

Packaged Altistart 48 Soft Starts

Catalog

04

File 8638



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Packaged Altistart 48 Soft Starts Overview and General Information

Overview

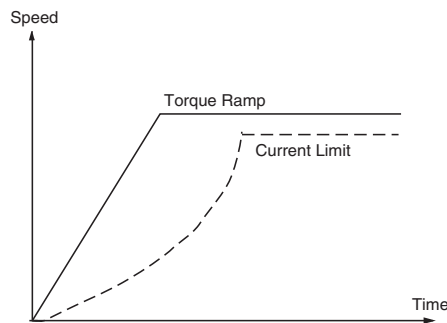
Packaged ATS48 electronic soft start motor controllers are available in either stand-alone enclosures (Class 8638 or 8639) or motor control center (Class 8998) construction. These devices provide a pre-engineered, integrated design consisting of a combination disconnect and soft start controller for reduced voltage starting and soft stopping of standard three-phase asynchronous induction (squirrel cage) motors. Packaged ATS48 soft start units integrate the latest ATS48 soft start technology into a combination package for application requirements up to 600 hp.

General Information

The ATS48 soft start is a digital controller that provides the benefits of reduced current inrush (and resulting voltage drop) and reduced mechanical shocks that can result from starting a motor across the line. A six thyristor (SCR) solid state power configuration provides smooth acceleration and deceleration control of three-phase squirrel cage motors. The ATS48 soft start uses a patented Torque Control System (TCS) technology to control motor performance with motor torque rather than with simple voltage or current based control (see the figures below). Advanced control algorithms are incorporated to ensure smooth rotation throughout the starting ramp without mechanical instability at the end of starting. The torque control provides accurate and repeatable acceleration and deceleration. This feature allows for linear speed ramp without tachometer feedback and reduces the temperature rise of the motor.



Size E Enc (Side View).tif



Torque Ramp vs. Current Limit Starting

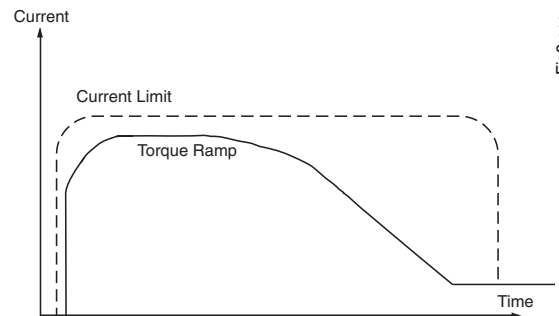


Fig3.eps

Packaged Altistart 48 Soft Starts

Overview and General Information

Benefits of ATS48 Soft Starts

- Reduced torque during start:
 - Prevents damage to material in process
 - Can increase the life of machines and reduce down time
- Reduced current peaks on the supply during starting:
 - Reduces plant capacity requirements
 - Reduces voltage sag on installations with limited capacity
 - Eliminates side effects on other equipment driven from a weak supply
- Smooth acceleration and deceleration independent of fluctuations in motor load:
 - Ideally suited for most fans, centrifugal pumps, or other variable torque loads
 - Can eliminate water hammer even on difficult pumping applications
- Advanced protection for the motor and the installation, including:
 - Selectable overload protection class
 - Overload pre-alarm
 - Phase loss and reversal protection
 - Stall protection during start
 - Protection from material jams while running
 - Underload detection

Starting and Stopping

Four types of starting are available:

- Torque Control System (TCS) soft start—adjustable from 1 to 60 seconds
- TCS with boost—adjustable from 50 to 100% of mains voltage
- Current limit—adjustable from 150 to 500% of controller rating
- Voltage ramping

Three types of stopping are available:

- Freewheel or coast to stop
- TCS soft stop—adjustable from 1 to 60 seconds
- InTele™ Braking—adjustable from 50 to 100%

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Protective Features

- Motor thermal overload protection—choice of Class 2, 10, 10A, 15, 20, 25, or 30
- Soft Start thermal protection
- Motor phase loss protection
- Line supply failure
- Overcurrent fault
- Locked rotor fault
- Line frequency outside limits of $\pm 5\%$ or $\pm 20\%$ —EGSA compliance with Class 3 application (droop operation) generators
- Selectable protection, including:
 - Phase reversal
 - Stall and jam
 - Thermal overload pre-alarm
 - Current threshold alarm
 - Underload fault

Monitoring and Indication

Door mounted keypad

- Displays setup parameters and fault codes for the previous five faults
- Factory preset for the most common application requirements
- Security to avoid accidental parameter modifications is provided by dip switches on the back of the keypad, which must be adjusted to provide access to 3 programming levels.

Real-time indication via the digital keypad of:

- Motor current
- Load torque
- Motor thermal state
- Power factor
- Fault status

Three logic outputs:

- Motor thermal overload or indication of motor current present
- Current threshold alarm
- Motor underload alarm

One analog output for 4 to 20 or 0 to 20 mA indication of motor current torque, thermal state, active power, or power factor.

Two logic inputs, which are configurable for force to freewheel, thermal overload reset, or indication of external fault.

Packaged Altistart 48 Soft Starts Overview and General Information

Application

Select the ATS48 soft start on the basis of three main criteria:

- AC Mains voltage supply:
 - Three-phase AC voltage: 208, 240, 480, or 600 V
- The power and the nominal current (motor FLA) indicated on the motor nameplate
- The type of application and the operating cycle. To simplify selection, the applications are categorized as 2 types:
 - Standard duty
 - Severe duty

Standard or severe duty applications define the limiting values of the current and the duty cycle ratings.

Standard Duty Application

In standard duty applications, the ATS48 soft start provides:

- Starting at 400% of nominal motor current (I_n) for 23 seconds or at 300% of nominal motor current (I_n) for 46 seconds from a cold state
- Starting at 300% of nominal motor current (I_n) for 23 seconds or at 400% of nominal motor current (I_n) for 12 seconds with a load factor of 50% and 10 starts per hour or an equivalent thermal cycling

The motor thermal protection conforms to Class 10 overload protection

Example: Centrifugal pump. See other examples in the Application Types table on page 7.

Severe Duty Application

In severe duty applications, the ATS48 soft start is provides:

- Starting at 400% of nominal motor current (I_n) for 48 seconds or at 300% of nominal motor current (I_n) for 90 seconds from a cold state
- Starting at 400% of nominal motor current (I_n) for 25 seconds with a load factor of 50% and 5 starts per hour or an equivalent thermal cycling

The motor thermal protection conforms to Class 20 overload protection.

Example: Grinder. See other examples in the Application Types table on page 7.

Packaged Altistart 48 Soft Starts Overview and General Information

Application Types

Depending on the type of machine, the applications are categorized as standard or severe duty based on the starting characteristics. Examples are given in the table below.

Type of Machine	Application	Functions Performed by the ATS48 Soft Start	Starting Current (% In)	Starting Time (s)
Centrifugal pump	Standard	Deceleration (reduction in pressure surges); Protection against underloads or inversion of the phase rotation direction	300	5 to 15
Piston pump	Standard	Control of running dry and direction of rotation of the pump	350	5 to 10
Fan	Standard Severe if > 30 s	Detection of overloads caused by clogging or underloads (motor fan transmission broken); Braking torque on stopping	300	10 to 40
Cold compressor	Standard	Protection, even for special motors	300	5 to 10
Screw compressor	Standard	Protection against inversion of direction of phase rotation; Contact for automatic draining on stopping	300	3 to 20
Centrifugal compressor	Standard Severe if > 30 s	Protection against inversion of direction of phase rotation; Contact for automatic emptying on stopping	350	10 to 40
Piston compressor	Standard	Protection against inversion of direction of phase rotation; Contact for automatic emptying on stopping	350	5 to 10
Conveyor, transporter	Standard	Overload control for detecting faults or underload control for detecting breaks	300	3 to 10
Lifting screw	Standard	Overload control for detecting hard spots or underload control for detecting breaks	300	3 to 10
Drag lift	Standard	Overload control for detecting jamming or underload control for detecting breaks	400	2 to 10
Lift	Standard	Overload control for detecting jamming or underload control for detecting breaks; Constant starting with variable load	350	5 to 10
Circular saw, band saw	Standard Severe if > 30 s	Braking for fast stop	300	10 to 60
Pulper, butchery knife	Severe	Torque control on starting	400	3 to 10
Agitator	Standard	The current display indicates the density of the product	350	5 to 20
Mixer	Standard	The current display indicates the density of the product	350	5 to 10
Grinder	Severe	Braking to limit vibrations during stopping, overload control to detect jamming	450	5 to 60
Crusher	Severe	Braking to limit vibrations during stopping, overload control to detect jamming	400	10 to 40
Refiner	Standard	Torque control on starting and stopping	300	5 to 30
Press	Severe	Braking to increase the number of cycles	400	20 to 60

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Contact your Schneider Electric field sales office for additional application information requiring:

- Two-speed or wye-delta motors
The ATS48 soft start can operate with a 2-speed motor. A motor demagnetizing period must elapse before changing from low speed to high speed in order to avoid antiphase between the line supply and the motor, which would generate very high currents.
- Motors other than NEMA Design B
- High-efficiency motors
- Low-slip motors
- Low RPM motors
- Power factor correction capacitors
Do not connect power factor correction capacitors to the terminals of a motor controlled by an ATS48 soft start. The power factor capacitors must be controlled and connected to a line side contactor sequenced by the ATS48 soft start at the end of starting.
- Soft start oversizing of more than 50%
- Multi-motor applications
Motors may be connected in parallel provided that the power limit of the soft start is not exceeded (the sum of the motor currents must not exceed the nominal current of the soft start selected, depending on the type of application). Individual thermal protection and local disconnect is required for each motor.
- Non-standard trip characteristics
- Modifications not listed in this catalog
- Horsepower ratings greater than those listed in this catalog
- Long motor cable lengths
Very long motor cables cause voltage drops due to the impedance of the cable. If the voltage drop is significant, it could affect the current consumption and the available torque. This criterion must be taken into account when selecting the motor and the soft start.
- Miscellaneous application precautions
Do not use the ATS48 soft start upstream of loads other than motors (for example, transformer and resistance type loads).

Packaged Altistart 48 Soft Starts Enclosed 48 Soft Start Motor Controllers

Enclosed 48 Soft Start Motor Controllers

Enclosed ATS48 soft starts (Enclosed 48) are available from 11 to 604 A in Type 1, 12, and 3R enclosures. The Enclosed 48 Soft Start provides soft starting (reduced voltage) and stopping with deceleration control, and provides machine and motor protection of standard NEMA Design B squirrel cage asynchronous motors in the following ranges:

- 3 – 200 HP, 208 V
- 5 – 250 HP, 230 V
- 10 – 500 HP, 460 V
- 15 – 600 HP, 575 V

Enclosed 48 Catalog Number Identification

Use the following grid for interpreting Enclosed 48 Soft Start catalog numbers:

Class **8639** Type **48UKA4N** + **C06, A07, etc.**

Combination Device

8638 = Fusible Disconnect
8639 = Circuit Breaker

Soft Start Device

48U = Enclosed ATS48 Soft Start

Horsepower Rating

A = 3 hp	J = 40 hp	S = 250 hp
B = 5 hp	K = 50 hp	T = 300 hp
C = 7.5 hp	L = 60 hp	U = 350 hp
D = 10 hp	M = 75 hp	W = 400 hp
E = 15 hp	N = 100 hp	X = 500 hp
F = 20 hp	P = 125 hp	Z = 600 hp
G = 25 hp	Q = 150 hp	
H = 30 hp	R = 200 hp	

Factory Modifications (MODS) See page 12.

C06 = Hand-Off-Auto selector switch
A07 = Run (Red) and Off (Green) lights

Power Circuit Type

N = Non-Reversing with Isolation Contactor
R = Reversing with Isolation Contactor
S = Shunt Trip Coil

Voltage Code

2 = 208 V, 60 Hz
3 = 230 V, 60 Hz
4 = 460 V, 60 Hz
5 = 575 V, 60 Hz

Enclosure Environmental Rating

G = Type 1
A = Type 12
H = Type 3R

Catalog No. Identification.eps



Packaged Altistart 48 Soft Starts Enclosed 48 Soft Start Motor Controllers

Technical Specifications

Environment	Degree of protection	<ul style="list-style-type: none"> Type 1: Indoor use primarily to provide a degree of protection against limited amounts of falling dirt. Type 12: Indoor use primarily to provide a degree of protection against circulating dust, falling dirt, and dripping noncorrosive liquids. Type 3R: Outdoor use primarily to provide a degree of protection against rain, sleet, and damage from ice formation. Enclosures are painted ANSI #49.
	Conformity to standards	UL Listed per UL508; CSA Certified per CSA 22.2 No. 14. Immunity to radioelectrical interference: conforms to IEC 60801-3.
	Operational test vibration	Conforms to IEC 60068-2-6, 1.5 mm peak from 2 to 13 Hz, 1 gn from 13 to 200 Hz (ATS48 soft starts).
	Seismic qualification	Available as an optional feature (MOD Y10). Provides a qualification label and hardware qualified to seismic rating AC156 harmonized with NFPA 5000 and IBC2000 standards. Applicable to floor mount enclosures Size D and E only.
	Transit test to shock	Conforms to the National Safe Transit Association and International Safe Transit Association test for packages weighing 100 lbs (45 kg) and over.
	Ambient air temperature	<ul style="list-style-type: none"> Operation: Ambient conditions in installed area from 0 to 40 °C, 32 to 104 °F (Type 1 and 12); 0 to 50 °C, 32 to 122 °F (Type 3R) Storage: -25 to +70 °C, -13 to 158 °F.
	Maximum ambient pollution	Conforms to IEC 60664-1, Pollution Degree 3
	Maximum relative humidity	95% without condensation or dripping water conforming to IEC 60068-2-3
	Maximum operating altitude	1000 m (3280 ft.), derate by 2.2% for each additional 100 m (328 ft) up to 3000 m (9842 ft) maximum.
Characteristics	3-phase supply voltage	208 Vac ± 10%; 230 Vac ± 15%; 460 Vac ± 15%; 575 Vac ± 10%
	Control voltage	115 Vac [Control Power Transformer (CPT) included as standard]
	Frequency	50/60 Hz
	Rated current	Full load current (FLA) per NFPA 70 / NEC Table 430-150.
	Motor power	3 to 600 hp
	Motor voltage	208, 220, 230, 240, 460, 480, 575, 600 V
	Duty cycle	<ul style="list-style-type: none"> Starting at 400% of I_n for 23 s, or 300% of I_n for 46 s, from a cold state Starting at 400% of I_n for 12 s, or 300% of I_n for 23 s, with a load factor of 50% and 10 starts per hour or an equivalent thermal cycling For additional information, refer to "Application and Protection" in bulletin 30072-450-61_.
Operation	Methods of starting:	
	Torque ramp	Adjustable from 1 to 60 s by keypad
	Current limitation	Adjustable from 150% to 500% of controller-rated current by keypad
Booster start-up pulse	Full voltage starting for 5 cycles of 50 to 100% mains voltage, selectable by keypad.	
Methods of stopping:		
Freewheel	Coast to stop on stop command	
Torque deceleration ramp	Adjustable from 1 to 60 s by keypad	
InTele™ Braking	Selectable by keypad. Contact Schneider Electric Technical Support for application assistance.	
Status and diagnostics:	Digital display of motor and controller status, including: <ul style="list-style-type: none"> Ready/Run/Fault Status Motor Current Motor Torque Motor Thermal State Power Factor 	
Protection	Motor:	
	Thermal overload	With Full Voltage Bypass: A bimetallic or solid state Class 20 (MOD A10) overload relay is integral to the ATS48 soft starts. Without Full Voltage Bypass: A solid state thermal overload is integral to the ATS48 soft start. Overload class is selectable as 10, 20, or 30 via keypad. Range is 50% to 100% of ATS48 soft start rated current.
	Shunt-trip disconnect	Removes all power from the controller cabinet when the ATS48 soft start detects a fault condition.
	Isolation contactor	Removes supply power from the Silicon Control Rectifier (SCR) power circuit and motor when the motor is not running or when the ATS48 soft starts detects a fault condition.
	Controller:	
	Short circuit current ratings	See the table on page 11.
Overcurrent protection device	An overcurrent protection device (OCPD) provides Type 1 coordination to the short-circuit current withstand ratings.	
Shorting contactor	A standard shorting contactor reduces temperature rise within the enclosure by eliminating the watts loss of the SCRs. Control of the contactor allows all forms of stopping.	
Thermal switch	Controllers rated for 17–62 A have one thermal switch to protect against overheating. Controllers rated 72 A and greater have 2 thermal switches; one controls the fan, the other protects against overheating.	

