Application Paper **AP03902014E** Effective July 2012

Benefits of using the Eaton S811+ soft starter to improve uptime and lower maintenance costs

Why soft start a motor?

The most significant benefits of soft starting a motor come from reduced mechanical and electrical stress. This not only translates to lower maintenance costs, but significantly improves equipment uptime. There is no need to tolerate belt breakage, bearing wear, coupling damage, and disruptions caused by electrical voltage dips that occur when starting a motor with an across-the-line starter.

There should be no fear of the upgrade in technology as reduced voltage starting is not new to the industry and can be accomplished in a variety of ways, including wye-delta starting and the use of autotransformers. However, the use of the S811+ solid-state soft starter offers benefits over these methods and has become a popular retrofit option for both wye-delta starters and autotransformers.

Users continue to learn the benefits of having the wide range of programming capabilities that traditional wye-delta starting and autotransformers simply cannot provide. Programming parameters include such features as kick-start and initial torque adjustments from 0 to 100 percent torque, which allow the user to tune the soft starter to each unique application. This feature, coupled with the ability to select either a voltage ramp or current limit start, provides substantial benefits over other traditional methods of reduced voltage starting.

Popular applications that benefit from the use of the S811+ solid-state soft starter include:

- Fans—helps eliminate belts breaking
- Pumps—reduction in water hammer and subsequent piping damage
- Compressors—eliminates mechanical wear and tear associated with starting torque spikes
- Conveyors—reduces mechanical wear and shock when starting and stopping

Powering Business Worldwide

Popular retrofit

As the popularity of solid-state control continues to grow and benefit companies worldwide, the Eaton S811+ has become one of the leading products used for retrofit applications. The S811+ provides a solid-state device whose compact size easily fits the footprint area of equally rated reduced voltage retrofit options without compromising performance. Although applications do benefit from the reduced voltage starting of wye-delta configurations and autotransformers, neither of these methods eliminates the torque spike associated with energizing a motor.

Will the Eaton soft starter fit in the existing enclosure or will an entirely new enclosure assembly be required? Even though Eaton can supply a brand new enclosed control assembly, many customers choose to use their existing control enclosures. It would indeed be rare that the S811+ package would not fit in an existing enclosure. Dimensions for the five frames offered are provided in **Figures 1–5** to help with decisions about enclosure fit.

