

# Greenheck Motor Starters

*The worlds best fans deserve  
the best motor protection.*



 **GREENHECK**  
Building Value in Air.

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# Greenheck Motor Starters

## Engineers

### Are you ensuring the best quality and consistency with your motor starter specification?

The motor starter you specify is critical to ensuring maximum protection for today's high efficiency fan motors. It can also be used to interface with the building management system (BMS). Specifying Greenheck's motor starter with your fan will ensure that you get the best possible protection for your fan.

### Specify Greenheck motor starters with your fan and:

- Get the best and quickest responding motor protection available.
- Select additional features for damper control and fire safety system interfacing.
- Greenheck's CAPS program automatically sizes the motor starter to match the fan.



## Contractors

### Are you spending too much time coordinating motor starter issues at the jobsite?

Yes, it is possible to provide a superior motor starter, save money, and eliminate jobsite headaches. The Greenheck motor starter provides superior motor protection, has an attractive first cost, and ensures that the starter is correctly sized and tagged to match the fan. Coordinating motor starters really can be that easy!

### Furnish Greenheck motor starters with your fan and:

- Eliminate sorting and guess work at the jobsite. Starters ship with tags that match the fan.
- Significantly reduce installation time with intelligent pre-engineered design and easy plug-in terminal strip.
- Fine tune with adjustable wide range electronic overload protection.
- Eliminate start-up delays.

## Communication Challenges

Communication breakdowns between the mechanical and electrical trades often lead to challenges with motor starters.

### Examples:

- Mismatch between the starter and fan motor due to misinterpreted specifications.
- Expensive change orders when starters are forgotten in the bidding process.
- Design changes not being coordinated between the engineer, mechanical and electrical trades.

These miscommunications cost time and money and often lead to starter installations that provide minimal protection to the fan motor.

Maximize protection to your motor with a Greenheck motor starter.

## Built-up Starters

Even with good communication, problems can occur when "built-up" starters use mismatched, incomplete or poor quality components.

*Built-up Starter Components*



One of the fundamental functions of a motor starter is to protect the motor from damage due to overheating. The protection in Greenheck motor starters is the best in the business.

As with most starters, Greenheck motor starters provide basic overload protection based on the maximum FLA (full load amps) setting, phase unbalance, and cycle fault (when the starter is activated at a rate exceeding 20 starts/min.). But then we go beyond.

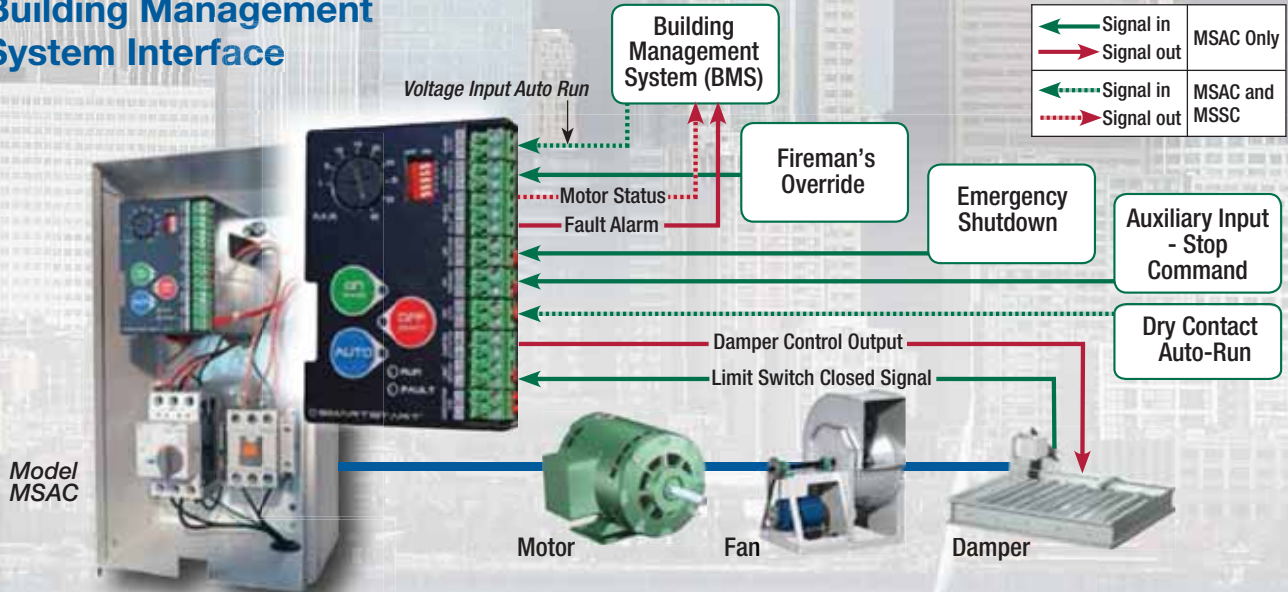
**Rapid Locked Rotor Detection:** Other starters with locked rotor protection take 10 seconds to respond. Greenheck’s starter detects a locked rotor within 0.5 seconds, extending motor life.