Packaged Altistart 48 Soft Starts Enclosed 48 Soft Start Motor Controllers

Enclosed 48 Features

- Class 8638 Fusible Disconnect version with provisions for Class J or L fuses. Fuses are not installed at the factory.
- Class 8639 Circuit Breaker version with Mag-Gard or Thermal Magnetic circuit breaker as OCPD.
- Three power circuit configurations: Shunt Trip, Non-Reversing, and Reversing.
- Industrial rated flange disconnect operating handle and mechanism.
- Shorting contactors (AC1 Duty) provided on all Enclosed 48 soft starts.
- Input Isolation Contactor option.
- Full Voltage Bypass (AC3 Duty) option.
- Transient suppression modules on all contactors.
- Agency listing to UL508 Industrial Control Equipment. cUL and/or CSA labels are available as an option.
- Coordinated short circuit ratings:

Enclosure Size	Horsepower Rating @				8638 Fusible Disconnect	8639 Circuit Breaker
	208 V	230 V	460 V	575 V		
A to C	3–50	5–60	10–125	15–150	100 k	25 k
D	60–100	75–125	150–250	200–300	100 k	30 k
E	125–200	150–250	300–500	350–600	65 k	30 k

- Type 1, 12, or 3R enclosure environmental ratings.
- 22 mm LED long life pilot light clusters with option for push-to-test configurations.
- 120 Vac control power transformers, with or without an additional 150 VA for customer use.
- Top and bottom conduit knockouts on wall-mounted enclosures
- Removable conduit entry plates on floor mounted enclosures.
- Cabinet component identification.
- ANSI #49 gray enclosure paint.
- Door mounted keypad on Type 1 and 12 units.
- Wire marking identification.
- Order-specific drawings.

Product Selection Criteria

The Enclosed 48 soft start must be selected based on three main criteria:

- AC mains voltage supply (distribution voltage):
 - Three-phase AC voltage: 208, 240, 480 or 600 V.
- The power and the nominal motor current (FLA) indicated on the motor nameplate.
- The type of application and the operating cycle.
To simplify selection, applications are categorized as either standard duty or severe duty applications. Refer to the table on page 7. Standard or severe duty applications define the limiting values of the current and the duty cycle ratings. **If severe duty is required, select the next higher horsepower device.**

The Enclosed 48 combination soft starts can be configured with the pre-engineered features and functions described on pages 12–15. Orders for Factory Modifications (MODS) identified as “custom engineered options” have extended lead times and are handled by a factory order engineer.

Packaged Altistart 48 Soft Starts

Enclosed 48 Soft Start Motor Controllers

Power Circuit Descriptions

Power Circuit N - Non-Reversing with Isolation Contactor

An isolation contactor ahead of the soft start automatically disconnects the motor from the AC line in the event of a fault. In addition, the isolation contactor is coordinated to open when the motor is running. This provides protection from voltage transients when the electronics are most susceptible to damage. The isolation contactor operation is coordinated via the soft start R1 relay in isolation contactor control mode. The control scheme and contactor sequencing maintains the control power but removes the line supply power from the soft start after a fault or normal stop. Not available with shunt trip option. Required with Full Voltage Bypass option.

Power Circuit R - Reversing with Isolation Contactor

The reversing combination soft start is configured for forward and reverse operation through a reversing contactor and appropriate logic control. The reversing contactor also provides isolation for the motor from the line supply after a stop command (and deceleration period, if selected) or in the event of a fault. Control of the forward and reverse contactors are via time delay relays (time set for 2 seconds) and the R1 fault relay in fault configuration. Not available with NEMA Contactors or Full Voltage Bypass.

Power Circuit S - Shunt Trip Coil

If a fault is detected, a shunt trip coil on the disconnect means removes all power on the load side of the disconnect. The disconnect must be reset before restarting is permitted after all fault conditions. The shunt trip function is coordinated via a time delay relay (time set for 2 seconds) signaled from the R1 relay in fault configuration. Shunt trip coils are standard for MCC and for Enclosed Option S, and available on both circuit breaker and molded case switch versions. Not available with the Input Isolation Contactor option (Power Circuit N).

Control Options

Mod	Start/Stop push-buttons
A06	Provides a black start and a red stop push button (3-wire control scheme). <u>Rules:</u> Not available on Power Circuit R (Reversing).
Mod	Forward-Off-Reverse selector switch
B06	Provides three-position selector switch to select between forward, off, and reverse (2-wire control scheme). <u>Rules:</u> Available for Power Circuit R (Reversing) configurations only.
Mod	Hand-Off-Auto selector switch
C06	Provides a three-position selector switch (2-wire control scheme). <u>Rules:</u> Not available on Power Circuit R (Reversing).
Mod	Stop-Run selector switch
D06	Provides a two-position selector switch. <u>Rules:</u> Not available on Power Circuit R (Reversing).
Mod	Hand-Auto selector switch and Start/Stop push-buttons
E06	Provides a two-position selector switch and start/stop push buttons (3-wire control scheme). <u>Rules:</u> Not available on Power Circuit R (Reversing).

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Pilot Light Cluster Options

Mod	Pilot Light Cluster #1
A07	Provides red "RUN" (ON) and green "OFF" pilot lights for status annunciation.
Mod	Pilot Light Cluster #2
B07	Provides red "RUN" (push-to-test) and green "OFF" (push-to-test) pilot lights for status annunciation.
Mod	Pilot Light Cluster #3
C07	Provides red "RUN" (ON), green "OFF", and yellow "FAULT" pilot lights for status annunciation. <i>Rules:</i> Not available on Power Circuit S (Shunt Trip).
Mod	Pilot Light Cluster #4
D07	Provides red "RUN" (ON) (push-to-test), green "OFF" (push-to-test), and yellow "FAULT" (push-to-reset) pilot lights for status annunciation. <i>Rules:</i> Not available with Power Circuit S (Shunt Trip).

Meter Display Options

Mod	Ammeter
A08	Provides a single-phase ammeter fed from the ATS48 soft start analog output. Dial is in percent of device rated current. <i>Rules:</i> Not available on Type 3R Enclosed.
Mod	Elapsed Time Meter
B08	Provides a seven-digit analog, non-resettable elapsed run time meter. <i>Rules:</i> Not available on Type 3R Enclosed.

Communications / Gateway Options

Factory installed communication options are available as a custom engineered option. The communication options use the RJ45 communications port for control and annunciation of the soft start in link mode.

Mod	ModBus®
A09	Provides Modbus communications (native protocol)
Mod	ModBus Plus
B09	Provides Modbus Plus communications protocol.
Mod	Ethernet
C09	Provides Ethernet gateway communications protocol.
Mod	DeviceNet™
D09	Provides DeviceNet™ gateway communications protocol.

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Miscellaneous Options

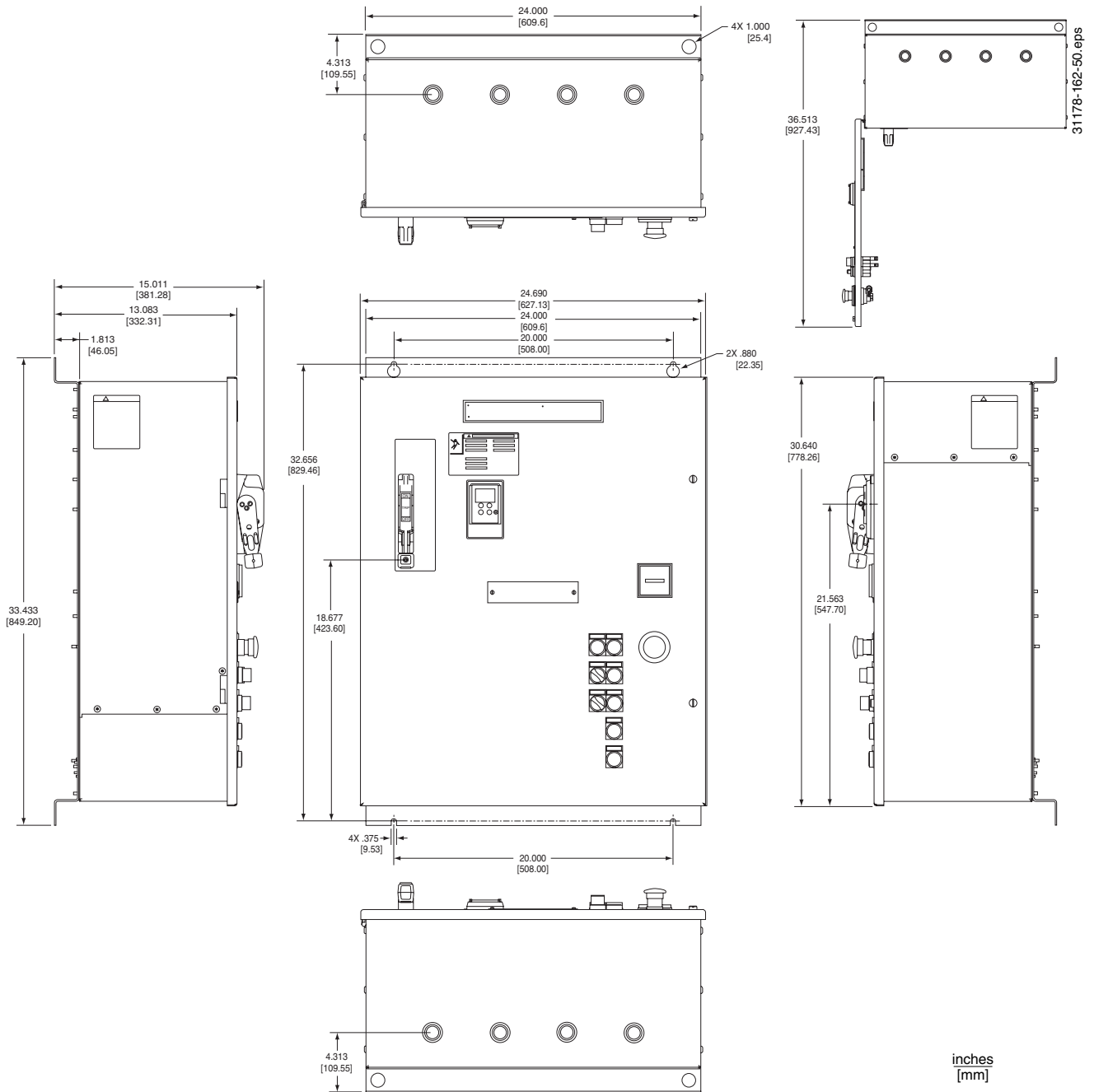
Mod	Full Voltage Bypass
A10	Provides an AC3 duty rated bypass/shorting contactor, normal/bypass selector switch, Class 20 bi-metal motor overload relay or SSOLR, and door mounted overload relay reset push-button for across-the-line starting capability. <u>Rules:</u> Only available for Power Circuit N (Non-Reversing). Not available with Power Circuit S (Shunt Trip) SCR fault isolation scheme.
Mod	150 VA additional control power capacity
B10	Provides 150 VA additional control power capacity for customer use.
Mod	Power Up ON delay (start relay)
C10	Provides an electronic time delay relay adjustable from 0.1 to 60 seconds. The relay is pre-wired to inhibit start for a customer-defined delay time upon power-up of control power circuit. <u>Rules:</u> Requires Power Circuit S (Shunt Trip). Only available on 2-wire control circuits.
Mod	Emergency Stop push-button
D10	Provides a push-button for immediate removal of all power. <u>Rules:</u> Requires Power Circuit S (Shunt Trip). Only available on 2-wire control circuits.
Mod	“cUL” or “CSA” Label
E10	Provides a Canadian Underwriters Laboratories label or a Canadian Standards Association label when required by local code requirements.
Mod	Auxiliary contacts for run mode
F10	Provides (1) Form 'C' contacts rated 5 A @ 120 Vac (8501 Type R relay or equivalent) wired to the terminal blocks for customer use. Contacts change state when the soft start is sending current to the motor. Controlled by the R3 relay programmed for “rnl”.
Mod	Auxiliary contacts for full voltage bypass run mode
G10	Provides (1) Form 'C' contacts rated 5 A @ 120 Vac (8501 Type R relay or equivalent) wired to the terminal blocks for customer use. Contacts change state when the motor is operated across the line with full voltage bypass soft start. <u>Rules:</u> MOD A10 (Full Voltage Bypass) must be selected. Must use Power Circuit N or R (line isolation contactor combination). Not compatible with Power Circuit S (Shunt Trip).
Mod	Auxiliary contacts for auto mode
H10	Provides an auxiliary soft start mode (auto) contact that energizes a relay with (1) Form 'C' contacts rated 5 A @ 120 Vac (8501 Type R relay or equivalent) wired to the terminal blocks for customer use. <u>Rules:</u> MOD C06 (Hand-Off-Auto selector switch) or E06 (Hand-Auto selector switch) must be specified.
Mod	Auxiliary contacts for fault mode
J10	Provides an auxiliary soft start mode (auto) contact that energizes a relay with (1) Form 'C' contacts rated 5 A @ 120 Vac (8501 Type R relay or equivalent) wired to the terminal blocks for customer use.
Mod	Motor space heater provisions (custom engineered option)
K10	Provides control circuit contacts, 120 V, 150–500 W supply and fusing, wired to the terminals for customer use.
Mod	ID engraved nameplates
L10	Provides a lamacoid nameplate, engraved with equipment designation.
Mod	Spare terminal blocks
M10	Provides up to 10 spare terminal blocks 'unwired' for customer use. Since Phoenix style terminal blocks are used, extra terminal points are provided as standard. 20 terminal points are standard for all control wiring (including any additional customer spare terminal points).
Mod	Permanent wire markers
P10	Provides permanent sleeve type wire markers on control wiring assemblies.

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Mod	ANSI #61 painted enclosure (custom engineered option)
Q10	Provides the option of standard ANSI #61 paint instead of ANSI #49 paint.
Mod	MOV / Surge arrester (custom engineered option)
R10	Provides supplementary MOV protection using a Class 6671 SDSA3650 Surgebreaker™ Secondary Surge Arrester hard-wired and factory mounted.
Mod	Dual motor overloads and branch circuit protection (custom engineered option)
S10	Provides dual-rated motor overload relays, rated one-half the horsepower of the selected soft start. Motor branch short circuit protection is provided per NEC. The maximum total current rating of the combined motors must not exceed the continuous current rating of the soft start package. <u>Rules:</u> Available on Class 8639 Circuit Breaker Disconnect configurations only.
Mod	Omit door mounted keypad display
U10	Omits the keypad display. The keypad display is not provided in any form except with the Type 3R construction. In that case, the keypad display is provided inside the controller cabinet as a kit. On all other models, the keypad on the ATS48 soft start can be used for programming and commissioning. <u>Rules:</u> Required for Type 3R enclosures.
Mod	NEMA style contactors (custom engineered option)
W10	Provides NEMA rated contactors instead of AC3 rated IEC TeSys or F-line contactors. <u>Rules:</u> Not available with Power Circuit R (Reversing) or MOD A10 (Full Voltage Bypass).
Mod	50 Degrees C operation
X10	Provides a high ambient equipment rating above 40 xC (104 xF) to a maximum of 50 xC (122 xF) without de-rating. <u>Rules:</u> Standard on Type 3R enclosures.
Mod	Seismic Qualification label
Y10	Provides a self-certified identification label with compliance to 2000 IBC, NFPA 5000, 2001 CBC, 1997 UBC, 1999 NBC, 1999SBC, and ASCE-7 02 seismic qualification/certification. Enclosures contain additional bracing as defined by the seismic qualification/certification criteria. <u>Rules:</u> Not available for Enclosure Sizes A – C (wall mounted enclosures).