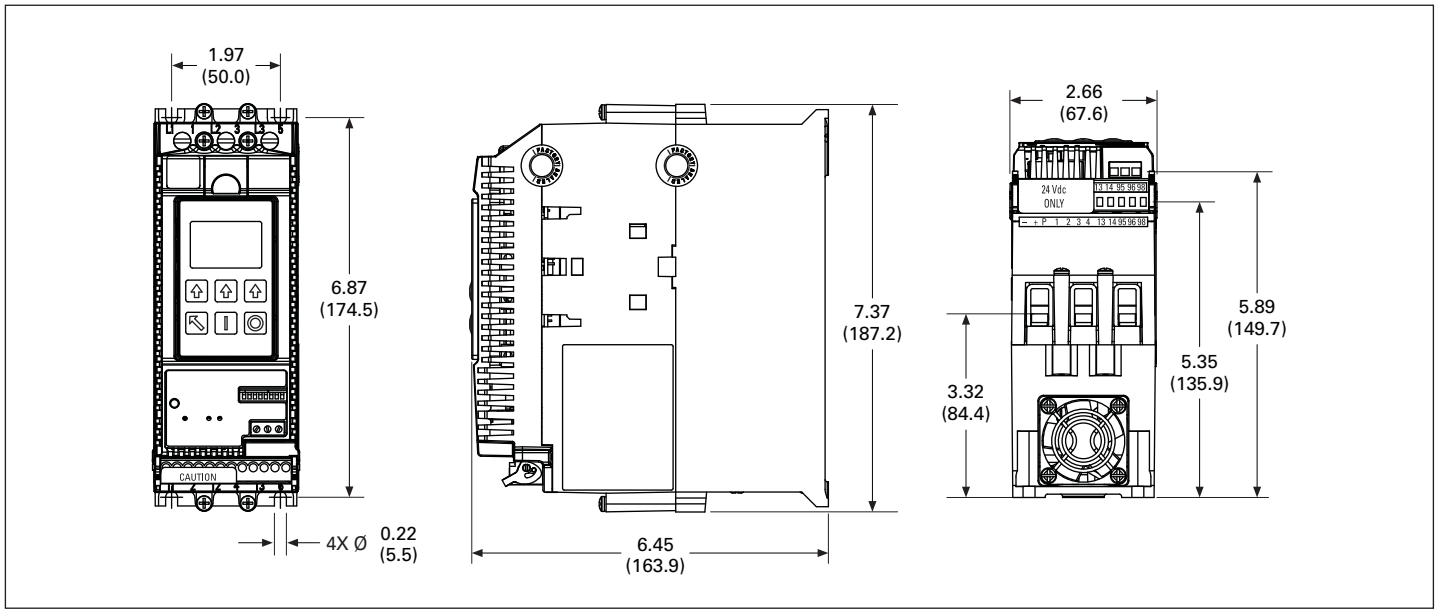

Figure 1. N-Frame (65 mm) S811+ Approximate Dimensions in Inches (mm)

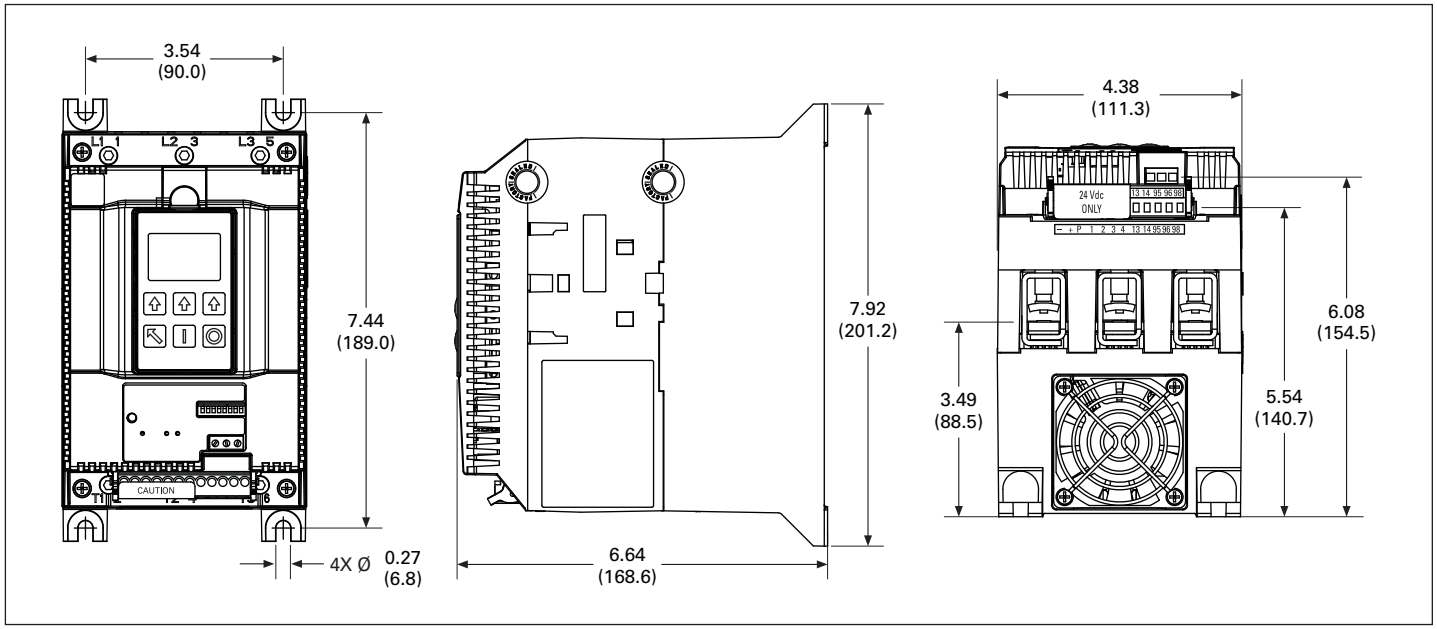

Figure 2. R-Frame (110 mm) S811+ Approximate Dimensions in Inches (mm)

