S2-IG-01 is the bare board version. The DSUB connectors can be ordered as either vertical or right angle or a mix. Contact Factory for details.

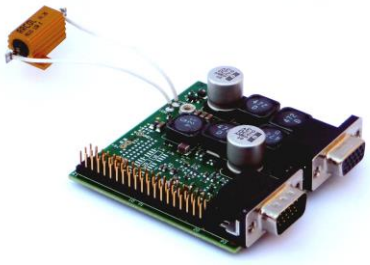
The SilverSterling may also be customized to hold a customer specific interface board using the optional 60 pin internal header to access additional internal I/O.

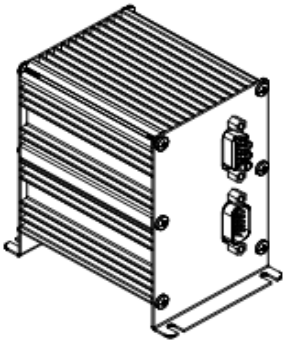
Full data sheet: http://www.quicksilvercontrols.com/SP/DS/QCI-DS026_QCI-S2-IG.pdf

QCI-S2-IG

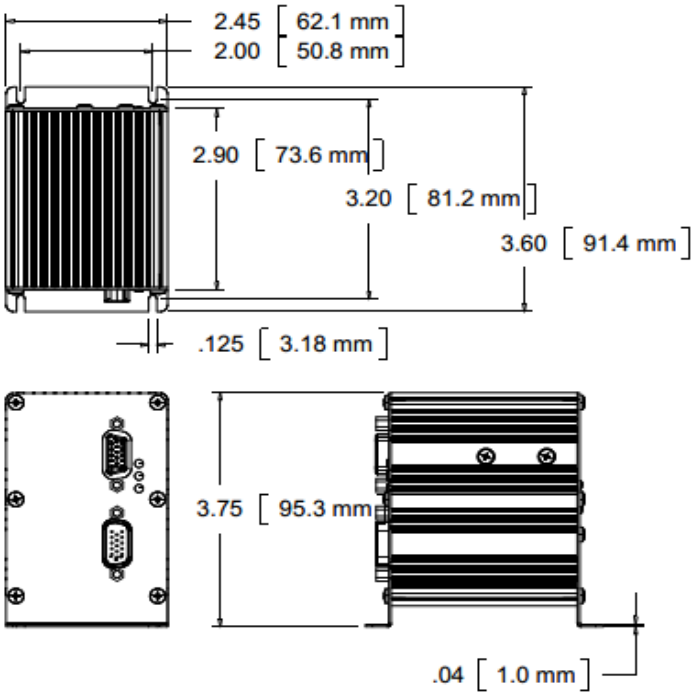
QCI-S2-X2-IG

QCI-S2-IG-01

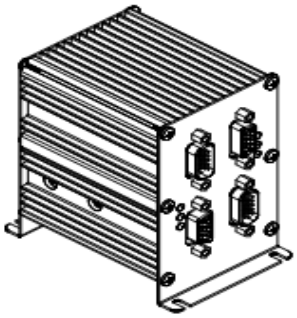


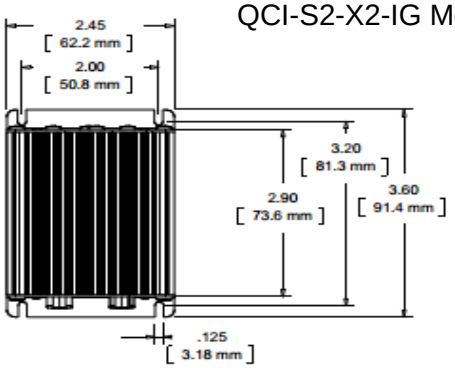


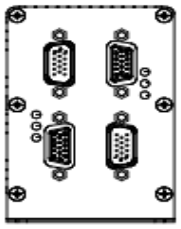
QCI-S2-IG Mechanical

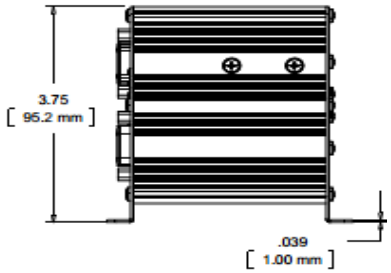


QCI-S2-X2-IG Mechanical

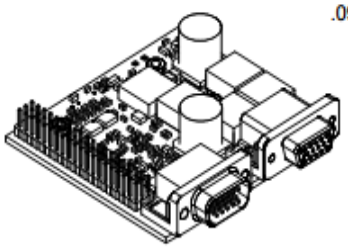


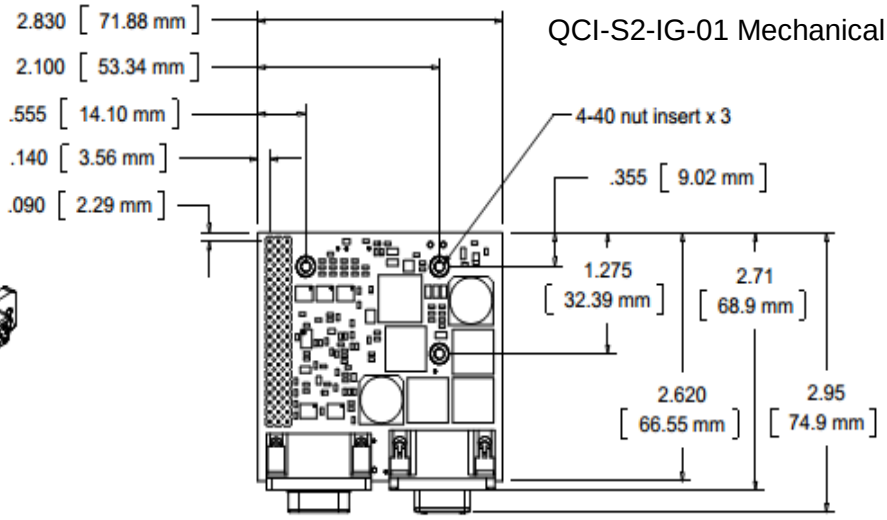


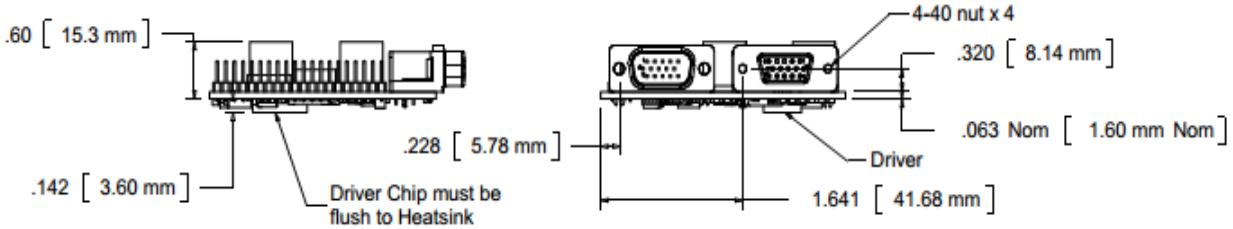




QCI-S2-IG-01 Mechanical







Power:

Input power is 12.5v to 48 VDC, regulated. An internal clamp is included. Power must be externally fused at not more than 8A. Input Current is 4.5A Max. Output current is 3.5A RMS continuous per phase. DC motor 6A Max (With both phases wired in parallel). Maximum 200W continuous (electrical) power out. May require derating dependent upon ambient temperature and air flow.

I/O:

0 to +3.3 VDC. LVTTL level compatible. All inputs have a light pull-up (~100k ohm to 3.3v). The 4 I/O are 5v tolerant. Do NOT connect to inputs in excess of 5VDC.

I/O 4 may be used as an Analog Input: 0 to +3.3 VDC input signal range. Resolution: 12 bits (before filtering), interpolated to 15 bits via filtering.

SilverSterling™ IG Controller/Drivers

Driver	Controller	Options
QCI-S2-IG: 4 A RMS Per Phase ○ Best paired with I-Grade Motor/Encoders ○ 3.5A RMS per phase ○ 5A peak per phase ○ 4.5A @ 12v-48v ○ Included Clamp circuit and resistor.	IG – SilverSterling S2 IG ○ 4 TTL Inputs or Outputs ○ 1 Analog input (IO#4) ○ 1 PWM output (IO#2) ○ Use QCI-BO-S1A ○ ASCII, 9 bit Binary, Modbus®, ○ DMX-512® ○ CANopen® ○ DB15HD (pin): SIP ○ DB15HD (socket): Motor I/F X2-IG ○ Two IG controllers in same enclosure	**Blank** – in Heat Sink Enclosure **01** – Board Only ○ Requires user to properly heat sink. **V1** – Board Only Motor Port with Vertical DB15HD connector ○ SMI Port with Right Angle DB15HD connector **V2** – Board Only ○ Motor Port with Right Angle DB15HD connector ○ SMI Port with Vertical DB15HD connector

SilverSterling S3 Family

The SilverSterling S3 Family is designed to handle a wide variation of motor and actuator types. SilverSterling includes a motor regeneration clamp and is available both as boxed and bare-board varieties. The QCI-S3-IG-01 is the bare board version. The DSUB connectors can be ordered as either vertical or right angle or a mix. Contact Factory for details.

