

## SX-Series Explosion-Proof Servo Motors:

### Frequently Asked Questions

Revised: March 17, 2014 (jh)

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## 1. What are “explosion-proof” motors?

A generalized discussion of “Explosion-Proof” motors is available for download from Elwood's website in .pdf format at:

[http://www.elwood.com/dSX\\_Seminar0810.pdf](http://www.elwood.com/dSX_Seminar0810.pdf)

The discussion includes basic information on explosion-proof terminology, ratings, certifications, motor construction, and some useful links to websites for associated explosion-proof products.

## 2. Where can I find general information on SX-Series “explosion-proof” brushless servo motors?

### ***Brochure***

The SX-Series brochure includes sizing data and information on ratings and certifications. The brochure is available for download at:

[SX-Series Brochure - http://www.elwood.com/2202.pdf](http://www.elwood.com/2202.pdf)

### ***Installation Manual***

The SX-Series installation manual includes standard connection diagrams, motor data sheets, speed/torque (speed/power) charts, certifications and additional beneficial information for specifications and installation.

[SX-Series Installation Manual - http://www.elwood.com/edn/033300.pdf](http://www.elwood.com/edn/033300.pdf)

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### 3. What ratings and certifications do SX-Series “explosion-proof” brushless servo motors include?

SX-Series brushless servo motors carry ATEX and UL/cUL ratings/certifications. While the SX-Series includes ratings for both gas/vapor and dust environments, there are four (4) distinct groups. The motors within each group are unique and exclusive to that group.

#### HAZARDOUS GAS OR VAPOR ENVIRONMENTS

##### UL/cUL

Rated:

M43x, M44x: UL/cUL – Class I Division 1 & 2, Groups C & D, T4

M46x, M47x: UL/cUL – Class I Division 1 & 2, Groups C & D, T3C

(9<sup>th</sup> character in model number = 7, 8, 9, A)

Motors that are rated for UL/cUL only hazardous gas or vapor environments include shaft seals and seals at the joints of the motors that are not allowed by ATEX. The design is equivalent to IP66.

##### ATEX and UL/cUL

Rated:

M43x, M44x, M46x – ATEX (Zone 1 & 2) Ex II 2 G Ex d IIB T3

(9<sup>th</sup> character in model number = 8, 9)

Motors that are rated for both UL/cUL and ATEX hazardous gas or vapor environments do not include shaft seals or seals at the joints of the motor. The design is equivalent to IP54.

#### HAZARDOUS DUST ENVIRONMENTS

##### UL/cUL

Rated:

M43x, M44x: UL/cUL – Class II Division 1 & 2, Groups E, F, & G, T4

M46x, M47x: UL/cUL – Class II Division 1 & 2, Groups E, F, & G, T3C

(9<sup>th</sup> character in model number = B, C)

Motors that are rated for UL/cUL hazardous dust environments include shaft seals and seals at the joints of the motor. In addition, these motors include a slinger at the shaft to reduce ingress of hazardous dust to the front bearing. The design is equivalent to IP66.

##### ATEX/IECEX

Rated:

M43x – ATEX (Zone 21 & 22) Ex tb IIIC T135 Db IP6X CE 0081 Ex II 2 D

M43x – IECEX (Zone 21 & 22) Ex tb IIIC T135 Db IP6X

(9<sup>th</sup> character in model number = B, C)

Motors that are rated for ATEX and IECEX hazardous dust environments include shaft seals and seals at the joints of the motor. In addition, these motors include a slinger at the shaft to reduce ingress of hazardous dust to the front bearing. The design is tested to IP6X.

Links to copies of Elwood's SX-Series ATEX certification information and UL/cUL files can be found at Elwood's SX-Series website at the following link:

[http://www.elwood.com/gettys\\_sx.shtml](http://www.elwood.com/gettys_sx.shtml)

Links to ATEX and IECEX certificates and information are found in the left-hand column under the heading “SX SERIES ATEX/IECEX INFORMATION”. Links to UL/cUL file information are found in the left-hand column under the heading “SX SERIES UL/cUL LISTING LINKS”.

[http://www.elwood.com/gettys\\_sx.shtml](http://www.elwood.com/gettys_sx.shtml)

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### **4. What cables can be used with SX-Series “explosion-proof” brushless servo motors?**

The cables required depend on several factors, feedback type, motor power, total number of conductors and conduit required. First, a discussion of motor construction is required to clarify connections to an SX-Series motor.