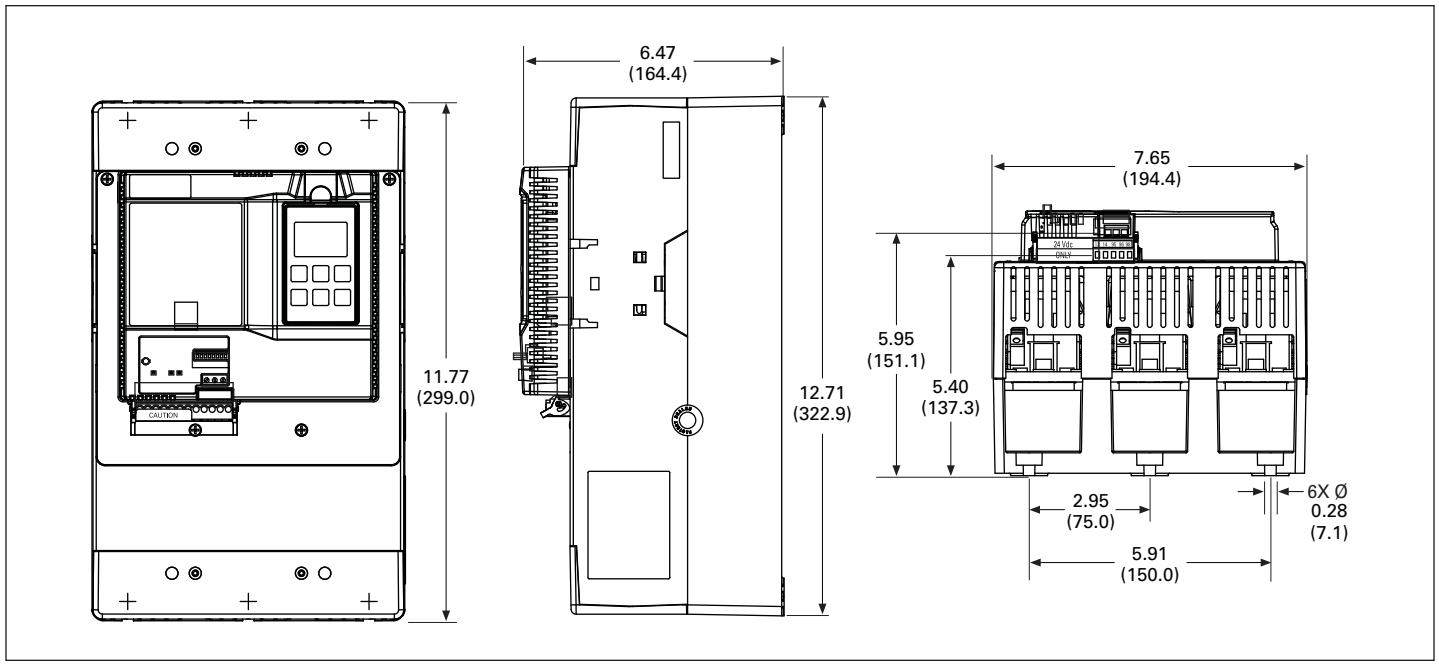

Figure 3. T-Frame (200 mm) S811+ Approximate Dimensions in Inches (mm)