Packaged Altistart 48 Soft Starts Wall Mount Unit Dimensions

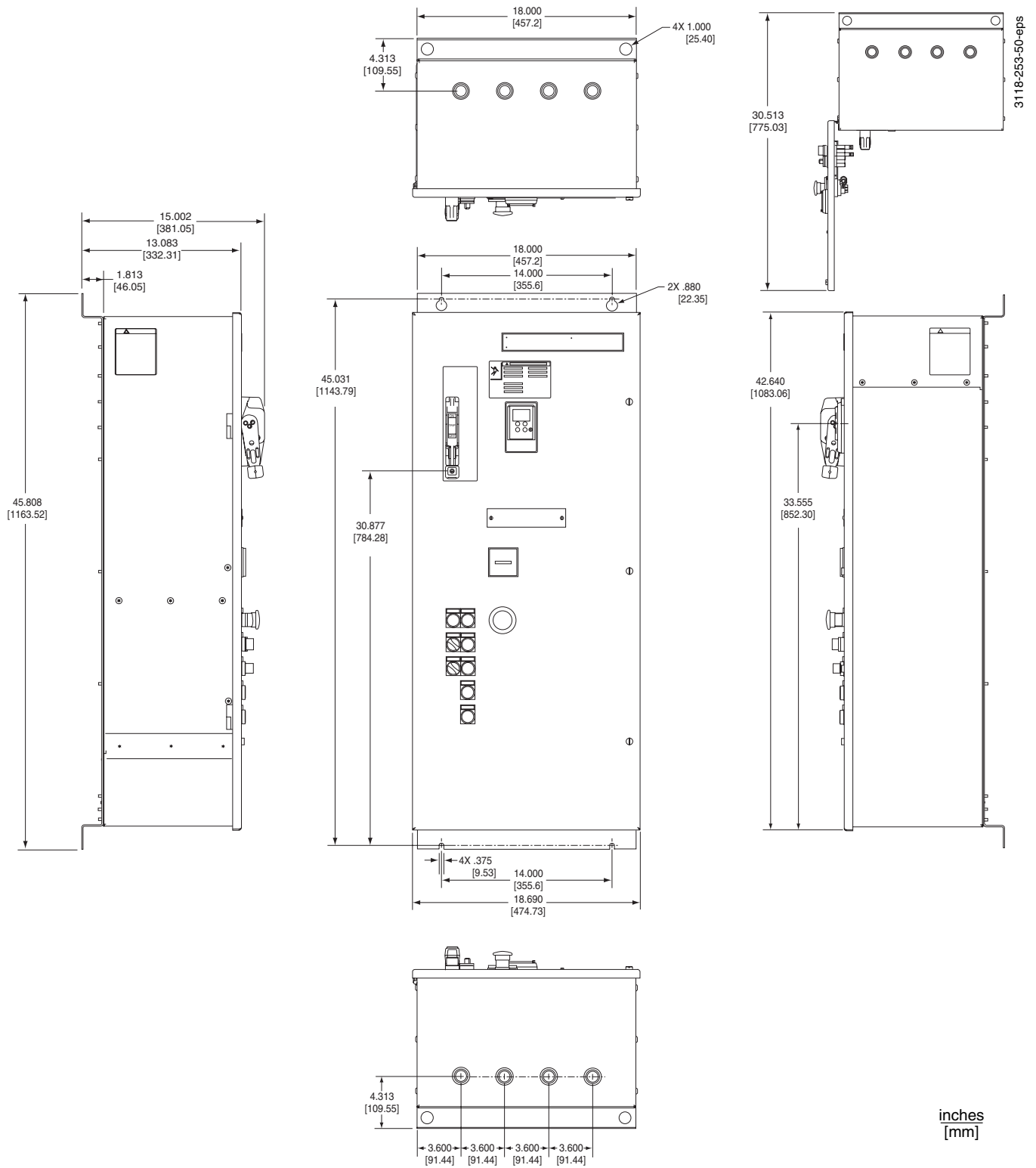
Wall Mount Unit Dimensions



inches
[mm]

**Size A Enclosure, Wall Mount, Type 1, 12, and 3R, 3–5 hp @ 208 V, 5–15 hp @ 230 V,
10–30 hp @ 480 V, and 15–40 hp @ 575 V**

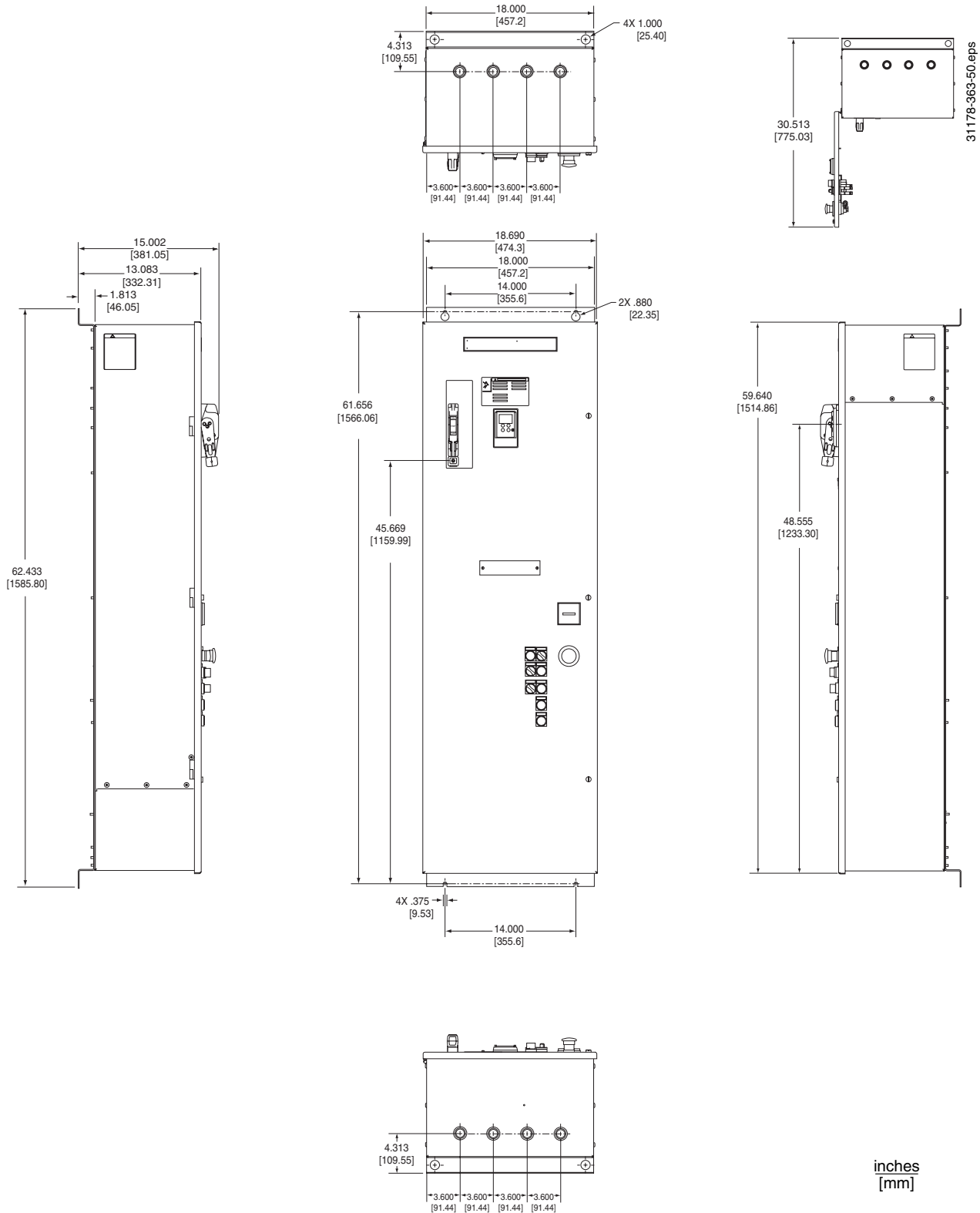
Packaged Altistart 48 Soft Starts Wall Mount Unit Dimensions



inches
[mm]

**Size B Enclosure, Wall Mount, Type 1, 12, and 3R, 15–30 hp @ 208 V, 20–40 hp @ 230 V,
40–75 hp @ 480 V, and 50–100 hp @ 575 V**

Packaged Altistart 48 Soft Starts Wall Mount Unit Dimensions

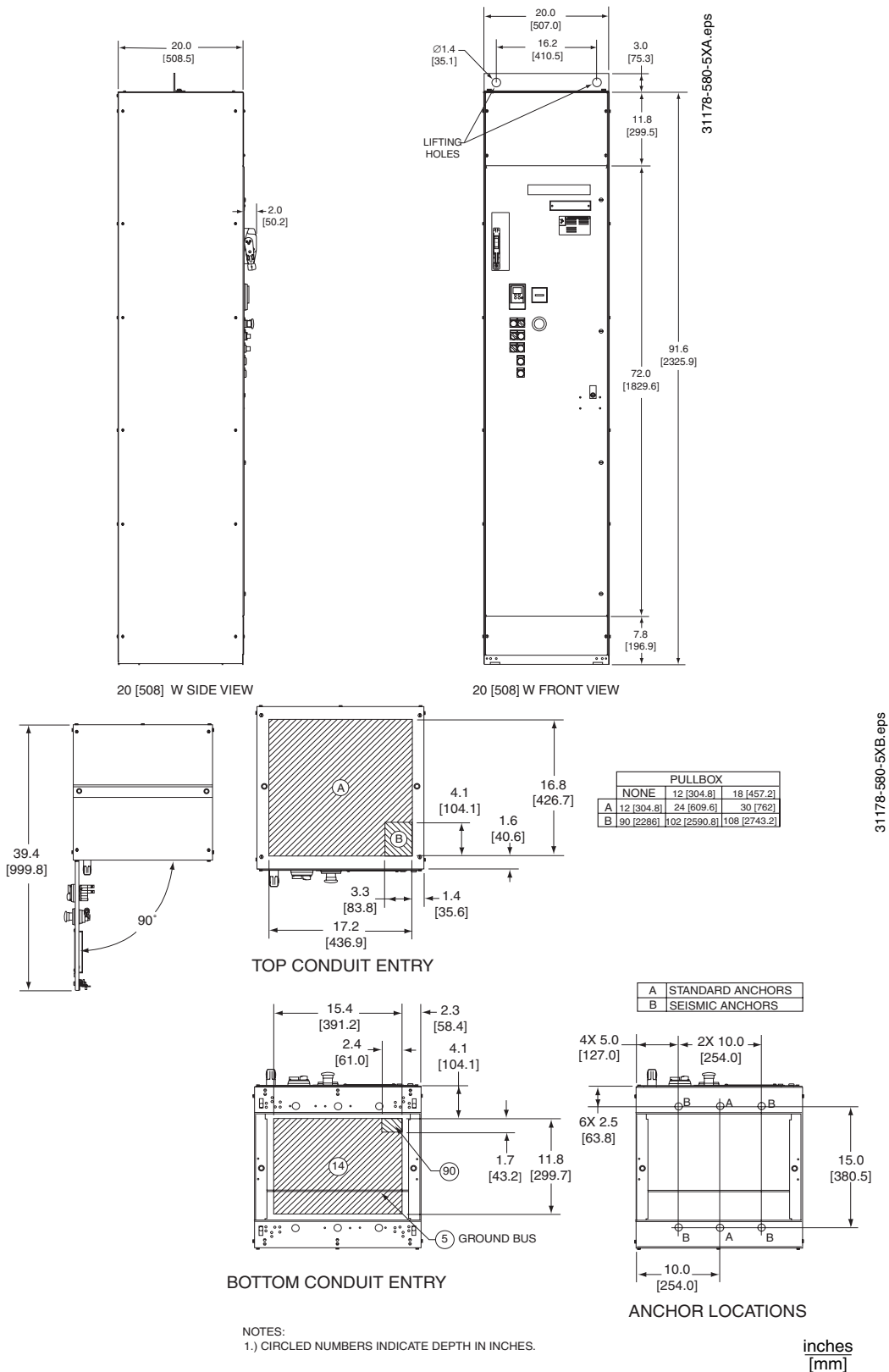


Size C Enclosure, Wall Mount, Type 1, 12, and 3R, 40–50 hp @ 208 V, 50–60 hp @ 230 V, 100–125 hp @ 480 V, and 125–500 hp @ 575 V

inches
[mm]

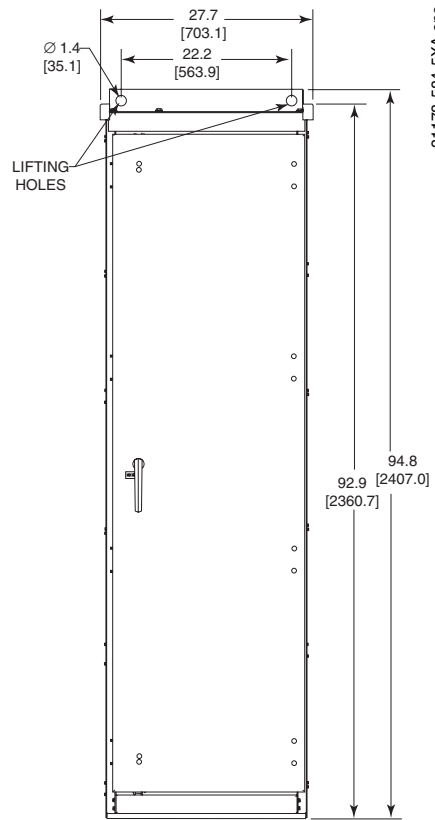
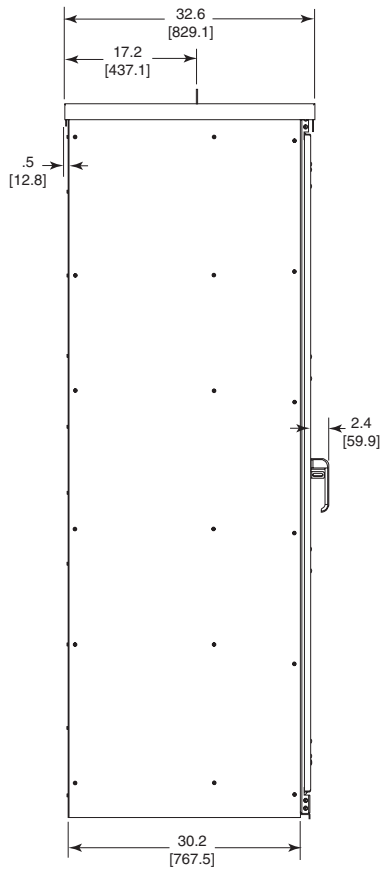
Packaged Altistart 48 Soft Starts Floor Mount Unit Dimensions

Floor Mount Unit Dimensions

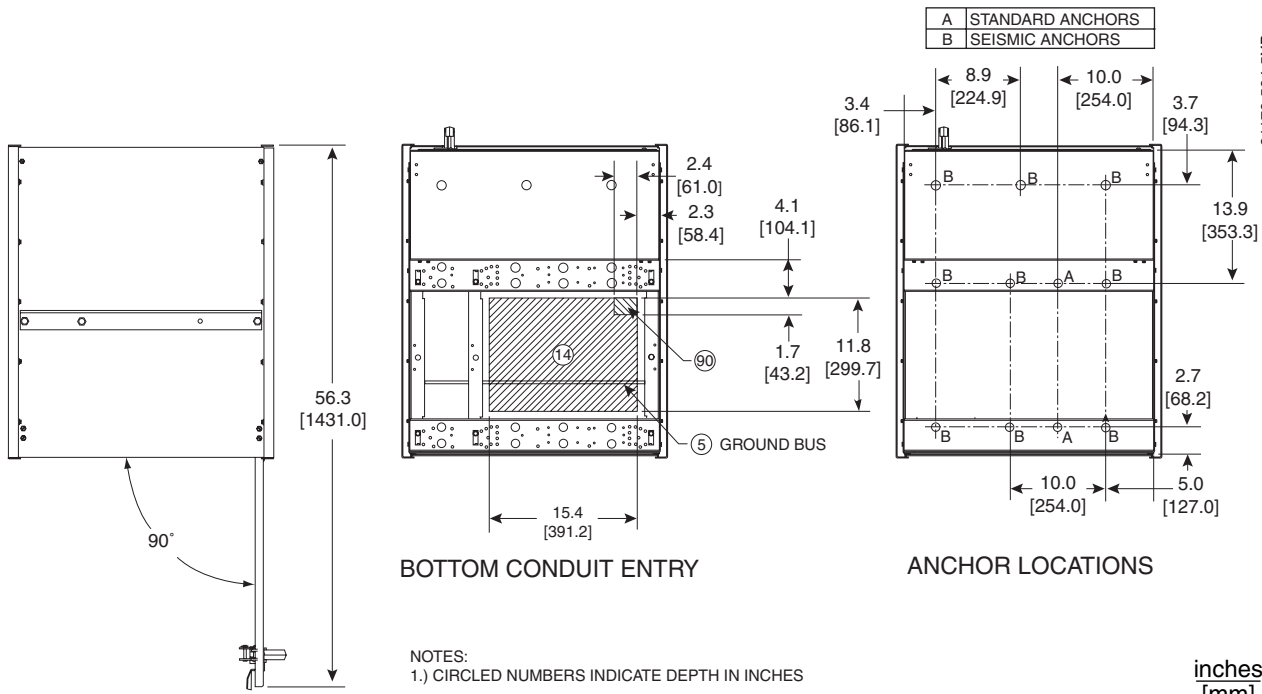


**Size D Enclosure, Floor Mount, Type 1 and 12, 20 inches wide, 8639 Power Circuit S (Shunt Trip)
only, 60–100 hp @ 208 V, 75–125 hp @ 230 V, 150–250 hp @ 480 V, and 200–300 hp @ 575 V**