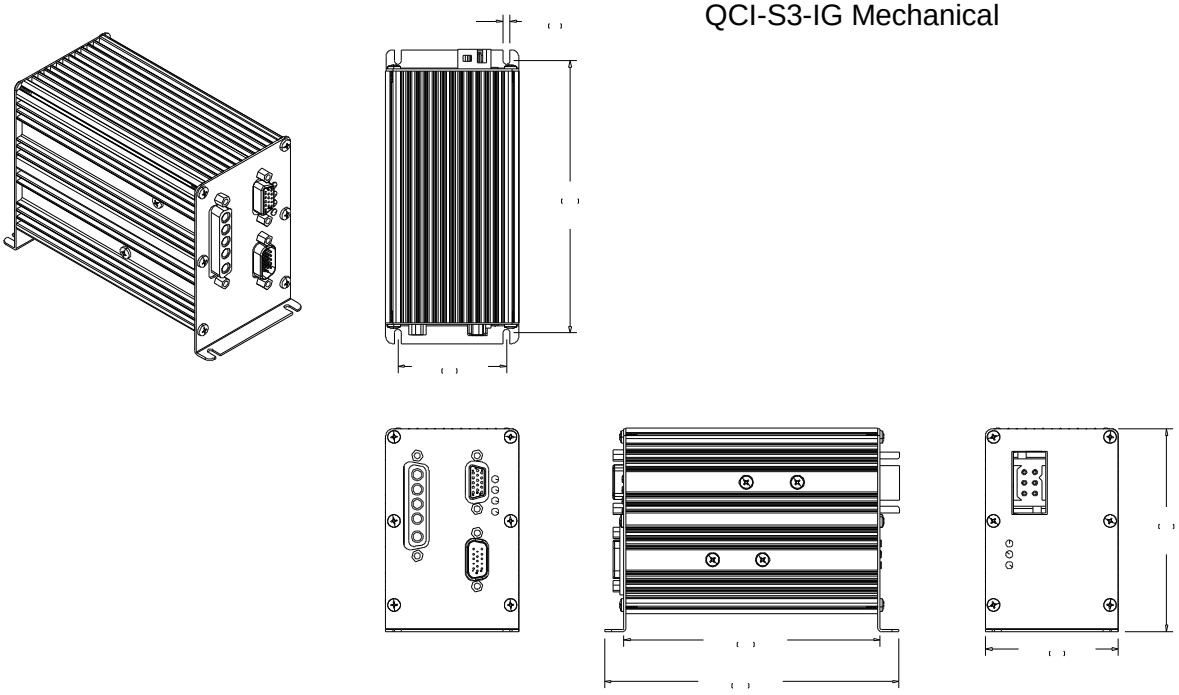
The SilverSterling may also be customized to hold a customer specific interface board using the optional 60 pin internal header to access additional internal I/O.

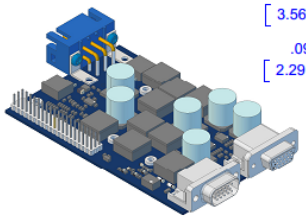
Full data sheet: http://www.quicksilvercontrols.com/SP/DS/QCI-DS027_QCI-S3-IG.pdf

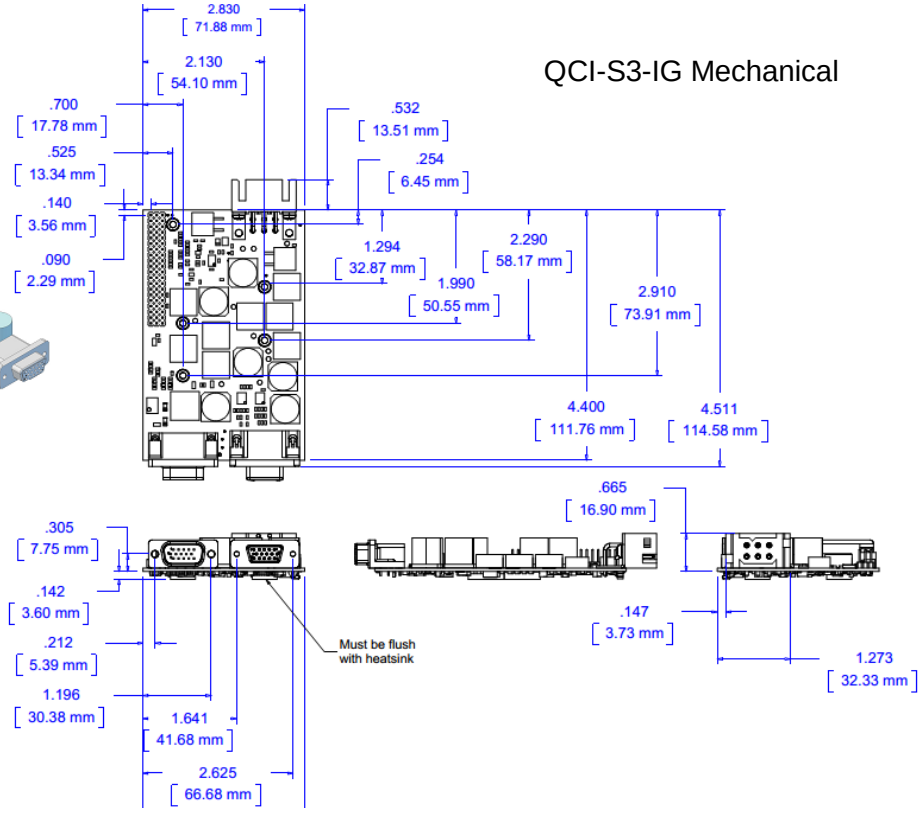
QCI-S3-IG-01

QCI-S3-IG

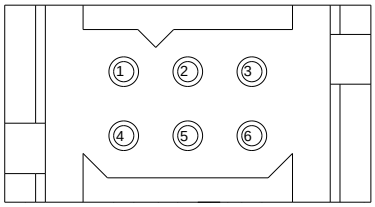
QCI-S3-IG Mechanical







Power:



1	RES-
2	Clamp Out
3	+Vdriver (internal)
4	Power Ground
5	V+ Processor
6	V+

Input power is 12.5v to 48 VDC, regulated. An internal clamp is included. Power must be externally fused at not more than 25A. Input Current is 20A Max. Output current is 10A RMS continuous per phase. DC motor 20A Max (With both phases wired in parallel). May require derating dependent upon ambient temperature and air flow.

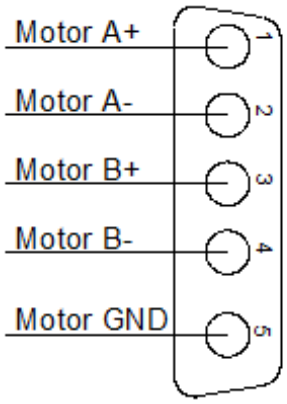
Clamp: to use internal resistor jumper pins 1 and 2. To use an external clamp resistor, connect between pins 2 and 3. Power normally supplied between pins 6 and 4. V+ processor is an optional power backup for the processor of 8 to 48V DC.

Drive Enable:

The drive enable is isolated using an optical isolator with a series current source, for operation from 6 to 48 VDC. A current limited version of the input power supply is available on pin 7 to allow enabling the drive by connecting pins 1 and 7 together, and connect pins 6 and 11 together. The current limited source is approximately 1.8mA, which is the needed input for the isolator.

Motor Interface

The motor interface is by way of a DB5W5 connector. The motor ground connection is provided to include a shield around the motor wires, and to provide a return path from the motor case for high frequency currents. The stray currents can be minimized by use of a ferrite bead over the 5 wires in the motor cable.



SilverSterling™ IG Controller/Drivers

Driver	Controller	Options
QCI-S3-IG: ▯ Best paired with I-Grade Motor/Encoders ▯ 10A RMS continuous ▯ 20A @ 12v-48v ▯ Included Clamp circuit and resistor. ▯ Isolated Drive Enable input	**IG** – SilverSterling S3 IG ▯ 4 TTL Inputs or Outputs ▯ 1 Analog input (IO#4) ▯ 1 PWM output (IO#2) ○ Use QCI-BO-S1A ▯ ASCII, 9 bit Binary, Modbus®, DMX-512® ▯ CANopen® ▯ DB15HD (pin): SIP Connector ▯ DB15HD (socket): Motor I/F ▯ DB5W5 (socket): Motor Power ▯ 6 pin Input Power Connector	**Blank** – in Heat Sink Enclosure **01** – Board Only ▯ Requires user to properly heat sink.
Example: For IG board only		
QCI-S3	**IG**	**01**
Selection creates part number: **QCI-S3-IG-01**		

SilverDust Controllers

The SilverDust Controllers are designed to handle 2 phase Hybrid Servos, DC brush Servos, and Voice Coil actuators. They are available both boxed and as separate boards to allow compact integration into final systems. The SilverDust controllers also feature soft configurable RS-232 / RS-485 communications and optional CANopen (see individual pages). The D2-IG8 has various Ethernet options as well