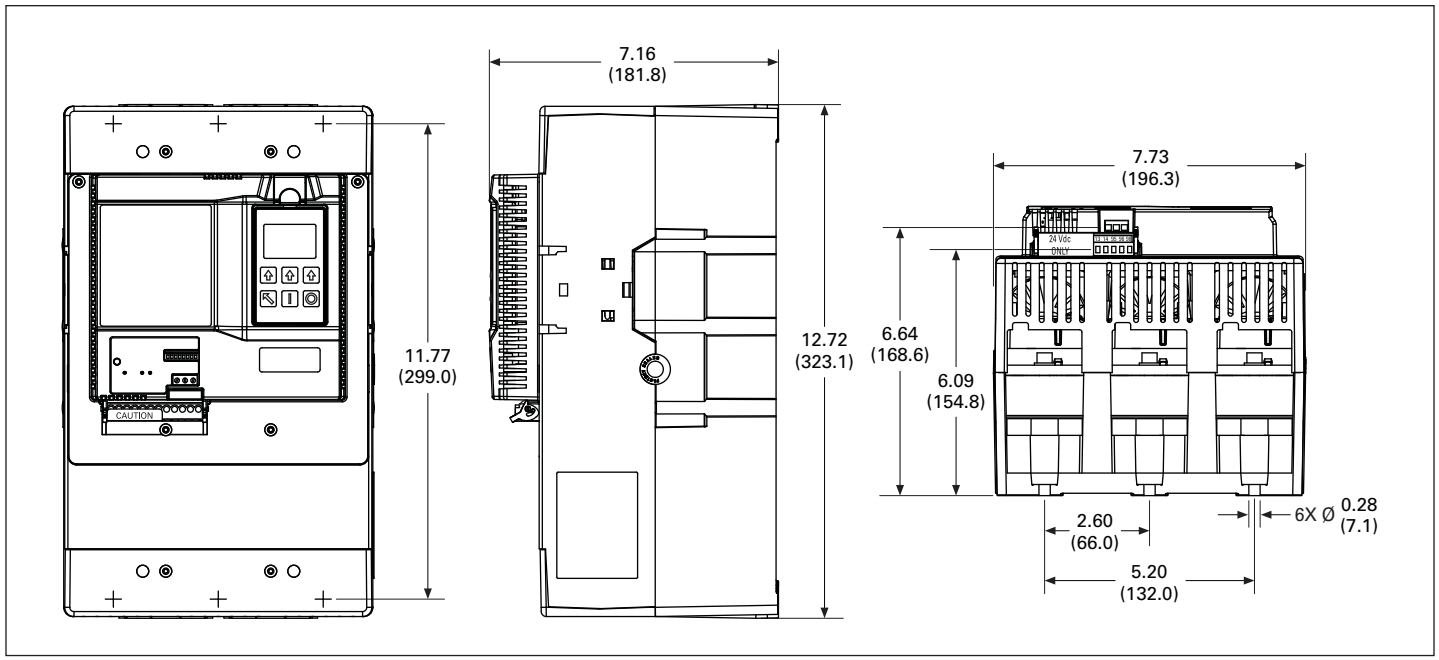

Figure 4. U-Frame (200 mm) S811+ Approximate Dimensions in Inches (mm)