SX-Series “explosion-proof” brushless servo motors have been tested and are sealed with appropriately rated explosion-proof cement. This type of construction prevents hazardous gas, vapors, or sparks from passing through the cable/conductor exit. SX-Series motors do not include typical connectors or terminals for connection. Rather, the motors include 3-foot long individual flying leads (optional lengths are available). The leads exit the motor through either a single 1-inch NPT male threaded bushing or through dual ¾-inch NPT male threaded bushings. Illustrations 1 and 2 show an example of single (side) exit construction. Rear exit is available as an option.

In a dual-exit motor, the motor power, P.E., and brake leads (if equipped) exit through one ¾-inch NPT bushing. The over-temperature limit and feedback leads exit the motor through the second ¾-inch bushing. In a single-exit motor, all leads exit through the same bushing.

Proper installation must follow all applicable standards. Typically, sealed rigid conduit or an appropriately rated junction box is fitted to the motor. The motor's individual flying leads are extended to the control enclosure through connections made within the junction box. Please refer to the following paper, [Elwood Document Number 057597 \(http://www.elwood.com/edn/057597.pdf\)](http://www.elwood.com/edn/057597.pdf), for typical installation methodology.

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Illustration 1: SX-Series Motor with single side-exit construction

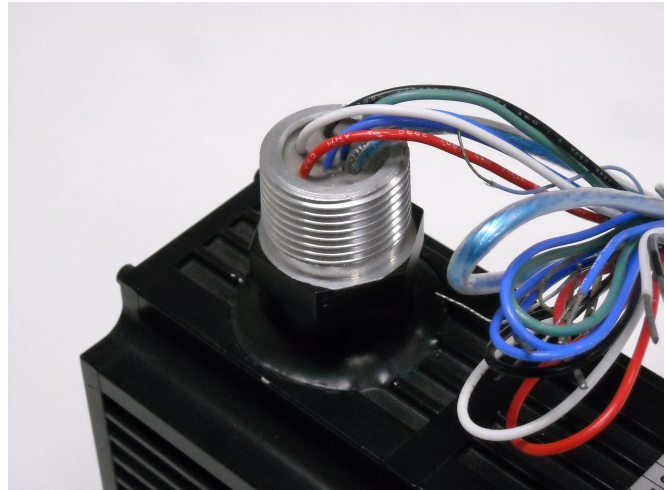


Illustration 2: Individual flying leads and male NPT bushing

Illustrations 1 and 2 show typical construction of SX-Series “explosion-proof” servo motors including individual flying leads and male NPT bushings.

To limit the effects of electromagnetic interference (EMI), motor power and feedback cables should be run in separate conduit and good grounding practices must be observed. Single exit construction, as shown in Illustrations 1 and 2, allows for fitting of an appropriately rated junction box directly to the motor. Conductors should be connected to extensions as close to the motor as possible and then routed through two conduit.

Consider the following when choosing cabling:

**Feedback Type:** SX-Series motors incorporate incremental encoders, resolvers, or absolute encoders. Specifications on the cable used by Elwood to build the cable can be downloaded by clicking the following links. Cables of similar construction are typically acceptable.

- [Resolver-Based Motor Feedback Cable: Elwood Document Number 036018](http://www.elwood.com/edn/036018.pdf)
- [Absolute Encoder-Based Motor Feedback Cable: Elwood Document Number 040924](http://www.elwood.com/edn/040924.pdf)
- [Incremental Encoder-Based Motor Feedback Cable: Elwood Document Number 033147](http://www.elwood.com/edn/033147.pdf)

**Motor Power:** The four conductors for motor power and P.E. (ground) should be run in separate conduit from feedback signals. Wire gauge should be chosen based on the current required by the application. Select materials based on all applicable codes and installation requirements.

**\*\* IMPORTANT INSTALLATION CONSIDERATION:** Conductors for motor power as supplied are not shielded. An appropriately rated wiring box should be applied directly to the motor or as close to the motor as possible. Extend motor power leads using a servo power cable with overall shield for best performance and EMI mitigation. Follow your drive manufacturer's best practices for grounding, shielding and EMI mitigation throughout your installation.

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#### Number of Conductors/Conduit:

Motor power and brake leads should be run in one conduit. If equipped, the motor's brake leads should also run in this conduit. Motor feedback and OTL should be run in a second conduit.