Point-to-Point Moves
- Relative or Absolute
- Velocity or Time Based
- S-Curve

Advanced Motion Profile Moves
- Profile Move Commands
- Register Based
- Position/Accel/Decel/Vel
- Modify On-the-Fly

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Anti-Hunt™
- Optionally use Open Loop While Holding
- No Servo Dither While at Rest

Communications
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- ASCII, Binary, Modbus®, DMX512 option
- Host Control While Servo in Motion
- CANopen® option

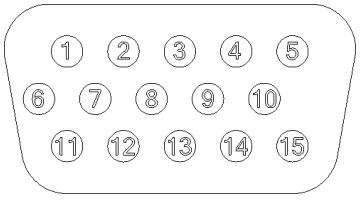
Programming Language
- Easy, Menu Driven Interface
- Command Parameter Prompts
- No Syntax Errors
- User Namable I/O and Registers

Advance PVIA™ Servo Loop
- 100:1 Inertial Mismatch
- Direct Drive Oversized Inertial Loads
- Flywheels/Belt Drives
- Typically Without Gearheads
- More Stable Than PID

Digital 4 Quadrant Vector Drive
- DSP Driven for Reduced Noise

Multi-Task/Multi-Thread

SMI port:



Power V+ 12 to 48VDC

D2-MG does not include a clamp. D2-IG series includes a regenerative clamp

SMI port	
Pin	Signal
1	V+
2	RS-232 Tx / RS-485-B (D-)
3	+5v Out (100mA)
4	I/O-#3
5	I/O-#6
6	Power Ground
7	V+
8	Logic Ground
9	I/O-#2
10	I/O-#5
11	Power Ground
12	RS-232 Rx / RS-485-A (D+)
13	I/O-#1
14	I/O-#4
15	I/O-#7

SilverDust QCI-D2-MG

The SilverDust D2MG: These controllers have been optimized for 2 phase hybrid servo motors. The QCI-D2-MG is connectorized for use with third party motors with common 3rd party encoders, with separate connectors for motor and encoder connections, and a jumper matrix to select differential or single ended encoders.

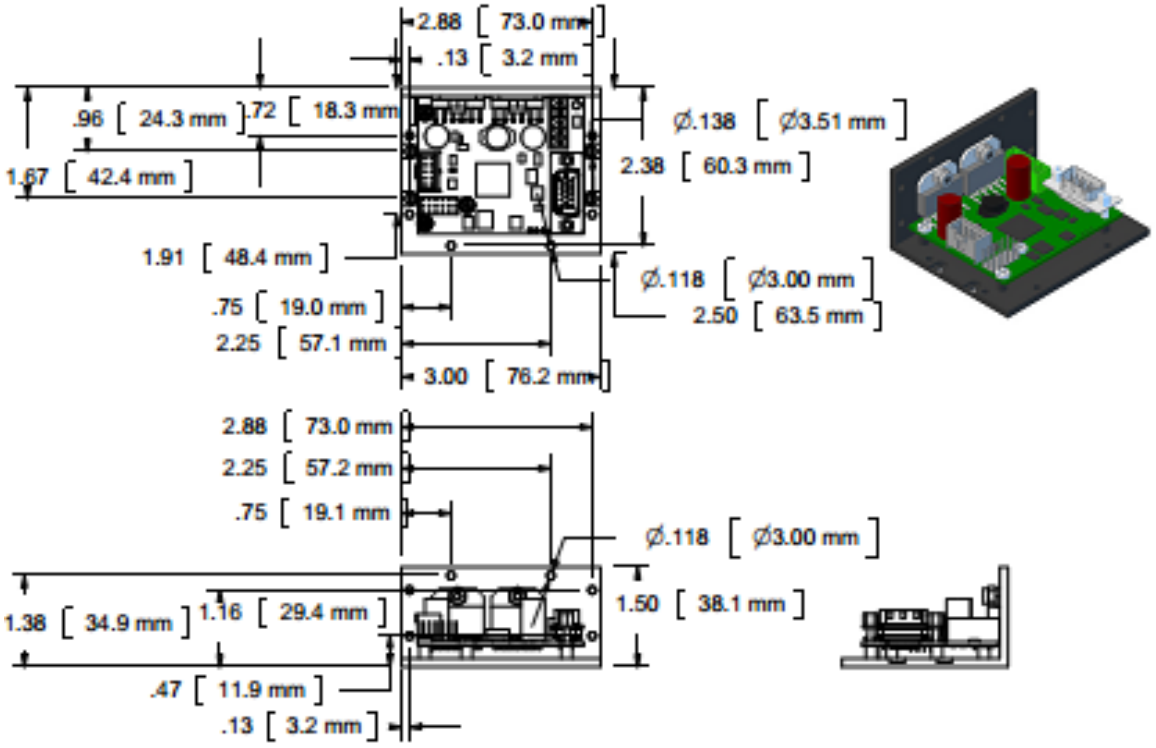
QCI-D2-MG

QCI-D2-MG-01

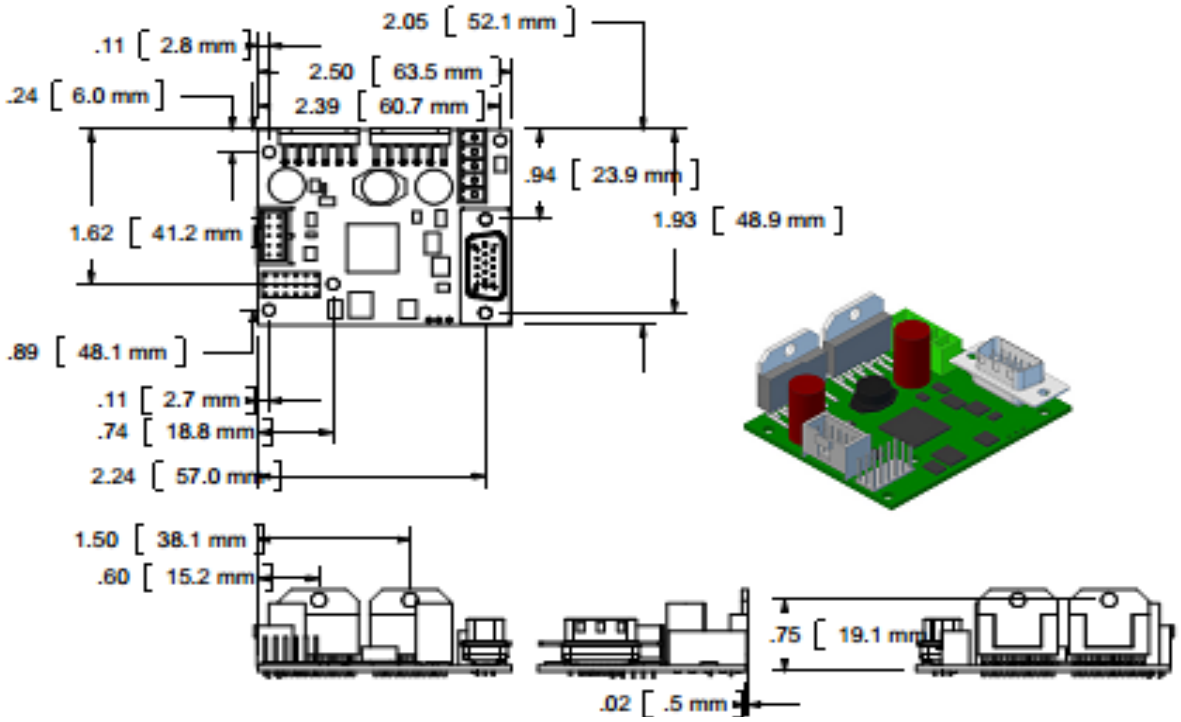
Power, communications, and I/O are accessed through a single DB15 high density interface connector. The interface includes 7 I/O, which support LVTTL. 4 of the I/O also support analog signals. DMX is available as a factory option. CANopen is available as a factory option.

The QCI-D2-MG is also available as a bare board version, the QCI-D2-MG-01.

QCI-D2-MG Dimensions



QCI-D2MG-01 Dimensions



Power:

Input power is 12v to 48 VDC, regulated. An external clamp may be required if rapid deceleration of large loads present. Power to be externally fused at not more than 8A. Input Current is 4A Max. Output current is 3.5A continuous per phase, 4.5A peak. Maximum 150W continuous (electrical) power out (with adequate heatsink). May require derating dependent upon ambient temperature and air flow.

I/O:

0 to +3.3 VDC. LVTTL level compatible. All inputs have a light pull-up (~200k ohm to 3.3v). The seven IO are protected to +/- 40v. For source and sink capability, see Data Sheet

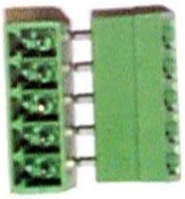
IO 4,5,6,7 may be used as Analog Inputs: 0 to +3.3 VDC input signal range. Resolution: 10 bits (before filtering), interpolated to 15 bits via filtering.