Packaged Altistart 48 Soft Starts Floor Mount Unit Dimensions



31178-584-5XA.eps

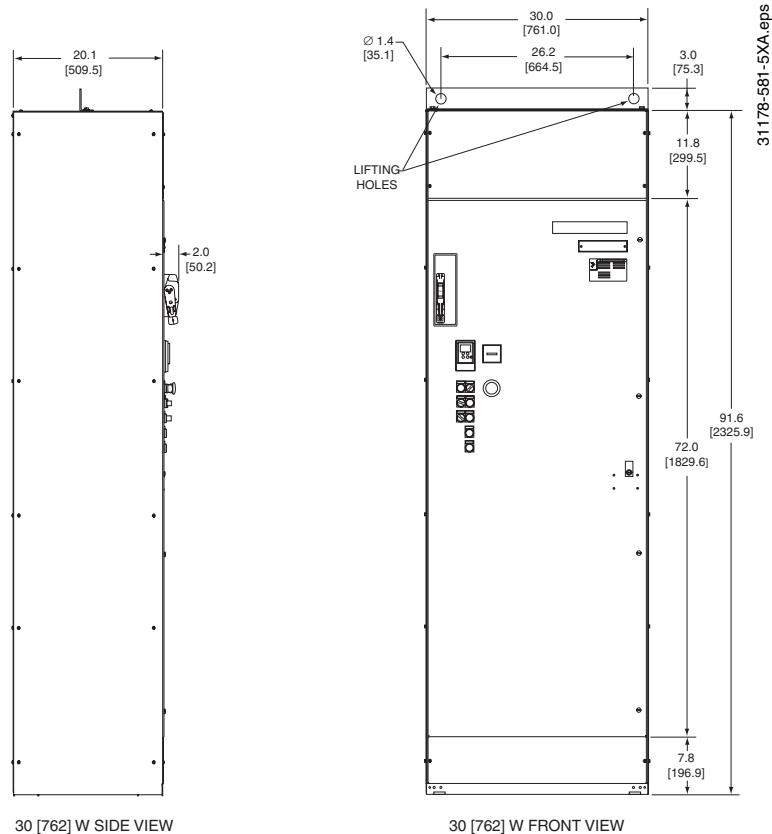


31178-584-5XB.eps

**Size D Enclosure, Floor Mount, Type 3R, 20 inches wide, 8639 Power Circuit S (Shunt Trip) only,
60–100 hp @ 208 V, 75–125 hp @ 230 V, 150–250 hp @ 480 V, and 200–300 hp @ 575 V**

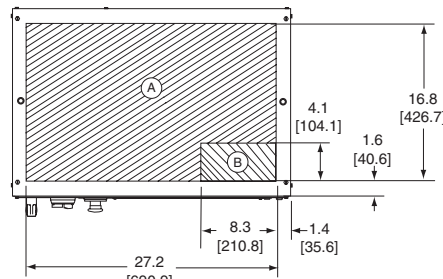
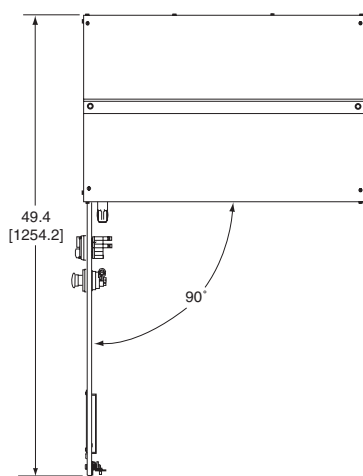
inches
[mm]

Packaged Altistart 48 Soft Starts Floor Mount Unit Dimensions



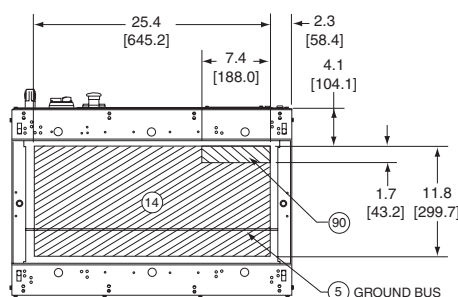
30 [762] W SIDE VIEW

30 [762] W FRONT VIEW

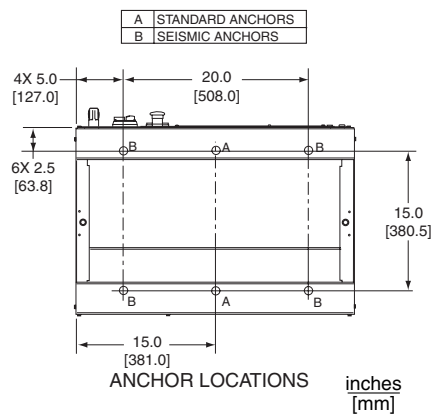


TOP CONDUIT ENTRY

PULLBOX		
NONE	12 [304.8]	18 [457.2]
A	12 [304.8]	24 [609.6]
B	90 [2286]	102 [2590.8]
		108 [2743.2]



BOTTOM CONDUIT ENTRY



ANCHOR LOCATIONS

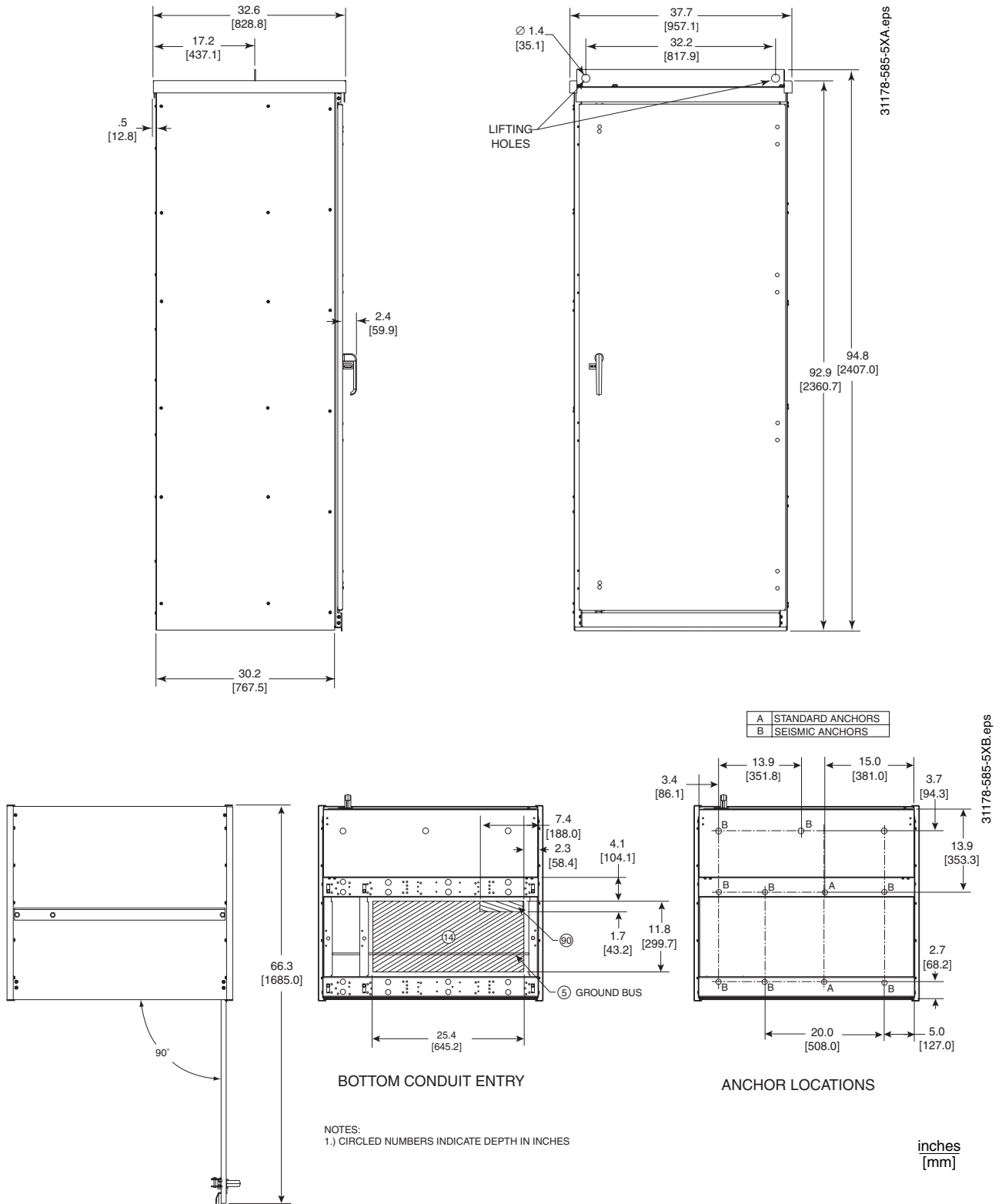
inches
[mm]

NOTES:
1.) CIRCLED NUMBERS INDICATE DEPTH IN INCHES.

Size D Enclosure, Floor Mount, Type 1 and 12, 30 inches wide, 8639 Power Circuit N (Isolation Contactor) or R (Reversing), 60–100 hp @ 208 V, 75–125 hp @ 230 V, 150–250 hp @ 480 V, and 200–300 hp @ 575 V

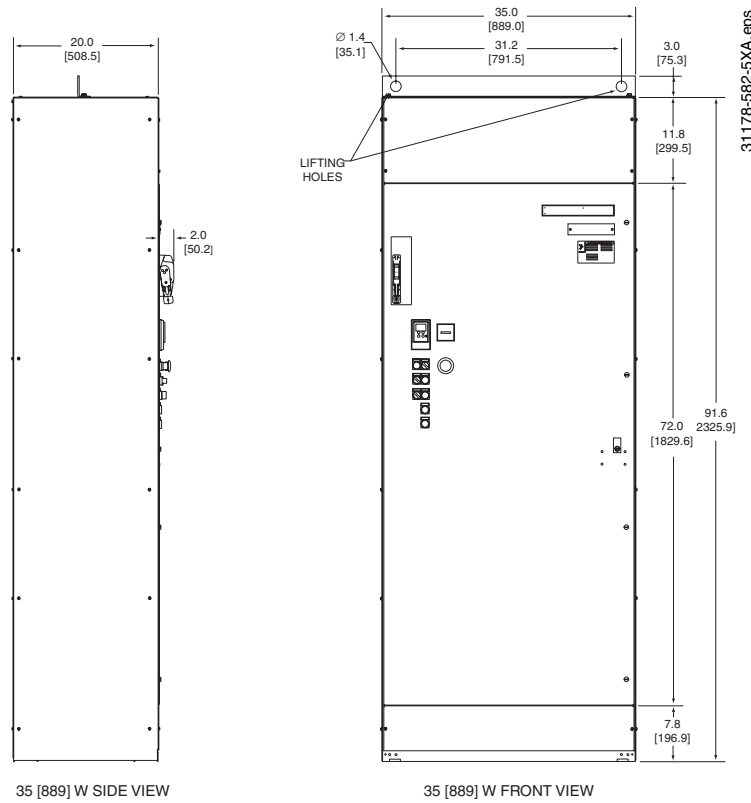
31178-581-5XB.eps

Packaged Altistart 48 Soft Starts Floor Mount Unit Dimensions

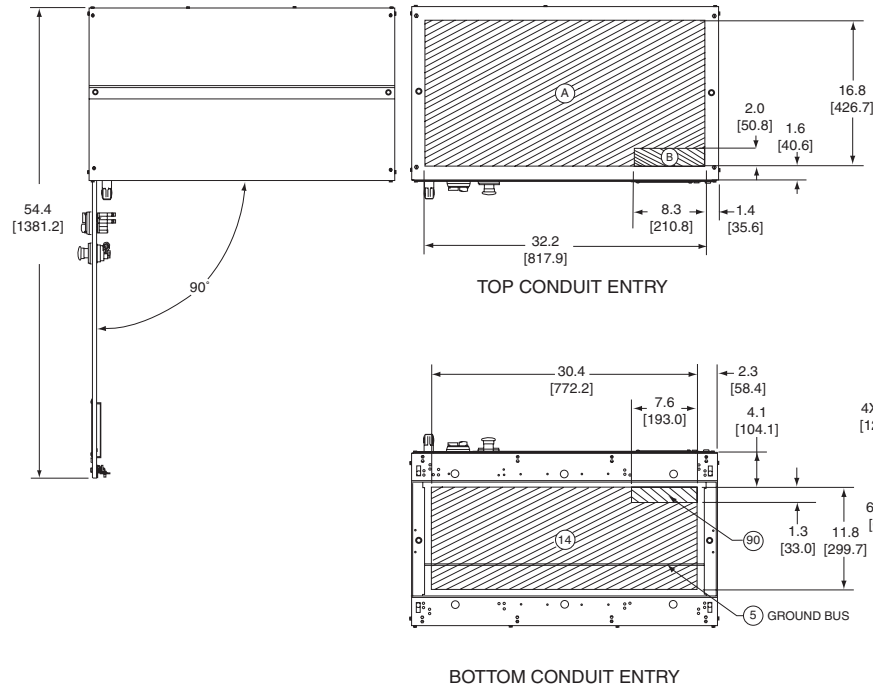


Size D Enclosure, Floor Mount, Type 3R, 30 inches wide, 8639 Power Circuit N (Isolation Contactor) or R (Reversing), 60–100 hp @ 208 V, 75–125 hp @ 230 V, 150–250 hp @ 480 V, and 200–300 hp @ 575 V

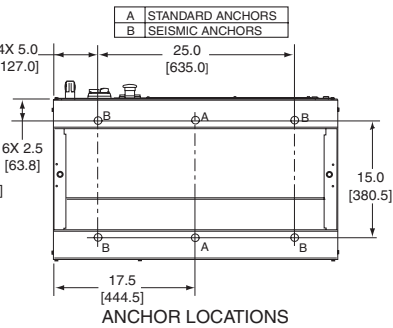
Packaged Altistart 48 Soft Starts Floor Mount Unit Dimensions



31178-582-5XA.eps



PULLBOX			
NONE	12 [304.8]	18 [457.2]	
A	12 [304.8]	24 [609.6]	30 [762]
B	90 [2286]	102 [2590.8]	108 [2743.2]

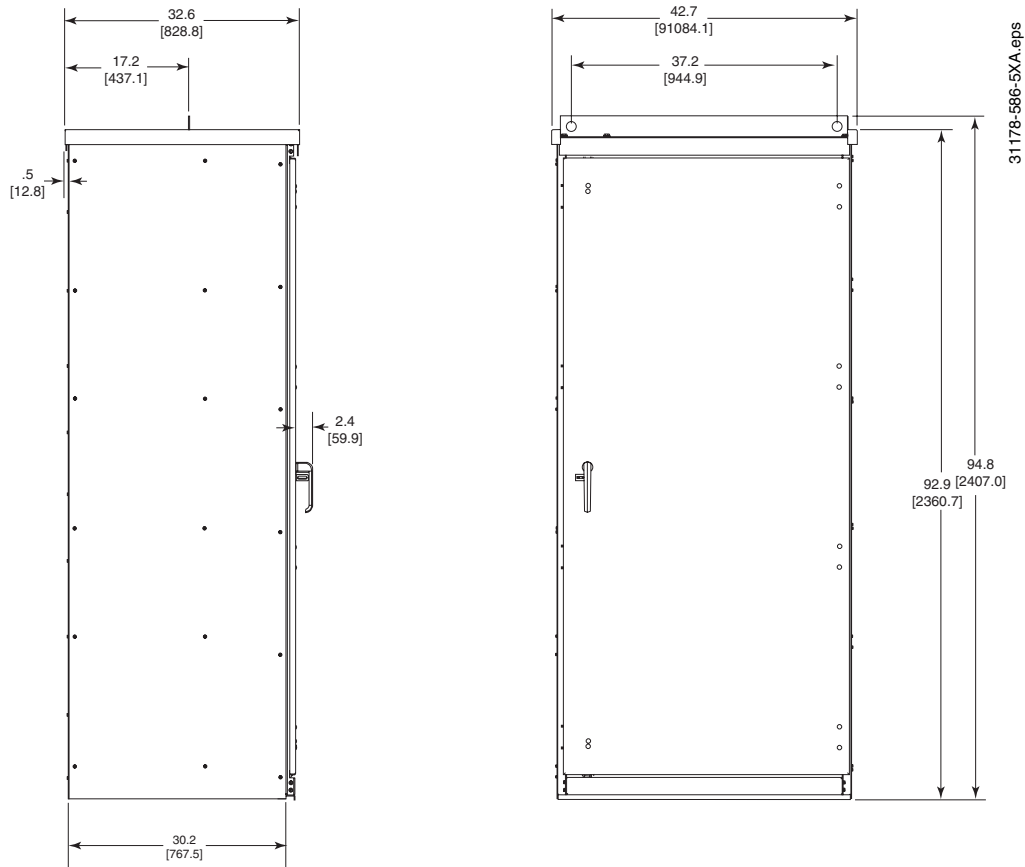


NOTES:
1.) CIRCLED NUMBERS INDICATE DEPTH IN INCHES.