SX-Series motors are constructed with the following leads:

#### Power:

M43x & M44x, 4 conductors (3+P.E.): 16 AWG

M46x, 4 conductors (3+P.E.): 12 AWG

M47x, 4 conductors (3+P.E.): 10 AWG

#### Over-Temperature Limits:

OTL Sensor Leads, 2 conductors: 18 AWG

#### Brake (if equipped):

Brake Power Leads, 2 conductors (if equipped): 18AWG

#### Feedback (by appropriate device, according to the specification below):

- [Resolver-Based Motor Feedback Cable: Elwood Document Number 036018](http://www.elwood.com/edn/036018.pdf)  
<http://www.elwood.com/edn/036018.pdf>
- [Absolute Encoder-Based Motor Feedback Cable: Elwood Document Number 040924](http://www.elwood.com/edn/040924.pdf)  
<http://www.elwood.com/edn/040924.pdf>
- [Incremental Encoder-Based Motor Feedback Cable: Elwood Document Number 033147](http://www.elwood.com/edn/033147.pdf)  
<http://www.elwood.com/edn/033147.pdf>

## 5. Where can I find drawings of SX-Series “explosion-proof” brushless servo motors?

3D models of common varieties of SX-Series motors are available for download from Elwood's website at:

[http://www.elwood.com/gettys\\_sx.shtml](http://www.elwood.com/gettys_sx.shtml)

Links to the 3D models are located in the right-hand column near the bottom of the page. They are organized in two groups motors for gas/vapor environments above motors for dust environments. Be sure to use a 3D model that is appropriate for the motor in your application. If you have any questions, please contact Elwood.

2D outline drawings and data sheets for individual SX-Series motors in .pdf format are available upon request from Elwood.

## 6. Which Rockwell Automation drives support SX-Series “explosion-proof” brushless servo motors?

Elwood is an Encompass Product Partner with Rockwell Automation and SX-Series brushless servo motors are included in Rockwell Automation's Enabled Technologies program. This means that specified drives from Rockwell Automation support SX-Series motors. The drives that support Elwood SX-Series motors are Ultra 3000, Kinetix 300, Kinetix 350, and Kinetix 6000.

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The following link includes a table showing Rockwell Automation drive families and Elwood SX-Series motors according to feedback.

[http://www.elwood.com/dSX\\_RA\\_Compatibility.pdf](http://www.elwood.com/dSX_RA_Compatibility.pdf)

#### **Kinetix 300 and Kinetix 350 – Incremental Encoder Feedback**

If you are not using a motor in the RSLogix database, setup of a motor with incremental encoder feedback on Kinetix 300 requires additional information not supplied on Elwood's motor data sheets. The required data can be found on the following document:

[http://www.elwood.com/dElwoodSX\\_MA.pdf](http://www.elwood.com/dElwoodSX_MA.pdf)

## 7. Where can connection diagrams for SX-Series to Rockwell Automation Drives be found?

Elwood and Rockwell Automation have worked together to develop the following documents (links included below) that show proper connections between Elwood SX-Series motors and Rockwell Automation Drives.

Three classes of feedback are supported, incremental encoder, resolver, and Stegmann high-resolution absolute. Select the document from the following listing appropriate to your application.

Design and installation of Elwood SX-Series motors should take into account all applicable electric code requirements, EMI mitigation measures, and grounding according to your servo amplifier manufacturer's best practices.

- [Kinetix6000 Drives with Resolver-Based SX-Series Motors](http://www.elwood.com/idSX_RA_Resolver.pdf)  
[http://www.elwood.com/idSX\\_RA\\_Resolver.pdf](http://www.elwood.com/idSX_RA_Resolver.pdf)
- [Kinetix6000/6500, Kinetix300/350, and Ultra3000 Drives with Absolute Encoder-Based SX-Series Motors](http://www.elwood.com/idSX_RA_Stegmann.pdf): [http://www.elwood.com/idSX\\_RA\\_Stegmann.pdf](http://www.elwood.com/idSX_RA_Stegmann.pdf)
- [Kinetix6000, Kinetix300/350, and Ultra3000 Drives with Incremental Encoder-Based SX-Series Motors](http://www.elwood.com/idSX_RA_Incremental.pdf): [http://www.elwood.com/idSX\\_RA\\_Incremental.pdf](http://www.elwood.com/idSX_RA_Incremental.pdf)