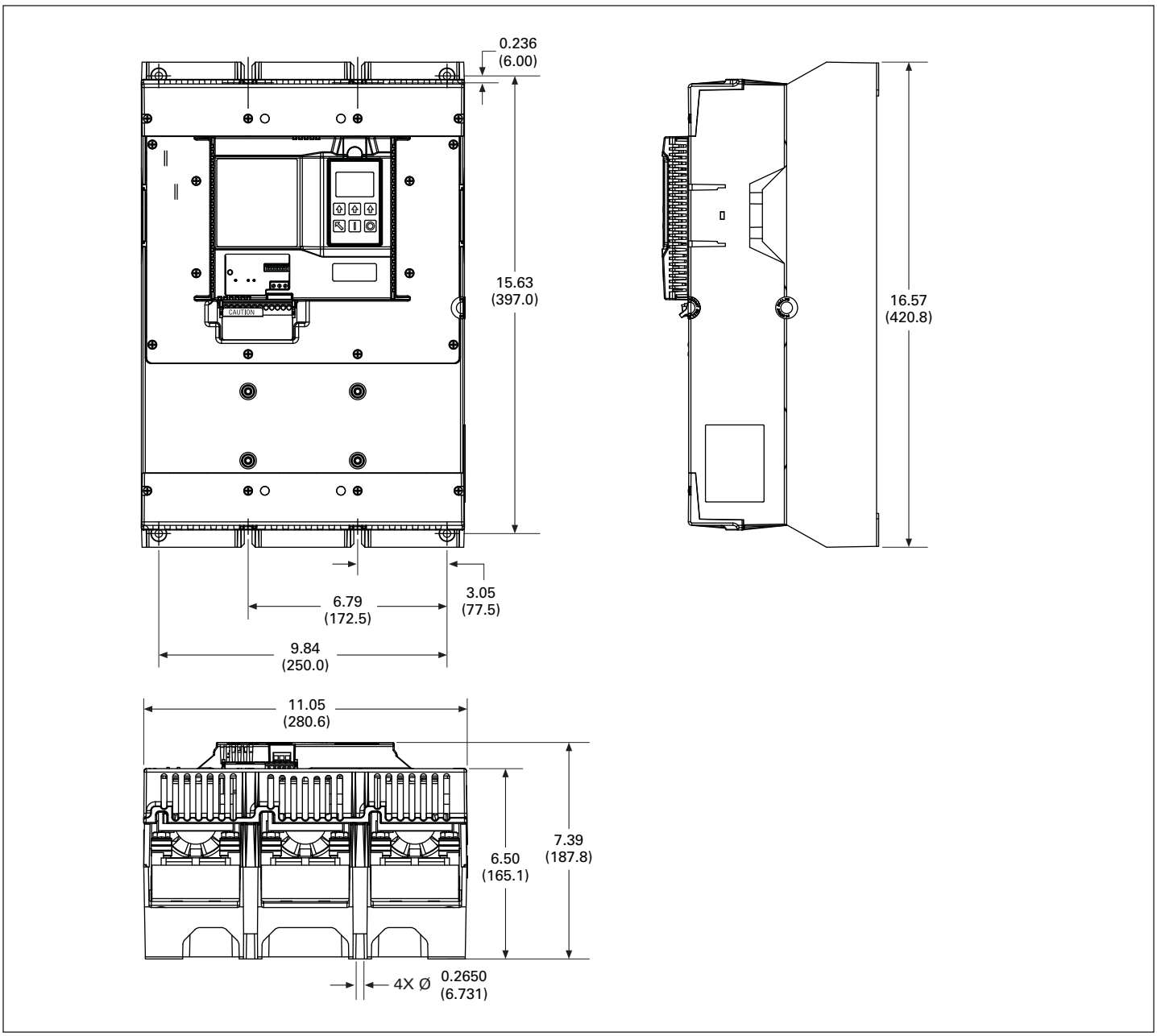

Figure 5. V-Frame (290 mm) S811+ Approximate Dimensions in Inches (mm)

Control

The control options for the S811+ range from as simple as applying and removing a single run command to the complexity of using a PLC controller or communication network. Regardless of control preference or options, the S811+ offers the personnel safety associated with 24 Vdc control, a staple of the soft starter family of products. **Figure 6** illustrates an example of a simple control scheme with several additional indication options installed in the panel.

Electrical heat loss generated by inefficient autotransformers is no longer a problem, as the S811+ uses an integrated set of bypass contacts that are designed into each unit. Once the motor is started and running with a reduced voltage start, the integrated bypass contact closes and the motor then runs across the line. This brings the already low amount of harmonics generated from the firing of the silicon controlled rectifiers (SCRs) to zero and requires less than 24 watts of power to run.

