

# TEAMMaster™

Medium Voltage Solid State Starters  
300 - 6,000 hp  
2,300 - 6,900 volts



# The **TEAMMaster™** Advantage

Today's global economy is in many ways driven by the AC Induction Motor. Industrial facilities worldwide depend on these motors to drive the machinery that enhances their efficiency and increases their production output.

However, many industrial operations unknowingly subject their machinery to severe stress during motor start-up. When motor operation is activated, high inrush currents flow into the motor's windings, producing very high levels of torque. This torque at the

TEAMMaster™ medium voltage soft starters provide several advantages including:

- Protection of machinery from failure and excessive maintenance caused by mechanical shock during starting or stopping. The TEAMMaster™ provides smooth, stepless acceleration and controlled deceleration.
- Control of the current ramp during start-up. The TEAMMaster™ protects electrical systems from disruptive voltage drops and power outages caused by motor locked rotor inrush current.
- Complete line monitoring, motor control and protection. These functions protect mission-critical motors from failure or unscheduled outages caused by machine or electrical system faults.
- Programming capabilities. The TEAMMaster™ includes control and power electronics, as well as bypass and isolation contactors that reduce maintenance and operating costs.
- A UL listing, CE mark, and a CSA approval.



motor's shaft can result in a substantial shock to the driven equipment. The result may be belts slipping or breaking, couplings disengaging, and gears or other components failing completely.

Therefore, it is often a cost-effective decision to protect your machinery investment with a TEAMMaster™ medium voltage soft starter. Available only from TECO-Westinghouse Motor Company, the TEAMMaster™ protects your machinery by controlling motor torque. The TEAMMaster™ also reduces current demand and creates a more stable line voltage which benefits facilities that have weak electrical systems.



# Prepackaged Solid State Starters with ATL Bypass

## SEVERE DUTY

### TEAMMaster™ Product Highlights

The TEAMMaster™ Medium Voltage Starter is a microprocessor controlled solid state reduced voltage starter for three phase induction motors. The starter provides a closed-loop current ramp for smooth stepless motor acceleration, supplied in a free standing enclosure.

Enclosures are available in NEMA 12 or NEMA 3R configurations. The medium voltage enclosure consists of two distinct compartments. The medium voltage, or power pole section, is located in the main body of the enclosure, whereas the low voltage section containing the control logic is located behind the door as an isolated compartment.

Each starter is supplied with a load break isolation switch, Class "R" motor fuses, an inline vacuum contactor, solid state power poles, and a vacuum bypass contactor. This bypass connector is used to bypass the SCR power poles once the motor is up to full speed.

The logic control incorporates the proprietary software that has all the circuitry required to drive the power semiconductors, which are located in the power section.

TEAMMaster™ starters provide solid state reduced voltage starting for normal operation and full voltage emergency back-up starting, with complete electronic motor protection at the flip of a switch.

This unique redundant design is ideal for critical applications where downtime is extremely disruptive and cannot be tolerated.

The proprietary solid state controls provide precise digital starting and stopping, motor protection, metering, diagnostics and communications as a standard.



## STANDARD FEATURES

- NEMA 12 or NEMA 3R Enclosure
- UL374 listed Class E-2 Solid State Starter
- 45kv Base impulse level (bil)
- 200MVa (2300V)/ 350 mVa (4160 VAC) short circuit fault load
- 500% - 30 second rated
- 8000 peak inverse voltage (PIV) (2100V); 12,000 PIV (4.2kV) both UL347 certified and listed
- Fiber optic cabling
- Modbus/ RS485
- Selectable solid state or emergency full voltage operation via selector switch mounted inside of LV compartment
- Load matched Class R fusing with blown fuse indication
- 400A load break, 600A continuous, 5KV rated disconnect switch, with viewing window, grounding assembly and lockable handle mechanism. Mechanically interlocked for safety.
- Fixed mounted, start duty rated vacuum contactors for isolation and SCR bypass, wired for normal bypass operation and full voltage start operation, with (2) N/O and (2) N/C auxiliary contacts.
- Separately mounted "SPE" series electronic overload device has the following standard features:
  - Class 10-30 adjustable
  - Phase imbalance protection
  - 1 NO/1 NC trip contact
  - Phase reversal protection
  - "Trip free" design
  - Phase loss protection
- Built-in self test (BIST) features for "quick commissioning"
- 120VAC, 1000VA CPT with primary and secondary fusing, with 500VA available for customer use
- Door-mounted start and stop push buttons.
- Door-mounted LCD keypad