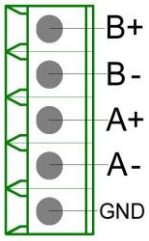
Serial Interface:

RS-232/RS-485 multi-drop, Reduced unit load accommodates up to 128 nodes. Note: RS-485 requires a nominal 120-ohm ½ W termination resistor at each end of the network for longer runs. This termination is not provided onboard and must be provided by the user. Use of biased termination for RS-485 is needed with this device.

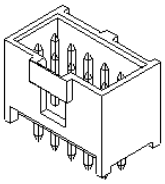
QCI-D2-MG Motor connectors

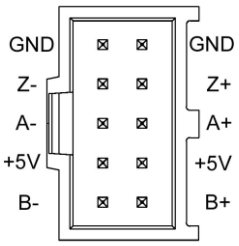
Motor interface





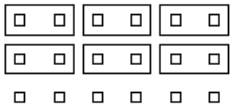
Encoder Interface



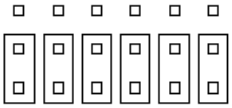


Encoder jumper block selects either single ended or differential encoder inputs. Single ended use the A+, B+, Z+ connections. These come jumpered for differential from the Factory.

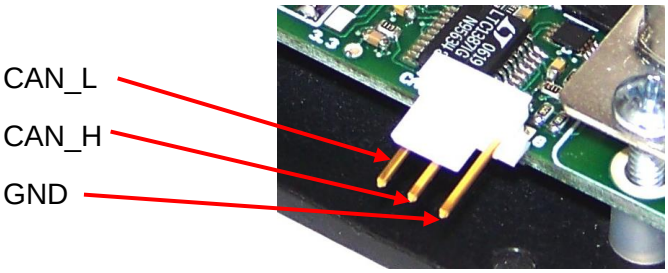
Jumpering for Differential



Jumpering for Single-ended



Optional CANopen connections:



Full Datasheets available on line:

http://www.quicksilvercontrols.com/SP/DS/QCI-DS004_QCI-D2-MG.pdf

SilverDust™ D2-MG Controller/Drivers

DRIVER	CONTROLLER	OPTIONS
QCI-D2 - 3.5 Amp • For 23 Frame and Smaller • 3.5 Amps per Phase Continuous* • 4.5 Amp Peak • Input Power: 4A@12V-48V * Depending on heat sink (25C ambient).	**MG** – SilverDust D2 MG • 7 TTL Inputs or Outputs (use QCI-BO-B52 for 24V I/O) • 4 Analog Inputs (Joystick) • Analog Output Option (use QCI-BO-B1A) • RS-232 or RS-485 • ASCII, Binary, Modbus® • DB15HD (pin): SMI Port • Motor: Plugged terminal strip • Encoder: 10 Pin/Double Row • Mating Connectors Sold Separately	**Blank** – Standard • L-Bracket for heat sinking. • DIN compatible **01** –Board Only ○ Requires user to properly heat sink. **D** – DMX512 **C** – CANopen® **C1** – Board Only w/ CANopen
Example: SilverDust MG board only with DMX512 and CANopen **QCI-D2-MG-CD1**		

Example Part Numbers:

QCI-D2-MG

QCI-D2-MG-01

QCI-D2-MG-D

QCI-D2-MG-D1

QCI-D2-MG-C1

QCI-D2-MG-CD1

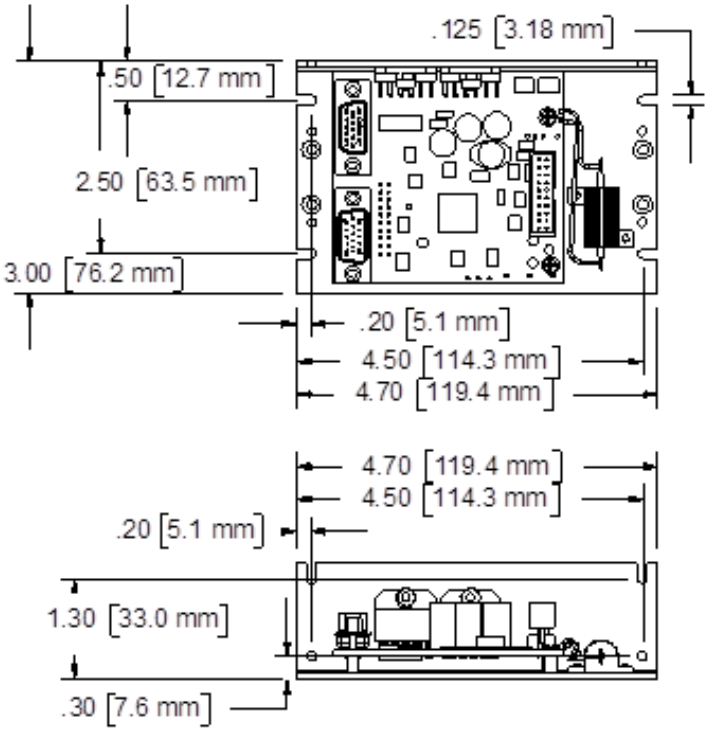
SilverDust QCI-D2-IG

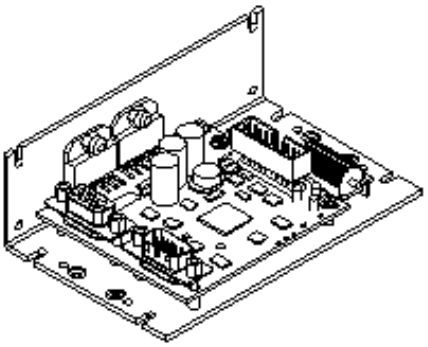
The SilverDust D2-IG. These controllers have been optimized for 2 phase hybrid servo motors. The QCI-D2-IG is connectorized for use with QCI I-Grade Motors. This board is the base controller/driver for the D2-IGB, D2-IG8, and D2-IGF Controllers Series

Power, communications, and I/O are accessed through a single DB15 high density interface connector. The interface includes 7 I/O, which support LVTTL. 4 of the I/O also support analog signals. DMX is available with the D option. CANopen is availabe as the J option

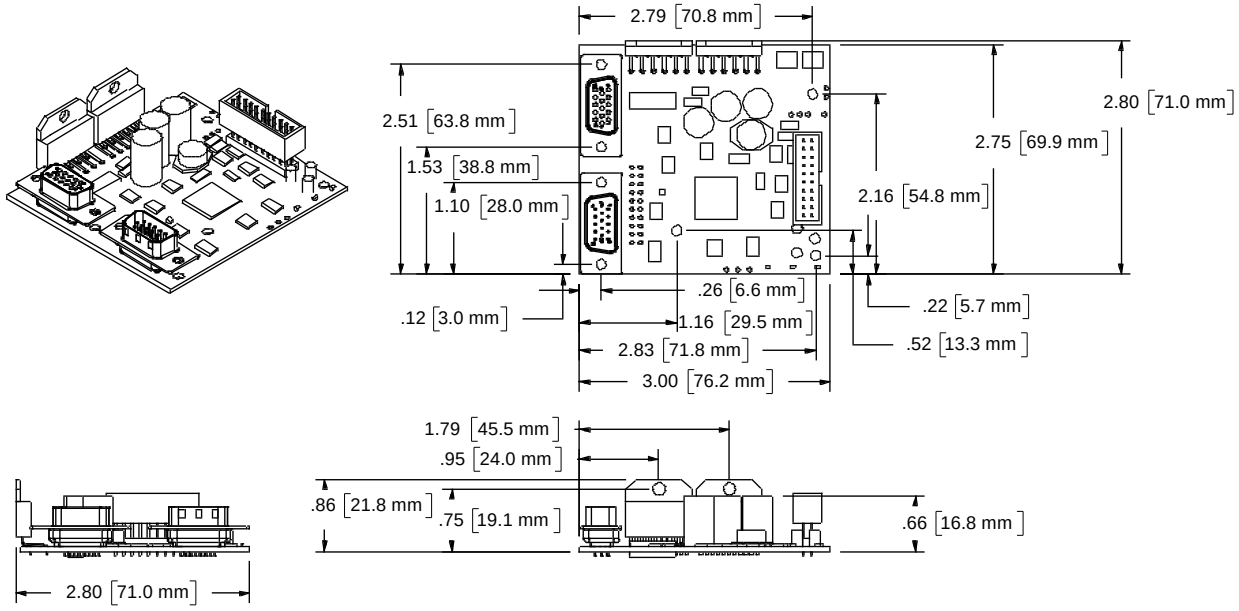
The QCI-D2-IG is also available as a bare board version, the QCI-D2-IG-01.

QCI-D2-IG Dimensions





QCI-D2IG-01 Dimensions



Power:

Input power is 12v to 48 VDC, regulated. An internal clamp is included in the D2-IG. Power to be externally fused at not more than 8A. Input Current is 4A Max. Output current is 3.5A continuous per phase, 4.5A peak. Maximum 150W continuous (electrical) power out (with adequate heatsink). May require derating dependent upon ambient temperature and air flow.