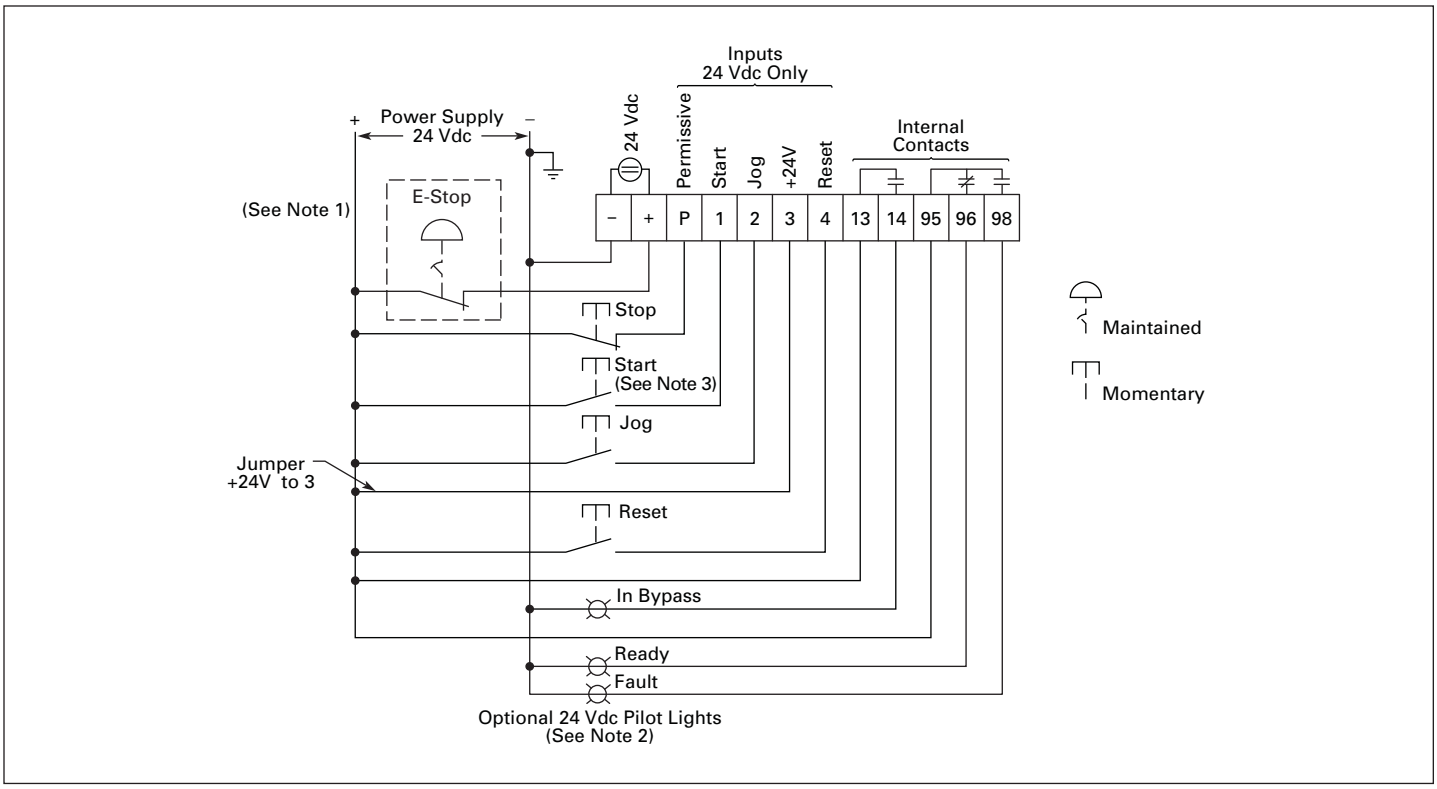

Figure 6. Basic Connection Diagram for 24 Vdc Three-Wire Pushbutton STOP/START/JOG/RESET and 24 Vdc Fault/Ready and Bypass Indication

Notes: A minimum wire of 14 AWG (2.5 mm^2) should be used between the power supply and the 24 Vdc + and – terminals.
Contact Eaton if it is desired to use a relay instead of an indicating lamp for terminals 13, 14, 95, 96, and 98.
If an isolation or reversing contactor is used upstream of the S811+, Eaton recommends that the user choose the level sensing option.