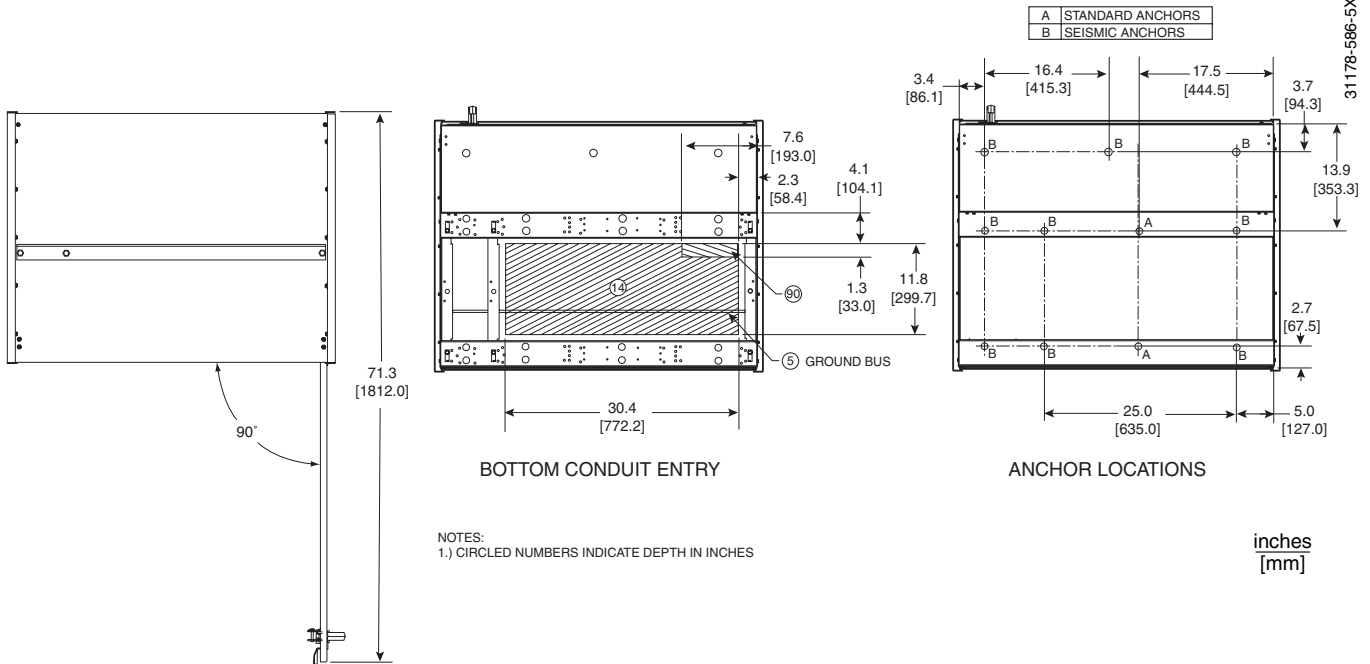
inches [mm]

Size E Enclosure, Floor Mount, Type 1 and 12, 35 inches wide, 8638 and 8639 Power Circuit N (Isolation Contactor) or S (Shunt Trip), 125–200 hp @ 208 V, 150–250 hp @ 230 V, 300–500 hp @ 480 V, and 350–600 hp @ 575 V

Packaged Altistart 48 Soft Starts Floor Mount Unit Dimensions



31178-586-5XA.eps



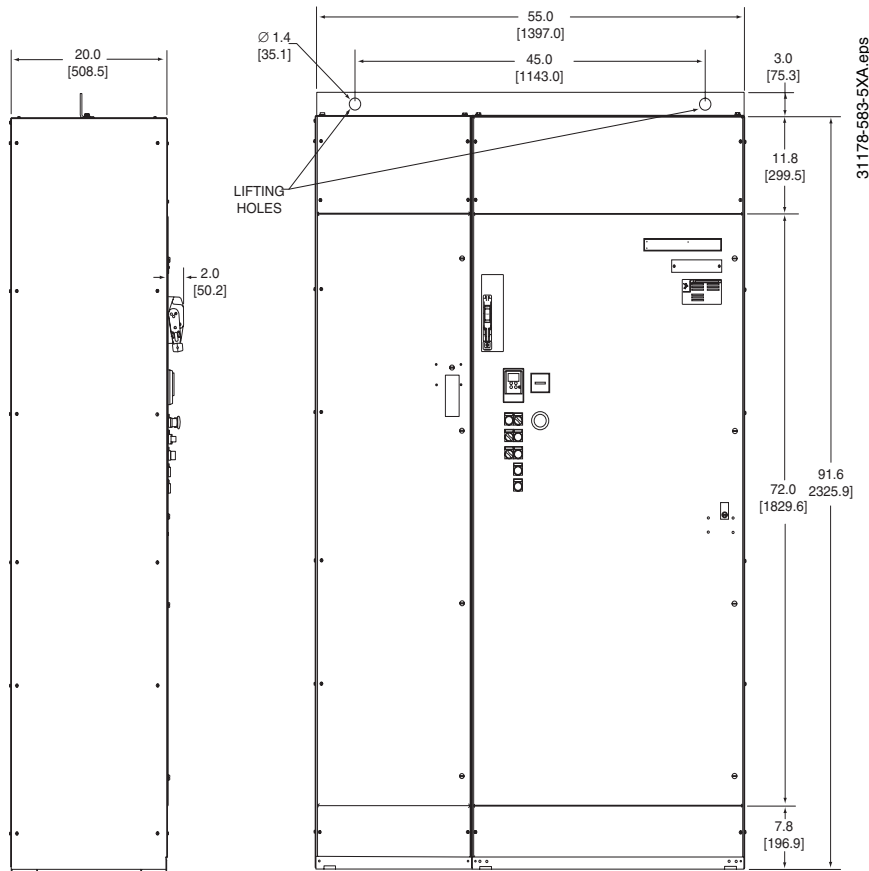
31178-586-5XB.eps

NOTES:
1.) CIRCLED NUMBERS INDICATE DEPTH IN INCHES

inches
[mm]

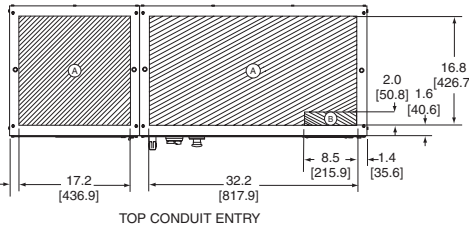
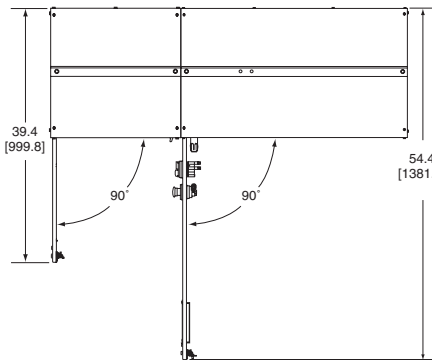
Size E Enclosure, Floor Mount, Type 3R, 35 inches wide, 8638 and 8639 Power Circuit N (Isolation Contactor) or S (Shunt Trip), 125–200 hp @ 208 V, 150–250 hp @ 230 V, 300–500 hp @ 480 V, and 350–600 hp @ 575 V

Packaged Altistart 48 Soft Starts Floor Mount Unit Dimensions



20 [508] W + 35 [889] W SIDE VIEW

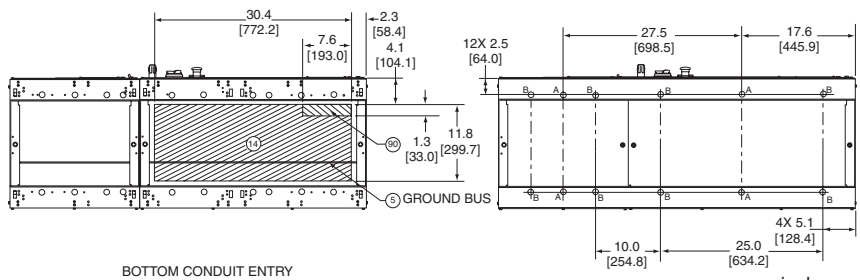
20 [508] W + 35 [889] W FRONT VIEW



TOP CONDUIT ENTRY

PULLBOX		
NONE	12 [304.8]	18 [457.2]
A	12 [304.8]	24 [609.6]
B	90 [2286]	102 [2590.8]
	30 [762]	108 [2743.2]

A	STANDARD ANCHORS
B	SEISMIC ANCHORS



BOTTOM CONDUIT ENTRY

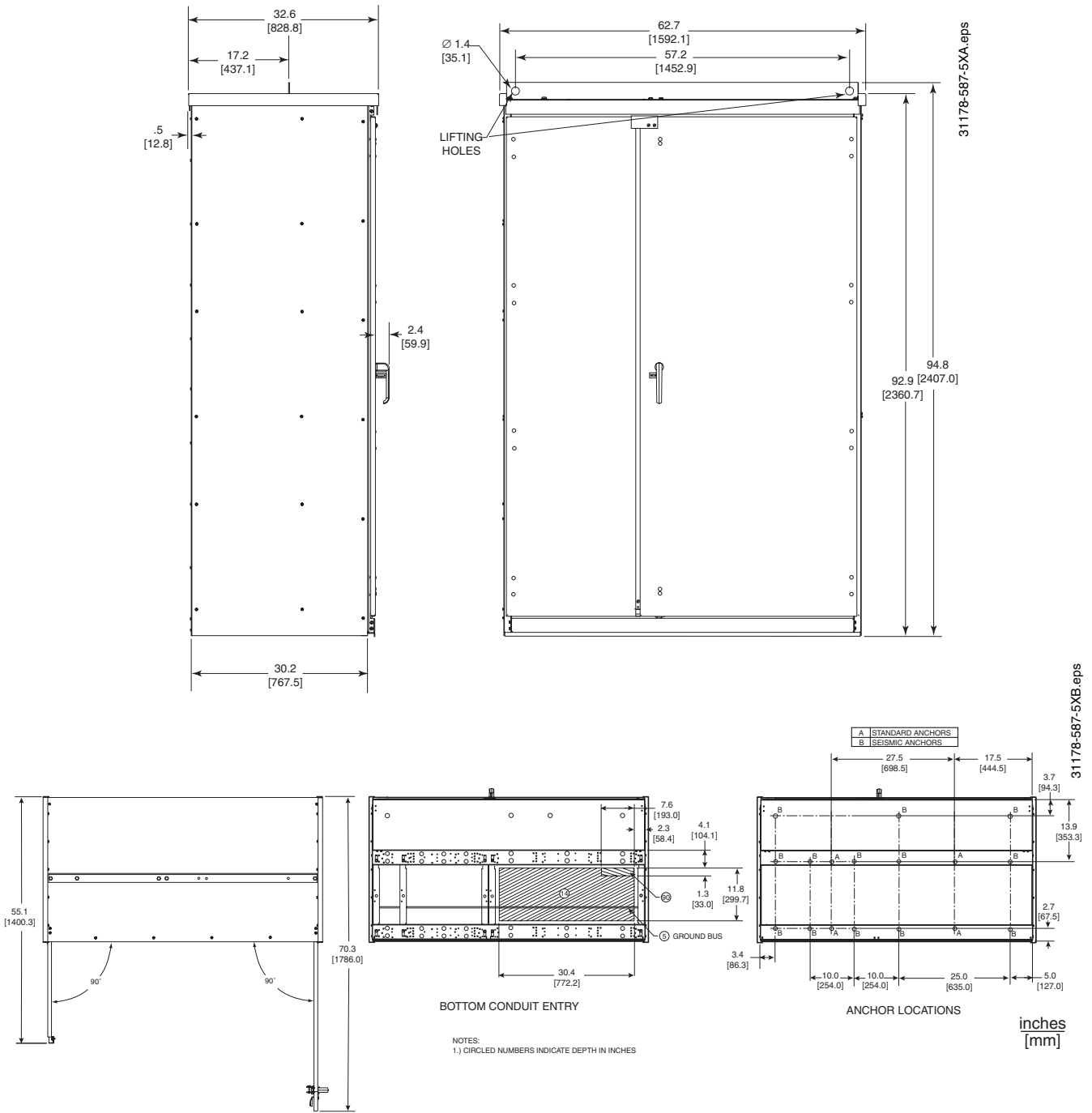
ANCHOR LOCATIONS

inches
[mm]

NOTES:
1.) CIRCLED NUMBERS INDICATE DEPTH IN INCHES.

**Size E Enclosure, Floor Mount, Type 1 and 12, 55 inches wide,
8638 and 8639 Power Circuit R (Reversing), 125–200 hp @ 208 V, 150–250 hp @ 230 V,
300–500 hp @ 480 V, and 350–600 hp @ 575 V**

Packaged Altistart 48 Soft Starts Floor Mount Unit Dimensions



**Size E – Enclosure Outline, Floor Mount, Type 3R, 55 inches wide,
8638 and 8639 Power Circuit R (Reversing), 125–200 hp @ 208 V, 150–250 hp @ 230 V,
300–500 hp @ 480 V, and 350–600 hp @ 575 V**

Packaged Altistart 48 Soft Starts Motor Control Center Construction

Motor Control Center Construction

Motor Control Center soft start units provide a pre-engineered, integrated motor control center package consisting of a disconnect and soft start controller for reduced voltage starting and stopping of standard three-phase asynchronous induction (squirrel cage) motors.

ATS48 Motor Control Center soft start units are available from 11 to 604 A in NEMA 1, 1A (Gasketed), 12, and 3R MCC enclosures. Units are available for three-phase, 60 Hz, 208 V, 240 V, 480 V, or 600 V, 3-wire or 4-wire power systems. The ATS48 soft start in MCCs can provide soft starting (reduced voltage) and deceleration, along with machine and motor protection of standard NEMA Design B three-phase squirrel cage asynchronous motors in the following power ranges: 3–200 hp, 208 V; 5–250 hp, 230V; 10–500 hp, 460 V; and 15–600 hp, 575 V.

The MCC soft start units integrate the latest ATS48 soft start technology from Schneider Electric into a combination starter package for MCCs. All packages and options are UL 845 Listed for a minimum 65,000 A short circuit rating up to 480 V (ratings of 100,000 A @ 600 V are available with fuses).

All MCC soft start units include a door-mounted keypad for setting up and monitoring the ATS48 soft start. Control devices, if chosen, are mounted on the unit control station plate.

The circuit breaker disconnects used on MCC soft start units are Square D brand thermal-magnetic (inverse-time) type. The fusible switch disconnects used on MCC soft start units are automatic molded case switches with visible blades. Provisions for Class J or L fuses are provided. Fuses are not installed at the factory.

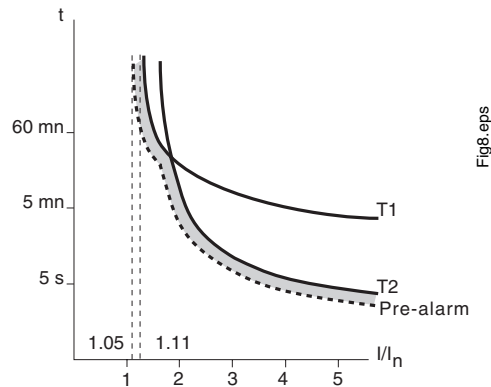
Each unit is a Motor Control Center style package capable of being installed and connected to standard MCC sections. Units are saddle type, plug-on construction up to 125 hp @ 480 V (156 amperes), with full height relay sections above 156 amperes. A 20 inch deep MCC is required for units rated above 156 amperes. The NEMA 1, 1A, and 12 units are totally enclosed, dead front, non-ventilated. NEMA 3R units are enclosed in a force ventilated, climate controlled outdoor-rated cabinet for 14–104 °F (-10–40 °C).

Features Include:

- Current limiting short circuit protection provisions to provide high short circuit rating for the unit (up to 65 or 100 kA at 600 V).
- Input power disconnect. Fusible switch or circuit breaker disconnects are available.
- TeSys D- and F-Line contactors are standard (NEMA/EEMAC type contactors are optional).
- Door-mounted keypad for setting up and monitoring the ATS48 soft start.
- Control devices, if chosen, are mounted on the unit control station plate.
- Agency listing: The Motor Control Center ATS48 soft start units are listed via the motor control center UL 845 procedures. CSA and NOM labels can also be applied.
- Shorting/Bypass Contactor:
A bypass contactor is supplied on all units. This allows the motor current to bypass the soft start thyristors once the soft start ramps up to full voltage/full speed. The use of a shorting contactor reduces temperature rise within the enclosure during steady state operation and requires less current carrying duty on the thyristors.
- Torque Control System (TCS™):
The ATS48 soft start uses TCS ramping to accelerate the motor to full voltage. Basing the acceleration ramp on the motor torque rather than current or voltage, as used in traditional soft starts, provides a linear speed ramp independent of the motor loading without tachometer feedback. The TCS ramp is also used for improved control of deceleration and eliminates the need for a special controller to handle water hammer problems.