I/O:

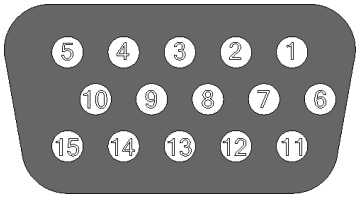
0 to +3.3 VDC. LVTTL level compatible. All inputs have a light pull-up (~200k ohm to 3.3v). The seven IO are protected to +/- 40v. For source and sink capability, see Data Sheet

IO 4,5,6,7 may be used as Analog Inputs: 0 to +3.3 VDC input signal range. Resolution: 10 bits (before filtering), interpolated to 15 bits via filtering.

Serial Interface:

RS-232/RS-485 multi-drop, Reduced unit load accommodates up to 128 nodes. Note: RS-485 requires a nominal 120-ohm ½ W termination resistor at each end of the network for longer runs. This termination is not provided onboard and must be provided by the user. Use of biased termination for RS-485 is needed with this device.

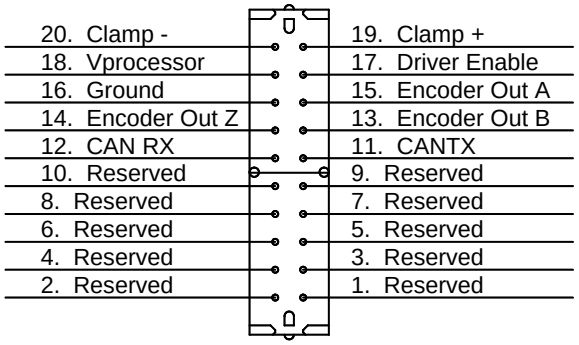
QCI-D2-IG Motor connector



I-Grade Motor Port	
Pin	Signal
1	Motor Phase B+
2	Motor Body Ground
3	Encoder +5V
4	Encoder A-
5	Encoder B-
6	Motor Phase A+
7	Motor Phase B-
8	Encoder Z+
9	Encoder A+
10	Encoder Z-
11	Motor Phase A
12	Motor Body Ground
13	Encoder B+
14	Encoder Ground
15	Motor Memory**

** Motor Memory supports QCI I-Grade Motors. Stores motor type, encoder resolution, alignment and runout calibration information.

Auxiliary Connector (Not accessible on boxed units):



Driver enable: By default, the SilverDust IG comes with a jumper between pin 17 & 19 to automatically enable the driver. If user applications require a separate hardware drive enable, then use pin 16 and 17 to enable/disable motor driver.

The Encoder connections are buffered signals derived from the differential motor encoder inputs.

CAN TX and CAN RX are unprotected TTL. Do not connect if using J option.

Full Datasheets available on line:

http://www.quicksilvercontrols.com/SP/DS/QCI-DS019_QCI-D2-IG.pdf

SilverDust™ D2-IG Controller/Drivers

DRIVER	CONTROLER	OPTIONS
QCI-D2 - 3.5 Amp • For 23 Frame and Smaller • 3.5 Amps per Phase Continuous* • 4.5 Amp Peak • 4A@12V-48V * Depending on heat sink (25C ambient).	**IG** – SilverDust D2 IG • 7 TTL Inputs or Outputs (use QCI-BO-B52 for 24V I/O) • 4 Analog Inputs (Joystick) • Analog Output Option (use QCI-BO-B1A) • RS-232 or RS-485 • ASCII, Binary, Modbus® • Encoder Output • Voltage Clamp and Resistor • Drive Enable • DB15HD (pin): SMI Port • DB15HD (socket): Motor I/F including motor power and encoder	**Blank** – Standard • L-Bracket for heat sinking. • DIN compatible **01** – Board Only ○ Requires user to properly heat sink. **R1** – Board Only ○ Same as 01 w/ Right Angle DB15HD connectors **R2**– Right-Angle Connector Option ○ L-Bracket for heat sinking ○ Motor Port with Right-Angle DB15HD connector ○ SMI Port with Right-Angle DB15HD connector **V1** – Board Only ○ Motor Port with Right Angle DB15HD connector ○ SMI Port with Vertical DB15HD connector **V2** – Board Only ○ Motor Port with Vertical DB15HD connector ○ SMI Port with Right Angle DB15HD connector **V3** – Right-Angle Connector Option ○ L-Bracket for heat sinking ○ Motor Port with Right-Angle DB15HD connector ○ SMI Port with Vertical DB15HD connector **V4** – Right-Angle Connector Option ○ L-Bracket for heat sinking ○ Motor Port with Vertical DB15HD connector ○ SMI Port with Right-Angle DB15HD connector **D** – DMX512 **J** – CANopen® ○ L-Bracket for heat sink ○ CAN connector **J1** – CANopen® Board only • Same as 01, but with CANopen option.

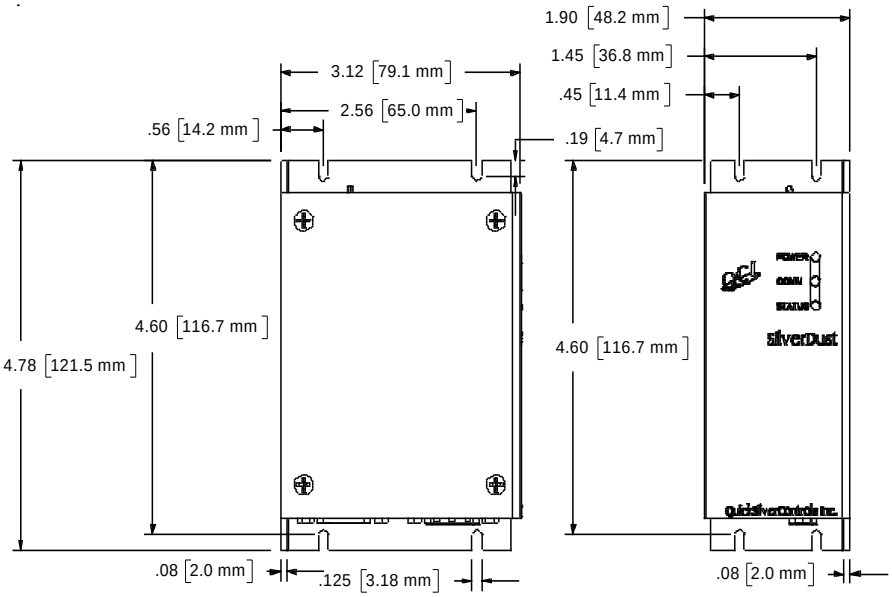
SilverDust QCI-D2-IGF

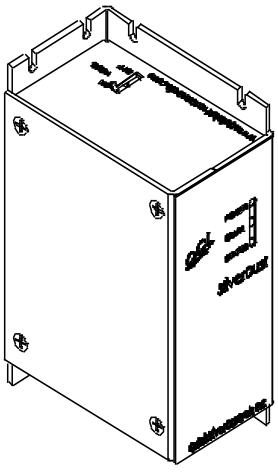
The QCI-D2-IGF is a closed case version of the QCI-D2-IG.

Other than the auxiliary connector (which is internal to the box), and the physical dimensions; all the specifications of the QCI-D2-IG apply to the D2-IGF.

The QCI-D2-IG also includes a power switch to simplify programming of multiple units after wiring.

QCI-D2-IGF Mechanical



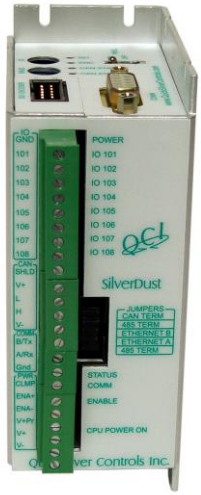


SilverDust™ D2-IGF Controller/Drivers

DRIVER	CONTROLER	OPTIONS
QCI-D2 - 3.5 Amp • For 23 Frame and Smaller • 3.5 Amps per Phase Continuous* • 4.5 Amp Peak • Input Power: 4A@12V-48V * Depending on heat sink (25C ambient).	**IGF** – SilverDust D2 IGF • 7 TTL Inputs or Outputs (use QCI-BO-B52 for 24V I/O) • 4 Analog Inputs (Joystick) • Analog Output Option (use QCI-BO-B1A) • RS-232 or RS-485 • ASCII, Binary, Modbus® • Voltage Clamp and Resistor • DB15HD (pin): SMI Port • DB15HD (socket): Motor I/F including motor power and encoder	**Blank** – Standard • DIN compatible **D** – DMX512

SilverDust QCI-D2-IG8

The SilverDust QCI-D2-IG8 builds on the basic D2-IG controller adding and isolated CANopen port, Switches to set the ID and Baud rate (or which may be used for customer specific functions), an optional differential encoder port which supports both SSI and incremental encoders, eight 24v (36V max) 1/2A I/O ports (NPN), in addition to the 7 LVTTL ports on the D2-IG base, termination jumpers for both the CAN and RS-485 ports.