## **Feature rich, the TEAMMaster™ Starters allow for a wide variety of settings**

2 Selectable ramp times	Selectable trip levels and times
Ramp profile (Linear, S curve, Squared)	- Over and Under voltage
Start up mode	- Over and Under current
Starts per hour	- Ground fault
Time between starts	- Phase loss and imbalance
Ground fault current	Analog input for trip level
Local and Remote run source selections	Analog and Meter output configuration
L1-L2, L1-L3, L2-L3 voltage	RS 485 configuration
Motor amps	Up to speed time limit
Motor "Kick" level and times	Initial and Max currents for ramps 1 & 2
Service factor	Initial voltage
Overload class select	Initial and Max torque settings
Stop via ramp, coast, or DC braking	Auto reset of faults
Decel ramp profile	Auto start on power up
Slow speed operation (Jog simulation)	

## **Real-Time metering goes far beyond simply starting a motor and ramping it up to speed. Monitoring capabilities are as follows:**

±3% accuracy	VARs
Average current	Line frequency
Input current at each phase (L1, L2, L3)	Analog input
Current imbalance %	Analog output
Ground fault current	Run time: Days, Hours
Average volts	# of Starts
L1-L2, L1-L3, L2-L3 voltage	TruTorque® %
Overload %	Power %
Power factor	Peak starting current
Watts	Last starting duration (Elapsed time)
Volt-Amps	Real time clock
kW and MW hours	RTD temperatures
Phase order	

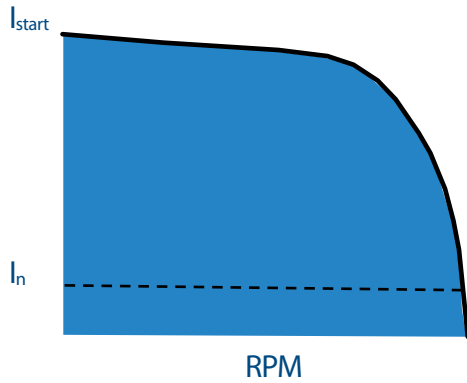
## **Motor protection features for overall equipment protection and safety**

Up-to-speed timer exceeded	Ground fault (Residual or Zero sequence)
Low line voltage	Disconnect fault
Low line frequency	In-line contactor fault
Phase reversal	Control power low
Phase Loss	Independent starting and running overloads
Instantaneous overcurrent	Motor thermal overload
Over and Under current	Stack over temperature
Current imbalance	Motor PTC input
Shorted SCR	

**MVRXE Medium Voltage Solid State Starters offer superior performance when compared to Across-The-Line or Auto Transformer Starts, as shown below.**

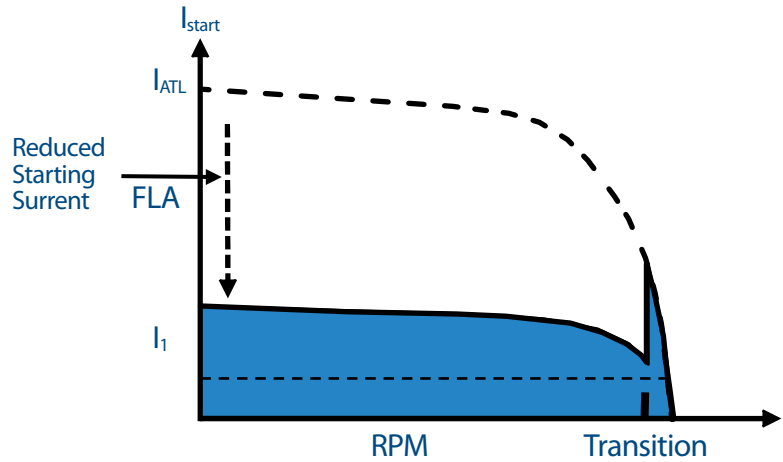
## ACROSS THE LINE (ATL)

Motor Inrush Current ( $I_{start}$ ) Typically 500-800%  
Motor Full Load ( $I_n$ ) Current