Packaged Altistart 48 Soft Starts Motor Control Center Construction

- Integrated motor and controller thermal protection:
The motor and controller temperature are continuously calculated based on the controller nominal current and the current that is actually drawn. The cooling curve of the motor is simulated through an electronic circuit that stores the thermal state of the motor even if supply power is disconnected. A rise in motor temperature can be caused by a slight or severe overload of long or short duration. As shown in the figure below, the ATS48 soft start creates a digital model of the motor temperature based on two thermal images. The first (T1) represents the level of temperature rise corresponding to “iron” (motor frame). The second (T2) represents the temperature rise of “copper” (stator windings). For each thermal image, two levels of alarm are detected. An overload pre-alarm is signaled via logic output when the thermal state exceed 105% for T1 and/or 130% for T2. A thermal fault is signaled via output relay and keypad when the temperature rise exceeds 110% for T1 and 140% for T2.



ATS48 Soft Start Electronic Overload Thermal Trip Curves

Options

- Input Isolation Contactor
- Full Voltage Bypass
- NEMA/EEMAC hp rated contactors substituted for TeSys D- or F-Line contactors
- Reversing
- 120 Vac Control Power Transformer
- 120 Vac customer power capacity added to control power transformer
- Push-To-Test Pilot Lights
- LED Pilot Lights
- Auxiliary interlocks
- Communication network (Modbus®, Modbus Plus, DeviceNet™, Profibus®, or Ethernet)

Selecting the Soft Start

Once the appropriate application has been selected from the Application Types table on page 7, select the soft start from the tables on pages 29 and 30 according to the supply voltage and the motor horsepower. If severe application is required, choose the next higher horsepower unit. For convenience, the selection tables are based on nominal horsepower ratings. Be aware that nameplate Full Load Amps and starting characteristics vary depending on motor manufacturer, base speed, and design. Altistart units must be quoted based on maximum unit amperage, not horsepower.

See the latest revision of the ATS48 Soft Start Catalog 8636CT0201 and technical publication 8636PD9703 for additional information.

Packaged Altistart 48 Soft Starts Motor Control Center Construction

Standard Duty ATS48 Soft Starts with Circuit Breaker Disconnects (Pumps, Fans, Lightly Loaded, or Unloaded Starting Applications)

Motor-rated horsepower is shown for convenience only. Size per actual motor full load amperes. For severe duty applications, choose the next higher horsepower size.

Soft Start Type and Horsepower			Soft Start Frame	Max. Unit A	Circuit Breaker A	Space ⁽¹⁾	
208 V	230 V	460 V				IEC Contactors	NEMA Contactors
3	–	–	D17	10	20	30 in (762 mm)	39 in (991 mm)
–	–	10		14	25		
–	5	–		15	20		
5	–	–	D22	16	30		
–	–	15		21	40		
–	7.5	–		24	45		
7.5	–	–	D32	24	45		
–	–	20		27	50		
–	10	–		28	50		
10	–	–	D38	30	60		
–	–	25		34			
–	–	30	D47	40	80		
–	15	–		42			
15	–	–	D62	46	90	30 in (762 mm)	42 in (1067 mm)
–	–	40		52			
–	20	–		54			
20	–	–	D75	59	100		
–	–	50		65			
–	25	–		68			
25	–	–	D88	74	110		
–	–	60		77			
–	30	–		80			
30	–	–	C11	88	125		
–	–	75		96	125		
–	40	–		104	150		
40	–	–	C14	114	175	42 in (1067 mm)	60 in (1524 mm)
–	–	100		124	200		
–	50	–		130	200		
50	–	–	C17	143	200		
–	60	–		154	225		
–	–	125		156	225		
60	–	–	C21	169	250		
–	–	150		180			
–	75	–		192			
75	–	–	C25	211	300	72 in (1829 mm) 20 in. W (508 mm)	72 in (1829 mm) 30 in. W (762 mm)
–	–	200		240	350		
–	100	–		248	350		
100	–	–	C32	273	400		
–	–	250		302			
–	125	–		312			
125	–	–	C41	343	500	72 in (1829 mm) 35 in. W (889 mm)	72 in (1829 mm) 35 in. W (889 mm)
–	150	–		360	600		
–	–	300		361	600		
150	–	–	C48	396	600		
–	–	350		414			
–	–	400		477			
–	–	–	C59	477	800		
–	200	–		480			
200	–	–	C66	528	800	72 in (1829 mm) 35 in. W (889 mm)	N/A
–	–	500		590	900		
–	–	–		604	900		
–	250	–					

(1) Space shown is applicable to NEMA 1, 1A, 12, and 3R enclosures. Options may require additional space.

Packaged Altistart 48 Soft Starts Motor Control Center Construction

Standard Duty ATS48 Soft Starts with Fusible Switch Disconnects (Pumps, Fans, Lightly Loaded, or Unloaded Starting Applications)

Motor-rated horsepower is shown for convenience only. Size per actual motor full load amperes. For severe duty applications, choose the next higher horsepower size.

Soft Start Type and Horsepower				Soft Start Frame	Max. Unit A	Fuse A	Space ⁽¹⁾			
208 V	230 V	460 V	575 V				IEC Contactors	NEMA Contactors		
3	—	—	—	D17	10	30 (J)	30 in (762 mm)	39 in (991 mm)		
—	5	10	—		14					
—	—	—	15		15					
—	—	—	—		17					
5	—	—	—	D22	16	30 (J) 60 (J) 60 (J) 60 (J)				
—	—	15	—		21					
—	—	—	20		22					
—	7.5	—	—		24					
7.5	—	—	—	D32	24	30 in (762 mm)			39 in (991 mm)	
—	—	20	25		27					
—	10	—	—	28						
10	—	—	—	D38	30					
—	—	—	30		32					
—	—	25	—	34						
—	—	30	—	D47	40					100 (J)
—	—	—	40		41					
—	15	—	—	42						
15	—	—	—	D62	46		100 (J)			
—	—	40	50		52					
—	20	—	—	54						
20	—	—	—	D75	59			200 (J)		
—	—	—	60		62					
—	—	50	—		65					
—	25	—	—	68						
25	—	—	—	D88	74	200 (J)				
—	—	60	75		77					
—	30	—	—	80						
30	—	—	—	C11	88				200 (J)	
—	—	75	—		96					
—	—	—	100		99					
—	40	—	—		104					
40	—	—	—	C14	114					200 (J) 400 (J) 400 (J) 400 (J) 400 (J)
—	—	100	—		124					
—	—	—	125		125					
—	50	—	—	130						
50	—	—	—	C17	143		400 (J)			
—	—	—	150		144					
—	60	—	—		154					
—	—	125	—	156						
60	—	—	—	C21	169			400 (J)		
—	75	150	200		180					
—	—	—	—	192						
75	—	—	—	C25	211	400 (J) 600 (J) 600 (J) 600 (J)				
—	—	200	—		240					
—	—	—	250		242					
—	100	—	—	248						
100	—	—	—	C32	273				600 (J)	
—	—	—	300		289					
—	—	250	—		302					
—	125	—	—		312					
—	—	—	350	C41	343					600 (J) 600 (J) 800 (L) 800 (L)
125	—	—	—		343					
—	150	—	—		360					
—	—	300	—	361						
150	—	—	400	C48	382		800 (L)			
—	—	—	—		396					
—	—	350	—	414						
—	—	—	500	C59	472			1000 (L)		
—	—	400	—		477					
—	200	—	—		480					
200	—	—	—	C66	528	1000 (L) 1200 (L) 1200 (L) 1200 (L)				
—	—	—	600		580					
—	—	500	—		590					
—	250	—	—		604					

(1) Space shown is applicable to NEMA 1, 1A, 12, and 3R enclosures. Options may require additional space.

Packaged Altistart 48 Soft Starts Motor Control Center Construction

Power Options

Description	Soft Start Frame	Space Adder	
		IEC Contactors	NEMA Contactors
Input Isolation Contactor Replaces the standard shunt trip disconnect. Standard feature if Reversing or Full Voltage Bypass is chosen. As an option, MCC soft start units can include an input contactor to isolate the soft start in the event of a fault instead of a shunt trip disconnect. The input contactor also opens when the motor is not in use. This provides protection from voltage transients when the electronics are most susceptible to damage. Control power is maintained after the input contactor is opened so that fault diagnostics are available.	D17-D47	15 in (381 mm)	27 in (686 mm)
	D62-C11	18 in (457 mm)	15 in (381 mm)
	C14-C17	18 in (457 mm)	12 in (305 mm) [5 inches (127 mm) added to width]
	C21-C32	10 inches (254 mm) added to width for C/B version only	20 inches (508 mm) added to width
	C41-C66 (IEC) or C41-C59 (NEMA)	0 in (0 mm)	20 inches (508 mm) added to width
Integrated Full Voltage Bypass Soft Start Includes Input Isolation Contactor. As an option, MCC soft start units can include a full voltage bypass to allow emergency full voltage starting of the motor in the event that the soft start cannot be used. This feature includes necessary control and power circuitry to start the motor with full voltage using a bypass enable/disable selector switch. A Class 20 overload relay is provided to protect the motor in the bypass mode. The bypass contactor also acts as a shorting contactor in the soft start mode. Not available with Reversing Capability.	D17-D47	15 in (381 mm)	27 in (686 mm)
	D62-C11	18 in (457 mm)	27 in (686 mm)
	C14-C17	18 in (457 mm)	12 in (305 mm) [5 inches (127 mm) added to width]
	C21-C32	10 inches (254 mm) added to width for C/B version only	20 inches (508 mm) added to width
	C41-C66 (IEC) or C41-C59 (NEMA)	0 in (0 mm)	20 inches (508 mm) added to width
Reversing Capability Includes Input Isolation Contactor. Not available with NEMA Contactors or Full Voltage Bypass.	D17-D47	15 in (381 mm)	N/A
	D62-C11	18 in (457 mm)	
	C14-C17	18 in (457 mm)	
	C21-C32	10 inches (254 mm) added to width for C/B version only	
	C41-C66	20 inches (508 mm) added to width	

Control Circuit Variations

Description	Application	Space
Unfused separate 120 V control circuit with control power disconnect	Standard on all soft starts	0 in (0 mm)
Fused separate 120 V control circuit with control power disconnect	Includes one fuse and control circuit interlock	
Operating mechanism interlock (added to Form FT)	SPDT	
	DPDT	
Standard capacity fused control power transformer		
150 VA additional capacity	All frame sizes	

Packaged Altistart 48 Soft Starts Motor Control Center Construction

Control Options

Description	Space
1.5–30 second start delay	0 in (0 mm) if one per soft start; 3 in (76 mm) for up to three max.
Unwired 3 N.O. / 2 N.C. D line relay	
Unwired 3 N.O. / 2 N.C. D line relay; 1 N.O. / 1 N.C. 10–180 second on delay timer	
Unwired 3 N.O. / 2 N.C. D line relay; 1 N.O. / 1 N.C. 10–180 second off delay timer	
Pilot Lights (max. five devices)	0 in (0 mm)
On pilot light (Red)	
Off pilot light (Green)	
Power On pilot light (Blue)	
Fault pilot light (Yellow)	
On pilot light (Green)	
Off pilot light (Red)	
Special function pilot light (Red)	
Special function pilot light (Green)	
LED Pilot Lights (max. five devices)	
On pilot light (Red)	
Off pilot light (Green)	
Fault pilot light (Yellow)	
On pilot light (Green)	
Off pilot light (Red)	
Special function pilot light (Red)	
Special function pilot light (Green)	
Push-To-Test Pilot Lights (max. five devices)	
On pilot light (Red)	
Off pilot light (Green)	
Fault pilot light (Yellow)	
On pilot light (Green)	
Off pilot light (Red)	
Special function pilot light (Red)	
Special function pilot light (Green)	
LED Push-To-Test Pilot Lights (max. five devices)	
On pilot light (Red)	
Off pilot light (Green)	
Fault pilot light (Yellow)	
On pilot light (Green)	
Off pilot light (Red)	
Special function pilot light (Red)	
Special function pilot light (Green)	
Pilot Devices (max. five devices)	
Start/Stop push buttons	
Hand/Off/Auto selector switch	
Forward/Off/Reverse selector switch	
Stop/Run selector switch	
Hand/Auto selector switch and Start/Stop push buttons	
Emergency Off push button, maintained contact	0 in (0 mm)
Substitute Type K (max. three devices)	
Meter Options	
Current Meter—Analog, 2.5-inch panel type, 0-200% of nominal motor current	
Elapsed Time Meter	
Auxiliary Electrical Interlocks	
Run contacts, 1 N.O., 5 A @ 120 Vac (8501 Type R relay)	
Bypass Run contacts, 1 N.O., 5 A @ 120 Vac (8501 Type R relay) Requires Integrated Full Voltage Bypass (Form U503)	
Auto Mode contacts, 1 N.O., 5 A @ 120 Vac (8501 Type R relay) Requires Hand/Off/Auto Switch	
Fault contacts, 1 N.O., 5 A @ 120 Vac (8501 Type R relay)	
Communication Network	
- Modbus® - Modbus Plus - DeviceNet™ - Profibus® - Ethernet	

Packaged Altistart 48 Soft Starts

Enclosed 48 Soft Start Controller Recommended Specifications

Enclosed 48 Soft Start Controller Recommended Specifications

The following is a recommended specification for selecting an enclosed soft start product. It is intended to assist you in acquiring the best product for your application. This material is not copyrighted, and you may use it in whatever fashion best suits your particular needs.

PART 1 GENERAL

1.01 Scope of Work

- A. These specification requirements are for solid state reduced voltage motor controllers herein referred to as soft starts.
- B. They are for use with NEMA Design B AC motors to reduce the current inrush as well as mechanical shocks that can result from starting or stopping a motor across the line.

1.02 Quality Assurance

- A. The electronic soft start shall be listed by an independent testing laboratory in accordance with UL508 - Industrial Control Equipment.
- B. The soft start shall carry the CE mark for indication of compliance to low voltage and EMC directives in accordance with EN/IEC 60947-4-2.
- C. The manufacturer shall be a certified ISO 9002 facility.

1.03 Warranty

- A. An 18-month warranty shall be provided on materials and workmanship from date of invoice.

PART 2 PRODUCT

2.01 General Description

- A. The soft start shall be provided by the manufacturer factory mounted in an enclosure rated as [NEMA Type 1, Type 12, Type 3R] for [indoor, outdoor] use.
[select one]
 1. Enclosure shall include a door mounted digital keypad for adjusting the soft start parameters, viewing process values, and viewing the motor and soft start status without opening the enclosure door.
 2. Provisions shall be available for padlocking the enclosure door.
- B. The enclosed product shall be provided complete with [one of] the following overcurrent protective device for Type 1 short circuit protection:
[select one]
 1. Molded case disconnect switch and in line fuse block for Class J power fuses from 10 to 600 A or Class L power fuses from 601 to 1600 A. Short circuit withstand rating shall be 65 K AIC minimum.
 2. Circuit breaker disconnect means. Short circuit withstand rating shall be 25 K or 30 K AIC based on the motor horsepower as defined in UL 508.
- C. The motor must be automatically protected from solid state component failure by [one of] the following means.
[select one]
 1. Shunt trip coil to trip disconnect in the event of a soft start fault condition including a shorted SCR.
 2. Isolation contactor that opens when the motor is stopped or when the soft start detects a fault condition including a shorted SCR.

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- D. The soft start shall utilize a thyristor (SCR) bridge consisting of at least two SCRs per phase to control the starting and stopping of industry standard motors.
- E. The soft start shall provide torque control for linear acceleration independent of motor load or application type without external feedback. The gating of the SCRs will be controlled in such a manner to ensure a stable and linear acceleration ramp.
- F. The soft start shall be controlled by a microprocessor that continuously monitors motor current and controls the phasing of the SCRs. Analog control algorithms shall not be allowed.
- G. All soft start power ratings and all control options will utilize the same control board/module.
- H. A shorting contactor shall be standard on soft starts in all enclosure configurations. Protective features and deceleration control options integral to the soft start shall be available even when the shorting contactor is engaged.

2.02 Motor Data

The soft start shall be designed to operate a NEMA Design B motor with a nameplate rating of ___ horsepower, rated for ___ amp continuous at ___ volts $\pm 10\%$.