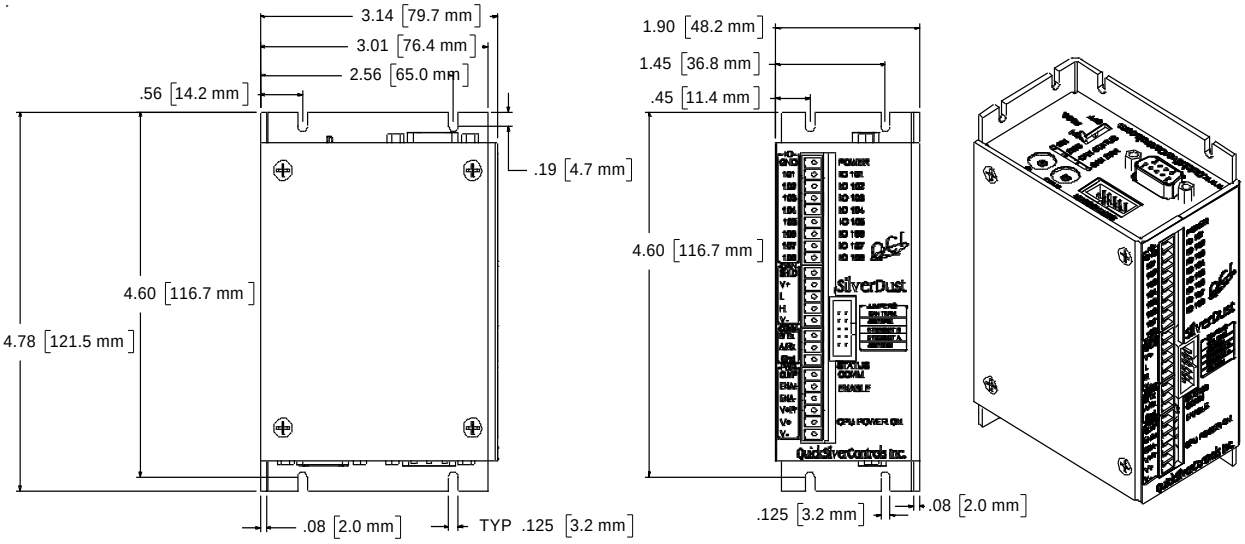


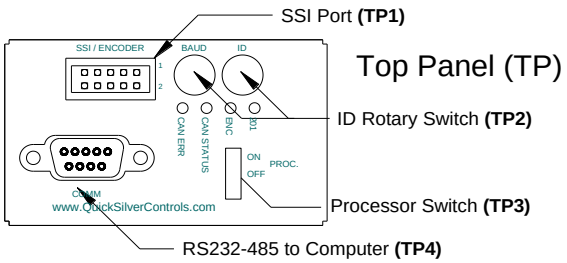
Ethernet: The QCI-D2-IG8 also has ethernet options including straight serial, Modbus TCP, and Ethernet/IP (contact Factory).

Full Data Sheet:

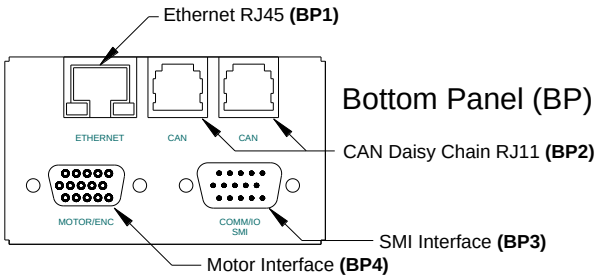
http://www.quicksilvercontrols.com/SP/DS/QCI-DS018_QCI-D2-IG8.pdf

QCI-D2-IG8 Mechanical



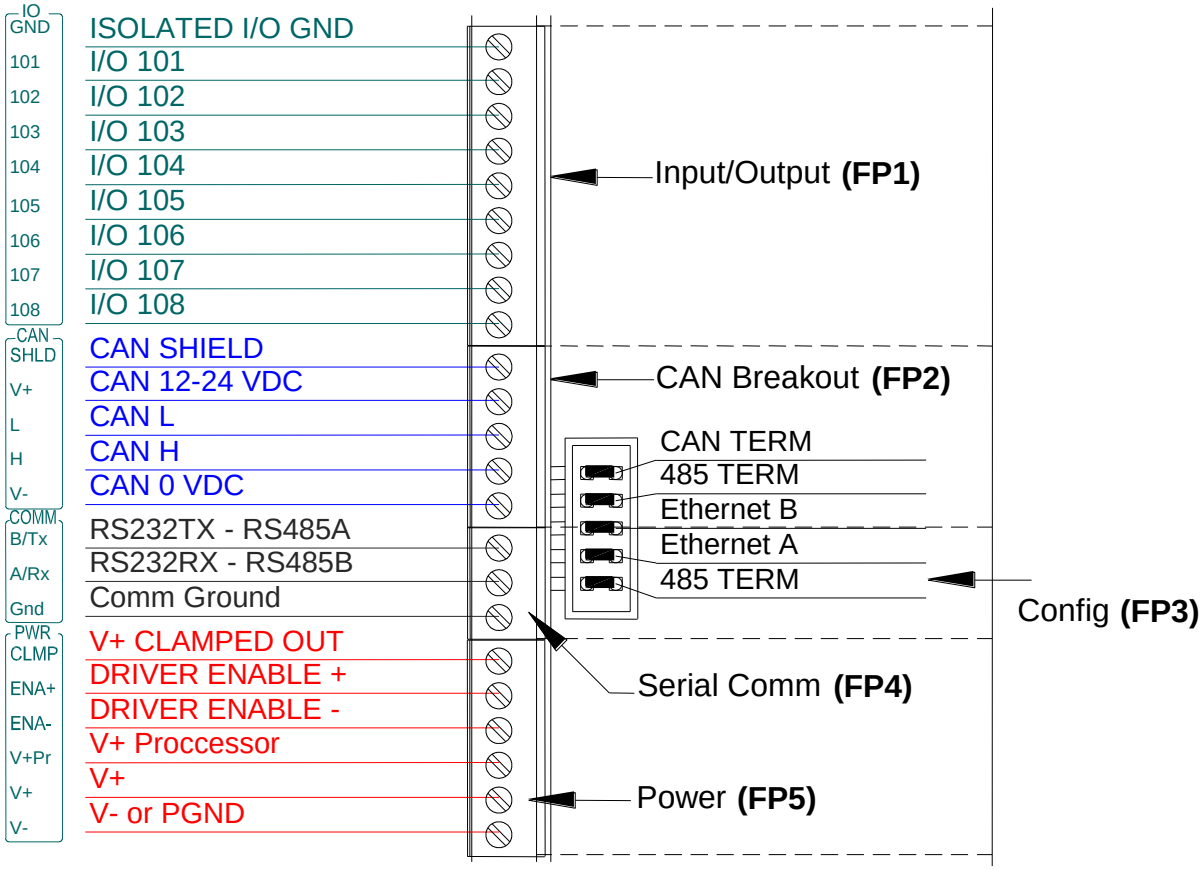


Top Panel (TP)

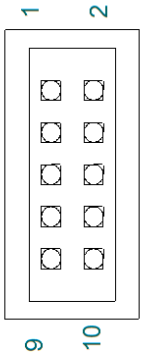


Bottom Panel (BP)

Front Connectors



SPI/SSI/Differential Encoder Port



Pin	SPI	SSI	Diff. Encoder
1	MOSI-	N/C	A-
2	MOSI+	N/C	A+
3	SCLK-	SCLK+	B-
4	SCLK+	SCLK-	B+
5	GND	GND	GND
6	+5V	+5V	+5V
7	CS-	N/C	Z-
8	CS+	N/C	Z+
9	MISO-	Data+	N/C
10	MISO+	Data-	N/C

This optional port allows for a differential connection for an SPI port, which is also used for SSI connections, or for use with a differential encoder input. The SSI may be configured for 8 to 31-bit interfaces, binary or Grey code.

SilverDust™ D2-IG8 Controller/Driver

DRIVER	CONTROLLER	OPTIONS
QCI-D2 - 3.5 Amp • For 23 Frame and Smaller • 3.5 Amps per Phase Continuous* • 4.5 Amp Peak • Input Power: • 4A@12V-48V Depending on heat sink (25C ambient).	**IG8**– SilverDust D2 IG8 • 8 5-24V, Isolated I/O • 7 TTL Inputs or Outputs (use QCI-BO-B52 for 24V I/O) • 4 Analog Inputs (Joystick) • Analog Output Option (use QCI-BO-B1A) • RS-232 or RS-485 • ASCII, Binary, Modbus® • Encoder Output • CANopen® • Voltage Clamp and Resistor • Drive Enable • DB15HD (pin): SMI Port • DB15HD (socket): Motor I/F including motor power and encoder	**Blank** – Standard ○ DIN compatible **E** – Ethernet ○ RJ45 Connector **EM** – Modbus TCP • Ethernet w/Modbus TCP **S** – SSI Port **D –** DMX512 For multiple options, list fields in alphabetical order