Application protections and benefits

There are many reasons for making the decision to switch to the Eaton S811+ solid-state soft starter. Several of these include:

- Maintenance costs
- Performance improvement
- Reliability
- Electrical penalty costs
- Production losses from downtime
- Flexibility
- Reduced product inventory
- Utility requirements

Additionally, the S811+ provides 28 self-check and system protections for your application. Has damage occurred to the power wiring during installation? Is the electrical integrity of the motor windings still good after that lightning storm? Was the belt or saw blade tightened too much during the last maintenance operation? Customers that use the S811+ have discovered problems like these before widespread system damage occurs. The protective features offered as standard in the S811+ improve application safety without the need for additional equipment to be added to the system. This is all accomplished through an easy-to-program digital interface, allowing the operator to decide which features best serve the specific application.

The S811+ also has the option of being ordered with specialized firmware to accommodate pumping applications for the reduction of water hammer or for motors wired to operate inside-the-delta. Please contact EatonCare at 877-ETN-CARE (386-2273) to learn more about how the S811+ can meet your specific application needs.

Table 1. FLA Current Ranges

Frame Size	FLA Current Range	Catalog Number
N (65 mm)	11–37	**S811+N37N3S**
	20–66	**S811+N66N3S**
R (110 mm)	32–105	**S811+R10N3S**
	42–135	**S811+R13N3S**
T (200 mm)	56–180	**S811+T18N3S** **S811+T18V3S**
	75–240	**S811+T24N3S** **S811+T24V3S**
	95–304	**S811+T30N3S** **S811+T30V3S**
U (200 mm)	112–360	**S811+U36N3S**
	131–420	**S811+U42N3S**
	156–500 ①	**S811+U50N3S**
V (290 mm)	112–360	**S811+V36N3S** **S811+V36V3S**
	131–420	**S811+V42N3S** **S811+V42V3S**
	156–500	**S811+V50N3S** **S811+V50V3S**
	203–650	**S811+V65N3S** **S811+V65V3S**
	225–720	**S811+V72N3S** **S811+V72V3S**
	265–850	**S811+V85N3S** **S811+V85V3S**
	310–1000	**S811+V10N3S**

① 500A rating does not have IEC certification.

Table 2. Standard Duty Ratings

	Three-Phase Motors											
	kW Rating (50 Hz)			hp Rating (60 Hz)								
				200V		230V		460V		575–690V		
Max. Current	230V	380–400V	440V	1.0 SF	1.15 SF	1.0 SF	1.15 SF	1.0 SF	1.15 SF	1.0 SF	1.15 SF	Catalog Number
Frame Size N (65 mm)												
37	10	18.5	18.5	10	10	10	10	25	20	30	30	**S811+N37N3S**
66	18.5	30	37	20	15	20	20	50	40	60	50	**S811+N66N3S**
Frame Size R (110 mm)												
105	30	55	59	30	25	40	30	75	60	100	75	**S811+R10N3S**
135	40	63	80	40	30	50	40	100	75	125	100	**S811+R13N3S**
Frame Size T (200 mm)												
180	51	90	110	60	50	60	60	150	125	150	150	**S811+T18N3S**
240	75	110	147	75	60	75	75	200	150	200	200	**S811+T24N3S**
304	90	160	185	100	75	100	100	250	200	300	250	**S811+T30N3S**
Frame Size U (200 mm)												
360	110	185	220	125	100	150	125	300	250	350	300	**S811+U36N3S**
420	129	220	257	150	125	175	150	350	300	450	350	**S811+U42N3S**
500	150	257	300	150	150	200	150	400	350	500	450	**S811+U50N3S** ①
Frame Size V (290 mm)												
360	110	185	220	125	100	150	125	300	250	350	300	**S811+V36N3S**
420	129	220	257	150	125	175	150	350	300	450	350	**S811+V42N3S**
500	150	257	300	150	150	200	150	400	350	500	450	**S811+V50N3S**
650	200	355	425	250	200	250	200	500	450	600	500	**S811+V65N3S**
720	220	400	450	—	—	300	250	600	500	700	600	**S811+V72N3S**
850	257	475	500	—	—	350	300	700	600	900	700	**S811+V85N3S**
1000	277	525	500	—	—	400	350	800	700	900	800	**S811+V10N3S** ②

① For more information on optimum performance of the 1000A Frame Size V S811+, see Appendix E of MN03902002E.

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