## AUTO TRANSFORMER REDUCED VOLTAGE STARTER

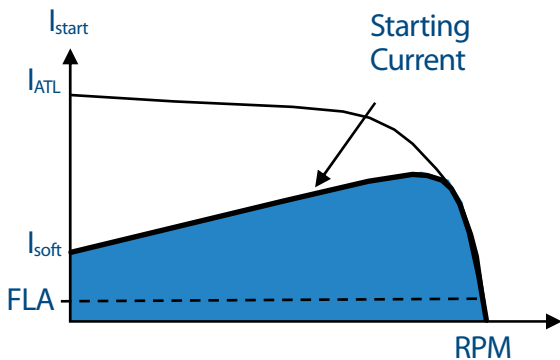
Starting current is reduced as the square of the applied voltage reduction. Current spikes occur at transition.



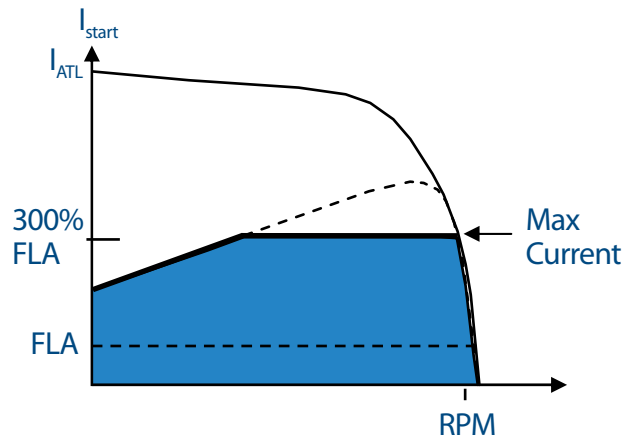
## Soft Start Motor Current Ramp

Lower peak currents and absence of spikes reduces energy costs and produces less motor/ process equipment wear and tear.

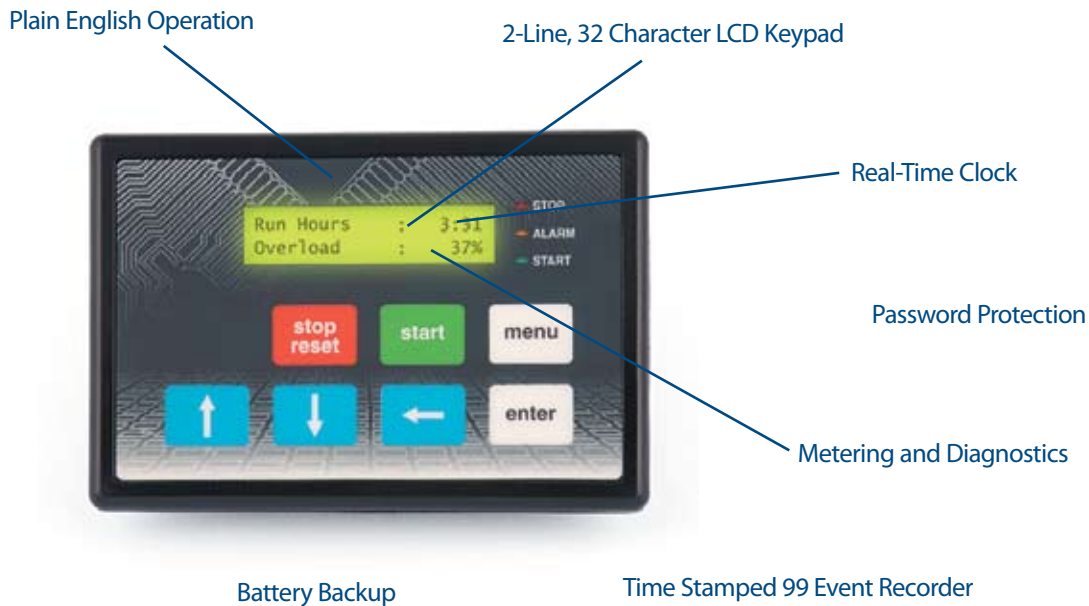
## TYPICAL CLOSED LOOP CURRENT RAMP PROFILE



## CURRENT RAMP WITH MAX CURRENT SETTING



# Powerful, Intuitive User Interface Provided with each Starter



## Selectable Starting Modes

- Voltage ramp
- Current ramp
- kW ramp
- Linear / Tach ramp
- Dual ramps

- TruTorque® ramp
- Cyclo® converter ramp
- Full voltage
- Adjustable kick currents