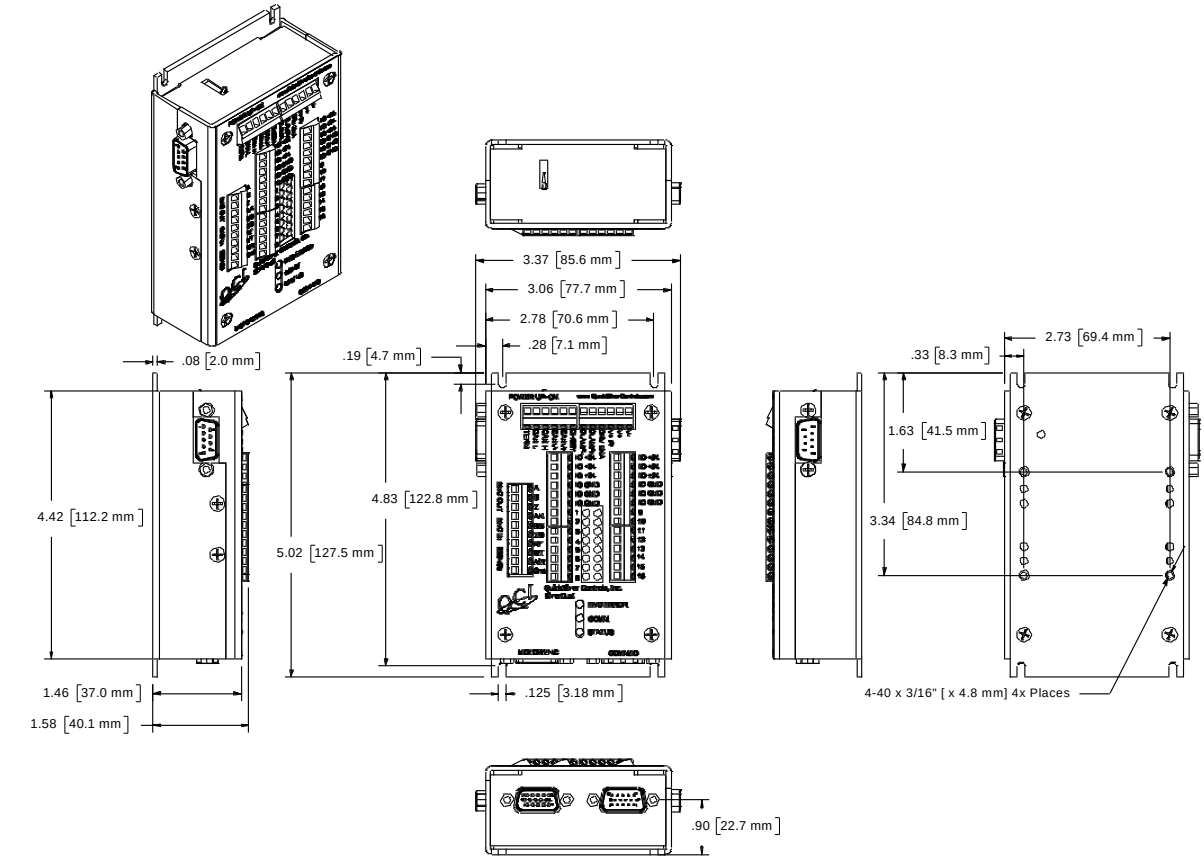
SiverDust QCI-D2-IGB

The SilverDust QCI-D2-IGB is built on the QCI-D2-IG controller and adds CANopen and sixteen 24v (36v max) NPN I/O 0.5A IO in addition to the 7 LVTTL IO present in the QCI-D2-IG. Buffered encoder outputs are provided, as well as connections for the CAN, clamp, drive enable, and encoder inputs. The 24V IO power is isolated from the driver power.

For full data sheet see:

http://www.quicksilvercontrols.com/SP/DS/QCI-DS003_QCI-D2-IGB.pdf

QCI-D2-IGB Mechanical

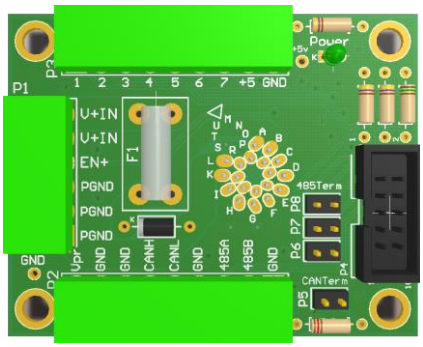


SilverDust™ D2-IGB Controller/Drivers

DRIVER	CONTROLER	OPTION
QCI-D2 - 3.5 Amp • For 23 Frame and Smaller • 3.5 Amps per Phase Continuous* • 4.5 Amp Peak • Input Power: 4A@12V-48V • IO power 12-36V * Depending on heat sink (25C ambient).	**IGB** – SilverDust D2 IGB • 16 5-24V, Isolated I/O • 7 TTL Inputs or Outputs • 4 Analog Inputs (Joystick) • Analog Output Option (use QCI-BO-B1A) • RS-232 or RS-485 • ASCII, Binary, Modbus® • Encoder Output • CANopen® • Voltage Clamp and Resistor • Drive Enable • DB15HD (pin): SMI Port • DB15HD (socket): Motor I/F including motor power and encoder	**Blank** – Standard, DIN Mountable **D –** DMX512

Accessories – Break Out Boards

QCI-BO-X1 and QCI-BO-X1A:



This breakout board is designed to be mounted though a cabinet wall to provide IP65 connections to a SilverMax X-series motor and controller without the need for additional glands. It provides jumperable termination for the RS-485 and for CAN, and a fuse for the power. A 10-pin header is provided to allow for easy daisy-chaining of the CAN and RS-485 signals.

The A option of this board included a filter for a PWM signal on IO2 to provide a 0-5v analog output.

http://www.quicksilvercontrols.com/SP/TD/QCI-TD079_QCI-BO-X1_A.pdf

QCI-BO-B1 and QCI-BO-B1A

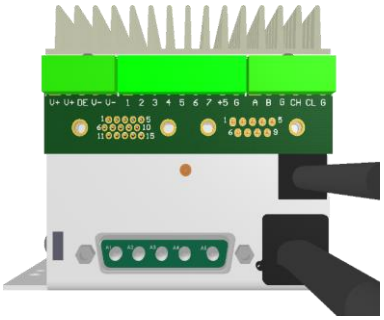
This Breakout board is designed to connect to the SMI port of various SilverDust D2 family controllers. It provides breakouts of all the signals to cage clamp terminals. This includes Power, Serial, and I/O.

The A option of this board included a filter for a PWM signal on IO2 to provide a 0-5v analog output.

http://www.quicksilvercontrols.com/SP/TD/QCI-TD036_QCI-BO-B_B1.pdf

http://www.quicksilvercontrols.com/SP/TD/QCI-TD048_QCI-BO-B1A.pdf

QCI-BO-X3 and QCI-BO-X3A



The BO-X3 is designed to break out the SMI and CAN ports for both the QCI-N3 X-series controllers. (Note: Controller shown sold separately.) Power, IO and Communications are brought out to separate pluggable cage clamp connectors

The A option of this board included a filter for a PWM signal on IO2 to provide a 0-5v analog output.

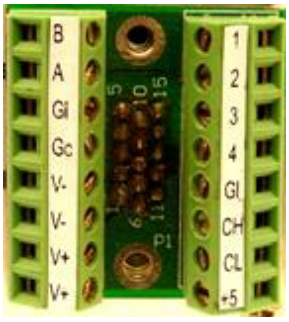
http://www.quicksilvercontrols.com/SP/TD/QCI-TD087_QCI-BO-X3_A.pdf

QCI-BO-B52

The QCI-BO-B52 Provides 5 optically isolated 24v (10-30v) inputs and two 24V, 1A NPN outputs. The outputs have thermal and current limiting. The QCI-BO-B52 is compatible with the SilverDust QCI-D2 family except for the QCI-D2-IGB.

http://www.quicksilvercontrols.com/SP/TD/QCI-TD046_QCI-BO-B52.pdf

QCI-BO-S1 and QCI-BO-S1A

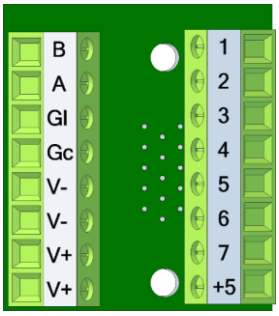


This Breakout board is designed to connect to the SMI port of various SilverSterling D2 family controllers. It provides breakouts of all the signals to cage clamp terminals. This includes Power, Serial, and I/O.

The A option of this board included a filter for a PWM signal on IO2 to provide a 0-5v analog output.

http://www.quicksilvercontrols.com/SP/TD/QCI-TD068_QCI-BO-S1_A.pdf

QCI-BO-B4 and QCI-BO-B4A

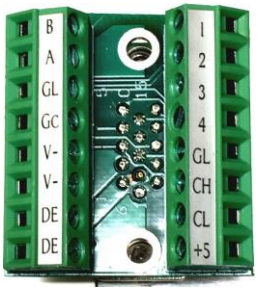


This Breakout board is designed to connect to the SMI port of various SilverNugget N2 X-series family controllers. It provides breakouts of all the signals to cage clamp terminals. This includes Power, Serial, and I/O.

The A option of this board included a filter for a PWM signal on IO2 to provide a 0-5v analog output.

http://www.quicksilvercontrols.com/SP/TD/QCI-TD086_QCI-BO-B4.pdf

QCI-BO-S3



This Breakout board is designed to connect to the SMI port of the SilverSterling S3-IG controller. It provides breakouts of all the signals to cage clamp terminals. This includes Power, Serial, CAN, Drive Enable Signals, and I/O.