2.03 Ratings

- A. The Types 1 and 12 soft starts shall be designed to operate in an ambient temperature of $-10\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ ($14\text{ }^{\circ}\text{F}$ to $104\text{ }^{\circ}\text{F}$). For ambient temperatures between $40\text{ }^{\circ}\text{C}$ and $60\text{ }^{\circ}\text{C}$ ($104\text{ }^{\circ}\text{F}$ and $140\text{ }^{\circ}\text{F}$), derate the current by 2% per $^{\circ}\text{C}$ above $40\text{ }^{\circ}\text{C}$ ($104\text{ }^{\circ}\text{F}$).
- B. Storage temperature range shall be $-25\text{ }^{\circ}\text{C}$ to $70\text{ }^{\circ}\text{C}$ ($-13\text{ }^{\circ}\text{F}$ to $158\text{ }^{\circ}\text{F}$).
- C. Maximum relative humidity shall be 95%, non-condensing or dripping water, conforming to IEC 60947-4-2.
- D. The soft start shall be designed to operate in altitudes up to 1000 m (3300 ft). For higher altitudes, derate by 2.2% for each additional 100 m (330 ft) with a maximum of 2000 m (6600 ft).
- E. The soft start shall be capable of operation within $\pm 10\%$ of nominal voltage rating.
- F. The soft start shall automatically adapt for operation at 50 or 60 Hz, with a frequency tolerance of $\pm 5\%$. By configuration, it will have to be capable of operating at a supply line frequency that can vary by $\pm 20\%$ during steady state operation.
- G. The soft start shall be capable of supplying 400% of rated full load current for 23 seconds at maximum ambient temperature. The soft start shall also be capable of 10 evenly spaced starts per hour at 400% of full rated current for 12 seconds per start.
- H. The SCRs shall have a P.I.V. rating of 1800 Vac. Lower rated SCRs with MOV protection modules are not acceptable.
- I. A Seismic Qualification label shall be provided for all floor mount configuration units to comply with the latest IBC 2000 and NFPA 5000 guidelines.

2.04 Adjustments and Configurations

- A. All programming/configuration devices, display units, and field control wiring terminals shall be accessible on the front of the control module. Exposure to control circuit boards or electrical power devices during routine adjustments shall be prohibited.
- B. Digital indication shall provide, as a minimum, the following conditions:
 1. Soft start status - ready, starting/stopping, running.
 2. Motor status - current, torque, thermal state, power factor, operating time, power in kW.
 3. Fault status - Motor thermal overload, soft start thermal fault, loss of line or motor phase, line frequency fault, low line voltage fault, locked rotor fault, motor underload, maximum start time exceeded, external fault, serial communication fault, line phase reversal fault, motor overcurrent fault.

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- C. The soft start shall be preset to the following for operation without adjustment for most applications.
 - 1. Linear (torque-controlled) acceleration ramp of 15 seconds.
 - 2. Current limitation to 400% of the motor full load current rating.
 - 3. Class 10 overload protection.
 - 4. Motor current preset per NEC/NFPA 70 table 430.150 for standard HP motors.
- D. A digital keypad shall be utilized to configure the following operating parameters as required:
 - 1. Motor full load amps adjustable from 40 to 130% of the soft start's rating.
 - 2. Current limitation on starting adjustable from 150 to 700% of the motor current rating, not to exceed 500% of the soft start rating.
 - 3. Linear (torque-controlled) acceleration ramp adjustable from 1 to 60 seconds.
 - 4. Initial torque adjustable from 0 to 100% of nominal motor torque.
 - 5. Torque limit adjustable from 10 to 200% of nominal motor torque.
 - 6. Maximum start time adjustable from 10 to 999 seconds.
 - 7. Voltage boost adjustable from 50 to 100% of the nominal supply voltage.
 - 8. Selection of motor stop type: freewheel, linear timed ramp or braking.
 - 9. Linear (torque-controlled) deceleration ramp time adjustable from 1 to 60 seconds.
 - 10. Threshold to change from a controlled deceleration ramp to a freewheel stop: adjustable from 0 to 100% of the nominal motor torque.
 - 11. Braking torque level adjustable from 0 to 100% effectiveness.
 - 12. Selection of Class 2, 10, 10 A, 15, 20, 25 or 30 motor thermal overload protection.
- E. A digital keypad shall be utilized to configure the following controlling parameters as required:
 - 1. Selectable automatic fault reset operation.
 - 2. Cancellation of the torque control loop for multi motor installations.
 - 3. Adjustment of the stator loss estimation for specialty motors.
 - 4. Assignment of soft start input and output control terminals.
 - 5. Activation of line phase reversal protection.
 - 6. Reset of motor thermal state.
 - 7. Return to factory settings.
 - 8. Activation of test mode for use with low power motors.
 - 9. Indication of elapsed time in hours of starting, running, and stopping.
 - 10. Activation of programming keypad lockout with user selectable code.
- F. Output relays shall provide the following status indications:
 - 1. One Form A (N.O.) minimum for indication of fault.
 - 2. One Form A (N.O.) for indication that acceleration ramp is complete and current is below 130% motor FLA (End of start).
 - 3. One Form A (N.O.) assignable to one of the following functions: motor thermal alarm, motor current level alarm, and motor underload alarm.
- G. Additional control inputs and signal outputs shall be available:
 - 1. Two assignable control inputs for the following functions: force to freewheel stop, external fault input, disable serial link control, external motor overload reset, or general fault reset.
 - 2. Two assignable logic-level signal outputs for the following functions: motor thermal overload alarm, "motor powered" signal, motor overcurrent alarm, or motor underload alarm.
 - 3. One analog output shall be available for 4–20 or 0–20 milliamp indication of motor current, motor torque, motor power, motor thermal state, or power factor.
- H. Relay and I/O functions listed above must be isolated with respect to common.

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2.05 Protection

- A. A microprocessor-based motor thermal protection system shall be included which continuously calculates the temperature-rise of the motor and soft start and provides:
 - 1. A motor overload pre-alarm which indicates by relay contact or logic output that the motor windings have exceeded 130% of their temperature rise rating. This function shall be for alarm only.
 - 2. A motor overload fault will stop the motor if the windings have exceeded 140% of their temperature rise rating.
 - 3. An electronic circuit with a time constant adjustable to the motor's thermal cooling time constant ensuring the memorization of the thermal state even if power is removed from the soft start.
- B. The soft start shall provide line and motor phase loss, phase reversal, underload, stall, and jam protection.
- C. The integral protective features shall be active even when the shorting contactor is used to bypass the SCRs during steady state operation.

2.06 Control options

- A. The soft start's control circuit shall be fed from the line supply and be completely independent of the power circuit and separate from the control logic.
- B. The peripheral soft start control circuitry shall be operated at 120 Vac 60 Hz from a control power transformer included within the enclosure.
- C. Operator devices shall be door mounted and shall include:
[Choose all that apply]
 - 4. Red STOP and black START push buttons.
 - 5. Three position H-O-A switch which provides for manual (HAND) start or remote signal (AUTO) start from user supplied relay contacts.
 - 6. (Available with reversing starter only) Three position FWD-OFF-REV switch provides forward, off and reverse selector switch.
 - 7. Red RUN pilot light illuminated whenever the soft start is provided a run command and no fault condition is present.
 - 8. Green OFF pilot light illuminated whenever the soft start is supplied with control power and no run command is present.
 - 9. All operator devices shall be remote mounted using supplied 120 Vac control logic. Clearly labeled terminals shall be provided for field installation.
 - 10. Refer to the control circuit drawing.

2.07 Communications

- A. The soft start will have to include a multidrop serial link for its direct connection to Modbus.
- B. The soft start shall be able to be connected to Ethernet and other networks, with connection to communication bus as an option.
- C. The communication shall be able to provide access to the control, to the adjustment and to the supervision of the soft start.

2.08 Shorting Contactor (standard on all enclosures)

- A. A microprocessor shall control the operation of the shorting contactor via an output relay.
- B. The shorting contactor shall close, shorting around the SCRs after the acceleration ramp is complete and motor current is below 130% of motor FLA, and open on a stop command to allow a deceleration ramp.
- C. Overload protection integral to the soft start shall continue to protect the motor when the shorting contactor is engaged.

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2.09 Full Voltage Bypass Soft Start [optional – delete if not needed]

- A. A full voltage bypass soft start with overload protection shall be included to provide motor operation in the case of soft start failure.
- B. A “NORMAL/BYPASS” selector switch shall be mounted on the enclosure door.

PART 3 EXECUTION

3.01 Installation

- A. The soft start shall be installed per the manufacturer's specifications.
- B. A standard wiring diagram shall be included for making the appropriate electrical connections.

3.02 Start up [recommended, delete if not needed]

- A. The services of a qualified manufacturer's service technician shall be available to inspect, test and start-up all soft starts furnished under this specification.

END OF SECTION

Packaged Altistart 48 Soft Starts

MCC Soft Start Controller Recommended Specifications

MCC Soft Start Controller Recommended Specifications

NOTE: These specifications are for Altistart 48 Soft Start controllers, herein referred to as soft starts, to be mounted in Square D Motor Control Centers. The Motor Control Center specification must be used in conjunction with these specifications in order to specify a complete Motor Control Center.

Application information directly affects the type and size of soft starts controller unit that will be quoted. Brackets [] are provided where such data should be included.

Please call your local Schneider Electric distributor or sales engineer for specification assistance regarding a particular application.

The Soft Start Controller specification should be included in Division 16, Electrical with the electrical distribution system.

PART 1 GENERAL

1.01 Scope of Work

- A. This section provides specification requirements for soft starts packaged as a complete motor control center unit or herein identified as soft start controller units for use with NEMA B design AC motors.
- B. The soft start controller unit manufacturer shall furnish, field test, adjust and certify all installed soft start controller units for satisfactory operation.
- C. Any exceptions/deviations to this specification shall be indicated in writing and submitted with the quotation.

1.02 Submittals

- A. Submit with the delivery of the MCC an Installation and Maintenance Manual and one (1) copy of the manufacturer's drawings per shipping block.

1.03 Regulatory Requirements

- A. ANSI/NFPA 70—National Electrical Code.
- B. ANSI C84.1—Voltages Tolerances for North America.
- C. CSA C22.2 No. 14-M91—Industrial Control Equipment.
- D. IEC 721—Classification of Environmental Conditions.
- E. NEMA ICS 3, Part 1—Motor Control Centers Not Rated More Than 600 Volts AC.
- F. NEMA 250—Enclosures for Electrical Equipment.
- G. UL 508—UL Standard for Safety Industrial Control Equipment.
- H. UL 845—UL Standard for Safety for Motor Control Centers.
- I. UL 50—UL Standard for Safety Enclosures for Electrical Equipment.

1.04 Warranty

- A. The soft start controller unit shall be warranted to be free from defects in materials and workmanship for a period of eighteen (18) months from date of invoice by the manufacturer.

1.05 Quality Assurance

- A. The soft start controller unit and all selected catalog options shall be UL listed according to Motor Control Center Equipment Specification UL 845. A UL label shall be attached inside each soft start controller unit as verification.
- B. The soft start controller unit shall be designed, constructed and tested in accordance with NEMA & NEC standards and shall be NOM and CSA or cUL certified.
- C. The soft start and motor control center shall be manufactured by one supplier in an ISO 9001 certified facility.

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- D. The manufacturer of the soft start controller unit shall have been specialized in the design and production of motor control center soft start units for a period of at least 10 years.
- E. All soft start controllers and factory-supplied options shall be completely tested for successful operation before shipment. Documentation shall be furnished upon the request of the engineer.
- F. The soft start shall carry the CE mark for indication of compliance to low voltage and EMC directives.

PART 2 PRODUCTS

2.01 Acceptable Manufacturers

- A. The soft start controller unit shall be Square D Class 8998 Altistart 48 or prior approved equal. Substitutions must be submitted in writing three (3) weeks prior to original bid date with supporting documentation demonstrating that the alternative manufacturer meets all aspects of the specifications herein.
- B. Additions to existing MCCs shall be the same as the original manufacturer.

2.02 General Description

- A. The soft start shall utilize a thyristor (SCR) bridge consisting of at least two SCRs per phase to control the starting and stopping of industry standard motors.
- B. The soft start shall provide torque control for linear acceleration without external feedback independent of motor load or type of application. The gating of the thyristors will be controlled in such a manner to ensure smooth and stable acceleration ramp.
- C. The soft start shall be controlled by a microprocessor that continuously monitors the current and controls the phasing of the SCRs. Analog control algorithms shall not be allowed.
- D. All soft start power ratings will utilize the same control board/module.
- E. A shorting contactor shall be supplied with the soft start controller units. Protective features and deceleration control options integral to the soft start shall be available even when the shorting contactor is employed.

2.03 Construction

- A. The soft start controller unit shall be a combination disconnect-soft start motor control center style unit. The input [circuit breaker][fusible switch] shall provide NEC required branch circuit protection. The [circuit breaker][fusible switch] shall have an external operator. Wiring between the soft start and the disconnect shall not be disturbed when removing or installing the soft start controller unit from the motor control center. Units shall be of modular construction so that it is possible to readily interchange units of the same size without modifications to the MCC structure.
- B. The soft start controller unit shall be rated for a minimum short circuit level of 65,000 Amps and shall be certified by independent testing laboratory in accordance with UL 845 - UL Standard for Safety for Motor Control Centers.
- C. All conducting parts on the line side of the unit disconnect shall be isolated to prevent accidental contact with those parts.
- D. Soft start controller units rated for standard duty up to 156 amperes shall be plug-on units which connect to the vertical bus through a spring-reinforced stab-on connector. Units rated higher than 156 amperes shall be connected directly to the main horizontal bus with appropriately sized cable or riser bus.
- E. All soft start controller units shall be enclosed in a structure which contains a 12" (305mm) high horizontal wireway at the top of each section, and a 6" (152mm) high horizontal wireway at the bottom of each section. These wireways should be unobstructed the full length of the motor control center to allow room for power and control cable to connect between units in different sections.
- F. A full-depth vertical wireway shall be provided within motor control center sections containing soft start controller units rated for standard duty up to 156 amperes. The vertical wireway shall connect both the top and bottom horizontal wireway. The vertical wireway shall be 4 in (102 mm)

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wide minimum with a separate hinged door. There should be a minimum of 4,000 in³ (65,548 cm³) of cabling space available. Access to the wireways shall not require opening control unit doors. Soft start controller units which require a full section are not required to have vertical wireways.

- G. All soft start controller unit interior mounting panels shall be white for better visibility inside.
- H. The motor control center structure shall include unit mounting shelves with hanger brackets to support soft start controller units rated 156 amperes and below at standard duty operation during operation and removal. A twin handle camming lever shall be located at the top of soft start controller units rated up to 156 amperes for standard duty operation to rack in and out the unit.
- I. A cast metal handle operator shall be provided on each soft start controller unit disconnect. With the soft start controller unit connected to the motor control center bus and the soft start controller unit door closed, the handle mechanism shall allow complete on/off control of the unit disconnect with clear indication of the disconnect's status. All circuit breaker operators shall include a separate tripped position to clearly indicate a circuit breaker trip condition. It shall be possible to reset a tripped circuit breaker without opening the control unit door.
 - 1. A mechanical interlock shall prevent an operator from opening the soft start controller unit door when the disconnect is in the on position. Another mechanical interlock shall prevent an operator from placing the disconnect in the on position while the soft start controller unit door is open. It shall be possible for authorized personnel to defeat these interlocks.
 - 2. A non-defeatable interlock shall be provided between the handle operator and the structure to prevent installing or removing a plug-on soft start controller unit unless the disconnect is in the off position.
- J. Provisions shall be provided for locking all disconnects in the off position with up to three padlocks.
- K. All plug-on soft start controller units shall have a grounded stab-on connector which engages the vertical ground bus prior to, and releases after, the power bus stab-on connectors.
- L. Handle mechanisms shall be located on the left side to encourage operators to stand to the left of the unit being switched.
- M. All soft start controller units shall be provided with unit control terminal blocks for use in terminating field wiring. Terminal blocks shall be pull-apart type, 250 V, and rated for 10 amperes. All current-carrying parts shall be tin-plated. Terminals shall be accessible from inside the unit when the unit door is opened. The stationary portion of the terminal block shall be used for factory connections and will remain attached to the unit when the portion used for field connections is removed. The terminals used for field connections shall be accessible so they can be wired without removing the unit or any of its components.
- N. Enclosure shall include a door mounted digital keypad for adjusting the soft start parameters and viewing the motor, soft start and fault status without opening the enclosure door.
- O. A shorting contactor shall be supplied in each soft start controller unit to reduce temperature rise within the unit and MCC enclosure. The shorting contactor shall be rated to carry the motor full load current during steady state after full voltage has been applied to the motor by the soft start.