## Available Options

- Pilot lights
- Hand-Off-Auto selection
- Local-Off-Remote selection
- Metering: Amps, Volts, Watts
- Control relays
- Ground Fault relays and current
- RTD modules
- Control power supply/ 1000VA
- Additional control power up to 2000VA
- Door interlocks
- Surge arrestors

Additional RS485 protocols:

- Profibus
- Ethernet
- DeviceNet
- LonWorks

Transformers

Output signal transducers

Multilins

Space heaters

E-Stops

## TEAMMaster™ has been applied in Successful Solutions as follows

### Industries

- Power generation
- Chemical processing
- Pulp and paper production
- Oil and gas processing
- Municipal fresh water
- Wastewater
- Aggregate and mining
- Cement production
- Steel and aluminum

### Applications

- Pumps
- Fans and blowers
- Mixers and refiners
- Crushers
- Ball and hammer mills
- Compressors
- Chillers
- Conveyors
- Centrifuges

## SEVERE DUTY

MVRXE12 - 2300 VOLT						
MODEL	HP	FLA AMPS	DIMENSIONS (IN)			WT (LBS)
			H	W	D	
MVRXE12-650-2300-**	650	160	92	36	32	1,800
MVRXE12-750-2300-**	750	180	92	36	32	1,800
MVRXE12-1500-2300**	1,500	360	92	36	32	1,800

MVRXE18 - 4160 VOLT						
MODEL	HP	FLA AMPS	DIMENSIONS (IN)			WT (LBS)
			H	W	D	
MVRXE18-1000-4160-**	1,000	133	92	36	32	2,000
MVRXE18-1500-4160-**	1,500	200	92	36	32	2,000
MVRXE18-3000-4160-**	3,000	360	92	36	32	2,000

For ratings larger than 3,000 hp, or input voltages above 4,160 VAC, please consult the factory.

### Notes:

Starters are top entry/ bottom exit - top exit available upon request.

Dimensions and weights are approximate.

Insert appropriate option code as shown below:

\*\*NEMA 12 = 12

\*\*NEMA 3R = 3R

Power fuses ship loose. Please provide motor full load amps at time of order for proper fuse sizing.

Model	Standard Options
A171	Space Heater with Thermostat (Included in NEMA 3R Option)
A008	E-Stop Push Button, Mushroom Head, Red
A406	8 Channel RTD Module, 100 OHM Platinum (Also Available for Remote Mounting, Call Factory for Details)
A407	16 Channel RTD Module(s), 100 OHM Platinum (Also Available for Remote Mounting, Call Factory for Details)
A408*	Top Hat Enclosure Module for Top Entry (18"H x 30"W x 20"D), Top Left or Top Right Mounting. Accommodates Stress Cones.
A409	Service Entrance Labeled
A106	Additional 1000VA Control Power Transformer

Protective Relay Options	
A875	Ground Fault CT, 2000:1, 4.0:Dia. (For Internal Processor Use)
A876	Ground Fault CT, 2000:1, 8.13:Dia. (For Internal Processor Use)

The TeamMaster series was designed as an integrated package.

Listed above are the available modular options. For systems requiring more extensive requirements, please contact TECO-Westinghouse Motor Company directly.

\*Top hat will ship loose for customer installation.

### Lead Time:

Built-to-order: Please allow 1-2 weeks for shipment of complete TeamMaster™ unit when ordering these options to a stock starter.

TECO-Westinghouse Motor Company offers a three year warranty on TEAMMaster™ products when an authorized factory start-up is included with the order. For other warranty arrangements, such as starter/ motor/ combined packages, please consult the factory.

# ***Full Voltage Controllers for Three Phase Induction Motors***

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***TECO-Westinghouse Medium Voltage Control is not limited strictly to TEAMMaster™ reduced voltage starters. A whole new dimension of capabilities and solutions for medium voltage is also available as well.***

Full voltage motor starters are full voltage controllers for three phase induction motors. Combination CFMVATL starters are supplied in a NEMA 1, 3R, or 12 free standing enclosure.

CFMVATL series starters are supplied with a load break/fault make disconnect isolation switch, Class R motor current limiting fuses, vacuum motor starting contactor, and SPE Series electronic overload protection.