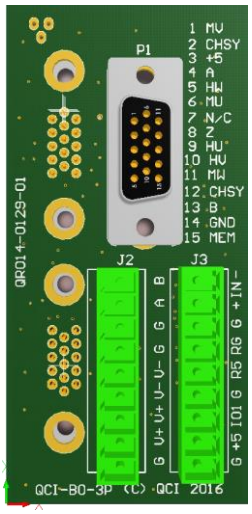
http://www.quicksilvercontrols.com/SP/TD/QCI-TD083_QCI-BO-S3.pdf

QCI-BO-M1

The QCI-BO-M1 is designed to allow third party motors to be used with any of our I-grade controllers, breaking out the motor port into a 10-pin differential encoder connector and a 5-pin motor connector (2 phases plus chassis ground).

http://www.quicksilvercontrols.com/SP/TD/QCI-TD057_QCI-BO-M1.pdf

QCI-BO-3P and QCI-BO-3P3



This interface board provides the hall sensor interface connections between a 3-phase motor and a SilverSterling S2-IG (QCI-BO-3P), or a SilverSterling S3-IG (QCIBO-3P3). The SilverSterling S2-IG units need to be internally jumpered for compatibility with this interface – contact the Factory for details. Use only the specific interface board with the designated controller type. This board may be configured to bring out either CAN or bias resistors for and optical IO. A differential 0-10v input is also available. Encoder pullup resistor are also provided, which can be customized according to need. Contact the Factory for specific options.

http://www.quicksilvercontrols.com/SP/TD/QCI-TD078_QCI-BO-3Px.pdf

QCI-CLCF Clamp Module

The Clamp Module is designed to isolate a regulated power supply from the power regenerated when a motor brakes a load. This power is dissipated in a resistor to prevent excessive driver voltage from occurring. The clamp modules are available both closed frame (shown) and open frame, and with different internal resistances to hand different input voltage ranges, and with no internal resistor to allow for larger power levels by using external resistor banks.

http://www.quicksilvercontrols.com/SP/TD/QCI-TD017_QCI-CLxF-04.pdf

Shaft Seals

Shaft sealing plates (shown on 17 frame motors – not included) are required for IP-65 motors which do not have front seals and for which the customer is not providing other shaft protections (such as an IP65 rated gearhead). Contact the factory for various sizes.

http://www.quicksilvercontrols.com/SP/TD/QCI-TD037_QCI-17M-65_23M-65.pdf

Power Supplies

SP-240-48v - 48V, 5A, 240W

SP-1000-48 – 48v, 20.8A, 1000W

RSP-1000-48 – 48V, 21A, 1000W with Power Factor Correction

Cables

SilverMax Cables:

QCI-XC-SMI-xx – IP65 M16 cables for SilverMax X series. 4’ and 10’ standard

QCI-XC-SMF-10 – IP65 M16 to Flying leads. 10’ standard

QCI-XC-LP-10 – IP65 M23 Power cable for SilverMax X34 Family. 10’ standard

I-Grade Cables

QCI-C-D15P-D15S-xx – I-grade motor interface cable. 2’, 4’, 10’, 20’ standard

QCI-C-D15P-T14S-xx – IP65 I-grade motor interface cable. 10’ standard.

QCI-C-D5P-D5S-xx – 34 frame I-grade motor power cable. 1’, 2’, 4’, 10’ standard

QCI-C-D5P-T6S-xx – IP65 34 frame I-grade motor power cable 10’ standard

Power Cables

QCI-EC-P-10 – QCI-N3-IX/MX Power and Clamp interface cable. 10’ standard.

QCI-C-S3S-04 – S3-IG power cable. 4’ standard

QCI-C-ACP-FLY-6 – Power Cable, 120v 13A 6’ standard

QCI-USB-485

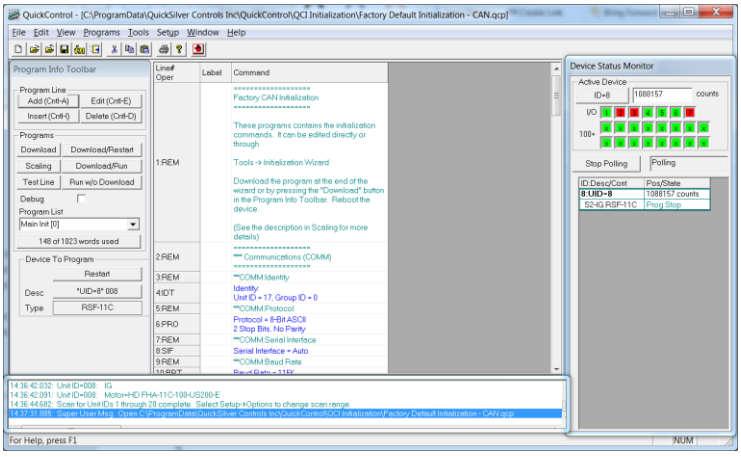
This adapter provides an RS-485 connection using a USB port.

Be sure to use the drivers from the QCI web page for best results. Default drivers are older and have issues with QuickControl.

http://www.quicksilvercontrols.com/SP/TD/QCI-TD073_USB-RS485_Converter.pdf

QuickControl

QuickConrol is our FREE integrated development environment. It is used for Motor Initialization and tuning as well as programing and debugging programs. It includes the ability to monitor registers while single stepping or real-time tracing a program.



The Programming method is to select the command from a list and fill in the parameters to reduce learning time and to eliminate syntax errors.

The latest version is available at https://www.quicksilvercontrols.com Select the Download Tab and then Software tab.

A training manual for programming is online, with video instruction to walk you through the first several chapters of the manual.
http://www.quicksilvercontrols.com/SP/UM/SilverLodeManual_v6.03.pdf

Units Conversion

Inertia – To convert from A to B, multiply by constant

A/B	oz-in^2	oz-in-s^2	lb-in^2	lb-in-s^2	NMs^2	g-cm^2	kg-m^2	kgf-m-s^2
oz-in^2	1	2.59*10^{-3}	6.25*10^{-2}	1.61*10^{-4}	1.82*10^{-5}	182.9	1.82*10^{-5}	1.86*10^{-6}
oz-in-s^2	386.09	1	24.131	6.25*10^{-2}	7.06*10^{-3}	7.06*10^{4}	7.06*10^{-3}	7.2*10^{-4}
lb-in^2	16	4.144*10^{-2}	1	2.59*10^{-3}	2.92*10^{-4}	2926.2	2.92*10^{-4}	2.98*10^{-5}
lb-in-s^2	6177	16	386.09	1	0.11298	1.13*10^{6}	0.11298	1.15*10^{-2}
NMs^2	5.467*10^{4}	141.62	3417.4	8.8512	1	1*10^{7}	1	0.10197
g-cm^2	5.467*10^{-3}	1.416*10^{-5}	3.417*10^{-4}	8.85*10^{-7}	1*10^{-7}	1	1*10^{7}	1.01*10^{-8}
kg-m^2	5.467*10^{4}	141.62	3417.4	8.8512	1	1*10^{7}	1	0.10197
kgf-m-s^2	5.362*10^{5}	1388.8	3.351*10^{4}	86.801	9.8067	9.80*10^{7}	9.8067	1

Power – To convert from A to B, multiply by constant

A/B	Watts	HP	Nm-RPS	Oz-in-RPM	Ft-lb-RPM	Ft-lb/sec	Nm/sec
Watts	1	1.34*10^{-3}	0.1952	1352	7.042	0.7375	1
HP	745.7	1	118.7	1*10^{6}	5251.4	549.93	745.7
Nm-RPS	6.283	8.42*10^{-3}	1	8496	44.25	4.634	6.283
Oz-in-RPM	7.396*10^{-4}	9.91*10^{-7}	1.17*10^{-4}	1	5.20*10^{-3}	5.45*10^{-4}	7.39*10^{-4}
Ft-lb-RPM	0.142	1.90*10^{-4}	2.26*10^{-2}	192	1	0.1047	0.142
Ft-lb/sec	1.356	1.18*10^{-3}	0.2158	1833	9.549	1	1.356
Nm/sec	1	1.34*10^{-3}	0.1592	1352	7.0423	0.7375	1

Torque – To convert from A to B, multiply by constant

A/B	Ft-lb	In-lb	In-oz	N-m	Kgf-m	Kgf-cm	Gf-cm
Ft-lb	1	12	192	1.3558	0.13825	13.825	1.38*10^{-4}
In-lb	8.33*10^{-2}	1	16	0.113	1.15*10^{-2}	1.1521	1152.1
Oz-in	5.208*10^{-3}	6.25*10^{-2}	1	7.06*10^{-3}	7.20*10^{-4}	7.20*10^{-2}	72.006
N-m	0.73757	8.8509	141.61	1	0.10197	10.197	1.02*10^{-4}
Kgf-m	7.2331	86.798	1388.8	9.8067	1	100	1*10^{5}
Kgf-cm	7.233*10^{-2}	0.86798	13.888	9.80*10^{-2}	1*10^{-2}	1	1000
Gf-cm	7.23*10^{-5}	8.67*10^{-4}	1.388*10^{-2}	9.80*10^{-5}	1*10^{-5}	1*10^{-3}	1