2.05 Motor Data

- A. The soft start controller unit shall be sized to operate the following AC motor:
 - 1. Motor horsepower: []
 - 2. Motor full load ampere: []
 - 3. Motor rpm: [3600/3000] [1800/1500] [1200/1000] [900/750] [720/600] [600/500], 60/50 Hz
 - 4. Motor voltage: [600][460] [230] [208]
 - 5. Motor service factor: [1.0] [1.15] [1.25]

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2.06 Environmental Ratings

- A. The soft start controller unit shall be designed for operation in a [NEMA Type 1] [NEMA Type 1 Gasketed] [NEMA Type 12] [NEMA Type 3R] Motor Control Center enclosure as specified elsewhere.
- B. The soft start controller unit shall be designed to operate while mounted in a motor control center structure with an ambient temperature from 0°C to +40°C (+32°F to 104°F).
- C. The storage temperature range shall be 0°C to +40°C (+32°F to 104°F).
- D. The maximum relative humidity shall be 93% at +40°C (+104°F), non-condensing.
- E. The soft start controller unit shall be rated to operate at altitudes less than or equal to 1000 m (3,300 ft). Derating factors shall be applied above 1,000m (3,300 ft) for the soft start controller unit and MCC.

2.07 Electrical Ratings

- A. The soft start controller unit shall be designed to operate from an input voltage between -10% and +10% of nominal voltage rating.
- B. The soft start controller unit shall operate from an input voltage frequency range of +/-5%. By configuration, it shall be capable of operation at a supply line frequency that can vary by +/- 20% during steady state operation.
- C. The soft start shall be capable of supplying 400% of rated full load current for 23 seconds at maximum ambient temperature.
- D. All soft start controller unit power and control devices shall be rated for:
[Standard Duty capable of 10 evenly spaced starts per hour at 400% of full rated current for 12 seconds per start without tripping.]
[Heavy Duty capable of 5 evenly spaced starts per hour at 400% of full rated current for 25 seconds per start without tripping.]
- E. The SCRs shall have a minimum P.I.V. rating of 1800Vac. Lower rated SCRs with protection by MOVs are not acceptable.
- F. A seismic qualification label shall be provided for all floor mount configuration units to comply with the latest IBC 2000 and NFPA 5000 guidelines.

2.08 Protection

- A. A microprocessor-based thermal protection system shall be included which continuously calculates the temperature-rise of the motor and soft starter and provides:
 - 1. A motor overload pre-alarm that indicates by relay contact or logic output that the motor windings have exceeded 130% of its rated temperature rise. This function shall be for alarm only.
 - 2. A motor overload fault will stop the motor if the windings have exceeded 140% of temperature-rise.
 - 3. An electronic circuit with a time-constant adjustable to the motor's thermal cooling time-constant ensuring the memorization of the thermal state even if power is removed from the soft starter.
- B. The soft starter shall provide line and motor phase loss, phase reversal, underload, stall, and jam protection.
- C. The soft start controller unit shall include a shorting contactor which closes after full voltage has been applied to the motor by the soft start to reduce the current carrying duty on the SCRs. The integral protective features shall be active even when the shorting contactor is used to bypass the SCRs during steady state operation.
- D. All units and options shall be constructed with protection provisions to pass UL 845 short circuit testing criteria at a minimum of 65,000 amperes short circuit current.
- E. Diagnostic faults and soft start status shall be displayed on the door-mounted keypad after a fault condition.

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- F. The motor must be automatically protected from solid state component failure by one of the following means: [select one]
[Shunt trip coil to trip disconnect in the event of a soft starter fault condition including a shorted SCR.]
[Isolation contactor that opens when the motor is stopped or when the controller detects a fault condition including a shorted SCR.]

2.09 Adjustments & Configurations

- A. All programming/configuration devices, display units, and field control wiring terminals shall be accessible on the front of the control module. Exposure to control circuit boards or electrical power devices during routine adjustments is prohibited.
- B. Digital indication shall provide, as a minimum, the following conditions:
1. Soft starter status - ready, starting/stopping, run.
 2. Motor status - current, torque, thermal state, power factor, operating time, power in kW.
 3. Fault status - Motor thermal overload, soft starter thermal fault, loss of line or motor phase, line frequency fault, low line voltage fault, locked rotor fault, motor underload, maximum start time exceeded, external fault, serial communication fault, line phase reversal fault, motor overcurrent fault.
- C. The starter shall be preset to the following for operation without adjustment in most applications:
1. Linear (torque-controlled) acceleration ramp of 15 seconds.
 2. Current limitation to 400% of the motor full load current rating.
 3. Class 10 overload protection.
 4. Motor current preset per NEC / NFPA 70 table 430.150 for standard hp motors.
- D. A digital keypad shall be utilized to configure the following operating parameters as required:
1. Motor full load amps adjustable from 40 to 130% of the controller's rating.
 2. Current limitation on starting adjustable from 150% to 700% of the motor current rating, not to exceed 500% of the soft start rating.
 3. Torque ramp adjustable from 1 to 60 seconds.
 4. Initial torque adjustable from 10 to 100% of nominal motor torque.
 5. Torque limit adjustable from 10 to 200% of nominal motor torque.
 6. Maximum start time adjustable from 10 to 999 seconds.
 7. Voltage boost adjustable from 50 to 100% of the nominal supply voltage.
 8. Selection of freewheel, soft stop or braking.
 9. Linear (torque-controlled) deceleration ramp time adjustable from 1 to 60 seconds.
 10. Threshold to change to freewheel following a soft stop from 0 to 100% of the nominal motor torque.
 11. Braking torque level adjustable from 0 to 100% effectiveness.
 12. Selection of Class 2, 10, 10A, 15, 20, 25 or 30 motor thermal overload protection.

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- E. A digital keypad shall be utilized to configure the following controller parameters as required:
 - 1. Selectable automatic reset operation.
 - 2. Cancellation of the torque control loop for multi motor installations.
 - 3. Adjustment of the stator loss estimation for specialty motors.
 - 4. Assignment of soft start inputs and outputs.
 - 5. Activation of phase reversal protection.
 - 6. Reset of motor thermal state.
 - 7. Return to factory parameter settings.
 - 8. Activation of test mode for use with low power motors.
 - 9. Indication of elapsed time in hours of starting, running and stopping.
- F. Output relays shall provide the following status indications:
 - 1. One Form A (N.O.) minimum for indication of fault.
 - 2. One Form A (N.O.) for indication that acceleration ramp is complete and current is below 130% motor FLA (end of start).
 - 3. One Form A (N.O.) assignable to one of the following functions: motor thermal alarm, motor current level alarm, and motor underload alarm.
- G. Additional inputs and outputs shall be available to provide the following status indications:
 - 1. Two assignable control inputs for the following functions: force to freewheel stop, external fault input, disable serial link control, external motor overload reset or general fault reset.
 - 2. Two assignable logic-level signal outputs for the following functions: motor thermal overload alarm, "motor powered" signal, motor overcurrent alarm, or motor underload alarm.
 - 3. One analog output shall be available for 4 to 20 or 4 to 20 milliamp indication of motor current, motor torque, motor power, motor thermal state, or power factor.
- H. Relay and I/O functions listed above must be isolated with respect to common.

2.10 Control Options

- A. The soft start's control circuit shall be fed from the line supply and be completely independent of the power circuit and separate from relay control logic.
- B. The peripheral soft starter control circuitry shall be operated from a control power transformer included within the enclosure.
- C. Operator devices shall be door mounted and shall be (Choose all that apply)
 - 1. Black START and red STOP push buttons.
 - 2. Three position H-O-A switch which provides for manual (HAND) start or remote signal (AUTO) start from user supplied relay contacts.
 - 3. (Available with reversing starter only) Three position FORWARD/OFF/REVERSE selector switch mounted on the door control island.
 - 4. Red RUN pilot light illuminated whenever the soft start is provided a run command and no fault condition is present.
 - 5. Green OFF pilot light illuminated whenever the soft start is supplied with control power and no run command is present.

2.11 Shorting Contactor (Standard on All Units)

- A. A microprocessor shall control the operation of the shorting contactor via an output relay.
- B. The shorting contactor shall close, shorting the SCRs after the acceleration ramp is complete and

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motor current is below 130% of motor FLA, and open on a stop command to allow a deceleration ramp.

- C. Overload protection integral to the soft starter shall continue to protect the motor when shorting is engaged.

2.12 Full Voltage Bypass [Optional—Delete If Not Needed]

- A. The soft start controller unit shall include full voltage starting capability to start and control the motor instead of the reduced voltage soft start method of starting the motor.
- B. The full voltage bypass shall be UL listed and shall include [an IEC rated] [a NEMA Rated] contactor capable of carrying the motor inrush and motor full load current.
- C. A door-mounted BYPASS/NORMAL selector switch shall be provided to enable the user to manually select a NORMAL mode to reduced voltage start the motor using the soft start or upon selection of the BYPASS mode the soft start will be left inactive and the motor will be started using an across the line full voltage starting method.
- D. An overload provision independent of the soft start shall be provided to protect the motor in the bypass mode.
- E. The full voltage bypass components shall be integrated inside the soft start controller unit and shall be fully tested by the MCC manufacturer.

PART 3 EXECUTION

3.01 Inspection

- A. Verify that the location is ready to receive work and the dimensions are as indicated.
- B. Do not install the soft start controller unit until the building environment can be maintained within the service conditions required by the manufacturer.

3.02 Protection

- A. Before and during the installation, the soft start controller unit shall be protected from site contaminants.

3.03 Installation

- A. Installation shall be in compliance with manufacturer's instructions, drawings and recommendations.
- B. The soft start controller unit manufacturer shall provide a factory certified technical representative to supervise the contractor's installation, testing and start-up of the soft start controller unit(s) furnished under this specification for a maximum total of [] days. The start-up service shall be quoted as a separate line item.

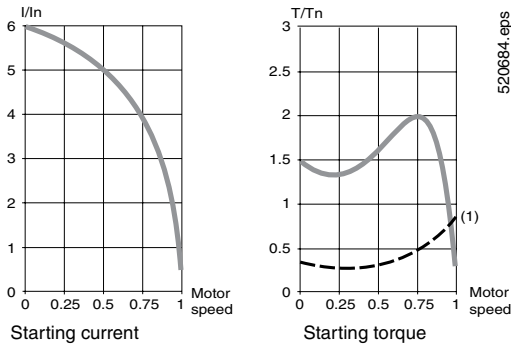
3.04 Training

- A. An on-site training course of [] training days shall be provided by a representative of the soft start controller unit manufacturer to plant and/or maintenance personnel and quoted as a separate line item.

END OF SECTION

Packaged Altistart 48 Soft Starts Conventional Starting Curves

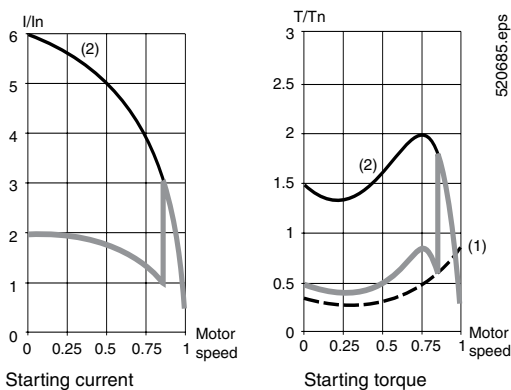
Direct starting



- Starting current: 4 to 8 times the nominal current
- Starting torque: 0.5 to 1.5 times the nominal torque
- Characteristics:
 - Motor with 3 terminals, low and medium power
 - On-load starting
 - High current peak and voltage drop
 - Simple device
 - Sudden starting for the mechanism
- No parameter adjustment

(1) Load torque

Wye Delta starting

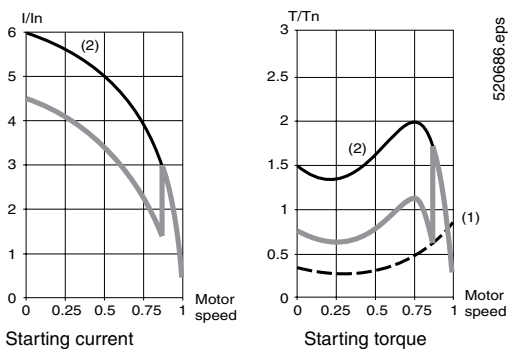


- Starting current: 1.8 to 2.6 times the nominal current
- Starting torque: 0.5 times the nominal torque
- Characteristics:
 - Motor with 6 terminals
 - No-load or low resistive torque starting
 - High current peaks and torque when changing to “Wye Delta” mode
 - A device requiring maintenance
 - Subject to mechanical stress when starting
- No parameter adjustment

(1) Load torque

(2) Direct Starting

Primary resistor starting

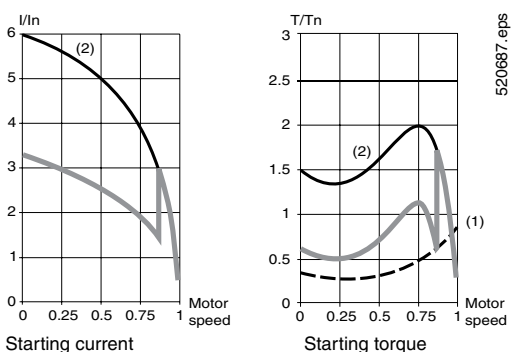


- Starting current: 4.5 times the nominal current
- Starting torque: 0.5 to 0.75 times the nominal torque
- Characteristics:
 - Motor with 3 terminals, high power
 - Starting with increasing resistive torque
 - High current peak
 - A large, bulky device requiring maintenance
 - Subject to mechanical stress when starting
- No parameter adjustment

(1) Load torque

(2) Direct Starting

Autotransformer starting



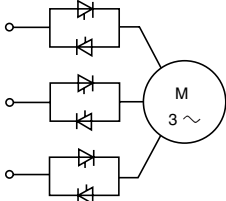
- Starting current: 1.7 to 4 times the nominal current
- Starting torque: 0.4 to 0.85 times the nominal torque
- Characteristics:
 - Motor with 3 terminals, high power
 - Large voltage drop and current peak when connected at full voltage
 - A complex, bulky device requiring maintenance
 - Subject to mechanical stress when starting
- No parameter adjustment

(1) Load torque

(2) Direct Starting

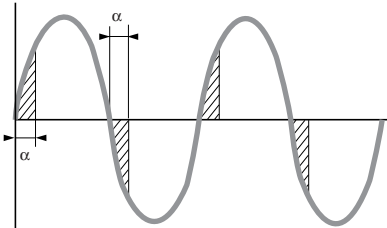
Packaged Altistart 48 Soft Starts Conventional Starting Curves

Conventional electronic starting with voltage ramp and current limit



Schematic diagram

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Firing angle

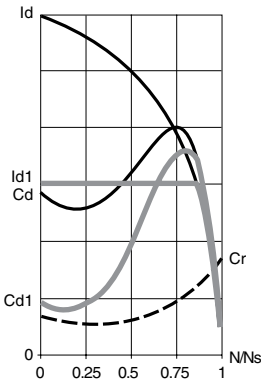


Figure 1

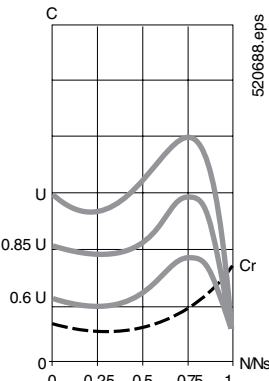


Figure 2

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- A soft start with 6 thyristors connected head-to-tail in each line phase is used to power the three-phase asynchronous motor by gradually increasing the voltage on start-up.
 - Depending on the firing time and angle of the thyristors, it can be used to supply a voltage which will gradually increase at a fixed frequency.
 - The gradual increase in the output voltage can either be controlled by the acceleration ramp, or by the value of the limiting current, or linked to both parameters.

- Figure 1 shows the behavior of the torque in relation to the starting current. Limiting the starting current I_{s1} to a preset value I_{s1} will reduce the starting torque T_{s1} to a value which is almost equal to the ratio of the square of currents I_s and I_{s1} .

Example

On a motor with the following characteristics: $T_s = 2 T_n$ for $I_s = 6 I_n$, current limiting at $I_{s1} = 3 I_n$ or $0.5 I_s$ results in a starting torque: $T_{s1} = T_s \times (0.5)^2 = 2 T_n \times 0.25 = 0.5 T_n$.

- Figure 2 shows the torque/speed characteristic of a squirrel cage motor in relation to the supply voltage. The torque varies like the square of the voltage at a fixed frequency. The gradual increase in the voltage prevents the instantaneous current peak on power-up.

Advantages of starting with the ATS48 Soft Start

• Conventional electronic starting

To rectify problems caused by:

- Mechanical stress when starting
- Hydraulic transients during acceleration and deceleration in pump applications

Conventional electronic starting requires the use of several current limits or the switching of several voltage ramps.

The settings become complicated and must be modified every time the load changes.

• Starting with the ATS48 Soft Start

The ATS48 soft start's torque control enables starting without mechanical stress and the smooth control of hydraulic transients with a single acceleration ramp. The settings are simple and effective, whatever the load.

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