Enclosures consist of two distinct components. The medium voltage section is located in the main body of the enclosure, while the low voltage section containing the control logic is located behind the door in an isolated compartment.

## ***Key Advantages:***

- NEMA 1, 12, 3R enclosures
- Disconnect switch (load break/ fault make, grounding bar, viewing window)
- Class R current limiting motor fusing
- Vacuum motor starting contactor
- Start/ Stop pushbuttons
- SPE Series electronic overload protection

## ***Reversing Motor Starters***

- Solid state starter
- Vacuum contactors for motor reversing
- Applications in aggregate crushers, shredders, rubber mills, coal mills, plus many more.

## ***Synchronous Motor Solid State Starters***

- Soft start stator control
- Synchronous speed monitoring packages
- Solid state DC field excitor
- Applications for chillers, compressors, ball mills, pumps, chippers, and shredders.





# Full Voltage Controllers for Three Phase Induction Motors

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## 15KV Class Solid State Reduced Voltage Starters

- 10,000/ 11,000/ 13,000 volt nominal operating voltages up to 30,000 horsepower
- Combination or non-combination configurations
- Standalone or motor control center lineups
- Custom enclosure and transition sections

## Intelligent MV Motor Control Centers/ Lineups

### Incoming Section(s)

- Main breakers or disconnects
- Main-Tie-Main (MTM) arrangements
- Main lug only sections
- 400/ 600/ 1200 amp load break fault make disconnects
- Surge protection devices
- Metering and communications



## Custom Configured Multiple Unit Motor Control Center (MCC) Lineups

- Transition sections to third party equipment
- 800/ 1200/ 2000/ 3000 amp horizontal bus
- Reduced voltage/ full voltage/ feeder controls
- Back to back construction



# ***Full Voltage Controllers for Three Phase Induction Motors***

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## ***Two Speed/ P.A.M. Motor Starters***

- Solid state starter
- Vacuum contactors for speed changing
- Applications include power generation plant ID fans, FD fans, Banbury mixers

## ***Multiple Motor Starting***

- Solid state starter
- Individual motor protection
- Applications include aggregate and coal conveyors, crushers, grinders, shredders

## ***Wound Rotor Motor Starters***

- Solid state starter
- Rotor resistors, shorting contactors, and interface
- Applications in aggregate, steel, mining, paper, power generation industries

## ***Capacitive Start/ Switching Controls***

- Solid state starter
- Capacitor banks, switching contactors, power monitoring devices
- Excessive voltage drop improvement, plant bus support, remote utility grid access

## ***Mine Duty Skid-Mounted Starters***

- Low profile skid mount mining packages
- Stand up skid mount mining packages
- 2300-13,800V



## Applications

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**TeamMaster™ starters are designed for use with medium voltage and synchronous motors such as those offered by TECO-Westinghouse Motor Company shown below.**

### **Global-Plus™ TEFC NEMA Premium Efficiency**



- Designs up to 2,000 hp
- Factory Self-Certified for Class I, Division II, Groups B, C, D
- 1.15 Service Factor Continuous
- Cast Iron Frame (Rolled Steel Fan Covers)
- Copper/ Copper Alloy Rotor Construction
- 1045 Carbon Steel Shaft
- Applications: Pumps, Fans, Blowers

### **Global-HD™ WP1 Medium Voltage**



- Designs to 1,250 hp
- 1.15 Service Factor-Continuous
- Cast Iron Frame, End Bells, and Conduit Box
- Copper/ Copper Alloy Rotor Construction
- 1045 Carbon Steel Shaft
- Applications: Pumps, Compressors, Fans, Blowers

### **World Series® Motors**



- 250 hp - 30,000 hp Range
- Rugged Frame Construction
- Copper Rotor Bar Construction
- Split Sleeve Bearings - Outstanding Service
- High Operating Efficiency
- Custom Designed for Specific Applications

### **Synchronous Motors**



- 1,000 hp - 30,000 hp Plus
- Constant Speed Operation
- High-Efficiency Ratings
- Low In-Rush Currents
- Performance Optimized Air Gaps, Slot Openings, and Slot Rates
- Stranded Copper on Stator Windings to Minimize Eddy Current Losses



*Available from:*



**TECO-Westinghouse Motor Company**

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Round Rock, Texas 78681  
1-800-279-4007

[www.tecowestinghouse.com](http://www.tecowestinghouse.com)

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