**Maximum Time to Start:** Monitors inrush current to detect harmful extended starting conditions and trips the motor if it doesn’t start in 10 seconds, regardless of FLA setting—extending motor life.

**Out of Calibration:** Based on the inrush current, the overload will determine the motor’s nominal running amps. The starter will trip and protect the motor in situations where the overload is set outside the calculated motor protection range.

**Stall Prevention:** Similar to the “Locked Rotor Detection” feature, but engages after the motor is running at FLA. So if the impeller jams, the motor is stopped before critical damage occurs.

**Building Management System Interface**



Model MSAC

**Models**

Greenheck motor starters are intelligently designed and pre-engineered to make system integration easy and reliable. Models are available, depending on the desired interface with the building management system.

| Model Features  | MSAC | MSEM/MSTS | MSSC |
|---|------|-----------|------|
| Voltage input from BMS                                    | x    | x         | x    |
| Auxiliary input (run command contact)                     | x    | x         | x    |
| Motor status output                                       | x    | x         | x    |
| Fault alarm output signal                                 | x    | x         |      |
| Fireman's override  | x    | x         |      |
| Emergency shutdown  | x    | x         |      |
| Damper control output and limit switch closed loop signal | x    | x         |      |
| Auxiliary input (stop command contact)                    | x    | x         |      |



# Motor Starter

## Energy Management MSEM, MSTS

### Features and Functions

The MSEM features all of the same controls options of the MSAC while adding voltage and power protection into the mix. The MSEM features settings that can be displayed and adjusted on the LCD screen and a suite of options to tailor it to a specific application.

### Building Management System Integration

The MSEM has two separate options for superior integration with a BMS system. The MSEM can provide this option in the form of BACnet® or Modbus Communications. This allows the starter to relay information to the BMS system, including run and fault status, what fault a particular MSEM is experiencing, general settings and measurements information.

### System Monitoring

The MSEM features an option for Ethernet Fault Logging. This allows the MSEM to record any faults that may occur and store them at an IP address for remote viewing. Alternatively, the “Power Monitoring” selection allows the MSEM to do more in-depth analysis of the source power. This includes a history of the power use, power metering, and energy usage.

### Further Customization

To further customize a selection, the MSEM has optional Ground Fault protection to protect your circuit from “leaking” current to ground as well as two options for damper control: 24VAC and 120VAC. Lastly we offer the MSTs, a two-speed version of the MSEM to round out the number of applications where this starter can be used.



| MSEM               |                     |            |
|--------------------|---------------------|------------|
| Phase              | 1Ø                  | 3Ø         |
| Voltage            | 115 - 230           | 200 - 575V |
| Max. Horsepower    | 15                  | 300        |
| Amps               | 1 - 300             |            |
| Class              | 5 - 30              |            |
| Enclosure          | NEMA 1 or 3R        |            |
| Disconnect         | Yes (optional)      |            |
| Lock-Out Ready     | Yes                 |            |
| Reset              | Manual              |            |
| Stall/Locked Rotor | 2 seconds @ 300%FLA |            |

- | Options                               |
|---------------------------------------|
| • Power monitoring board              |
| • BACnet® communications board        |
| • Modbus communications board         |
| • Ethernet I/O board                  |
| • Two speed motor option (model MSTs) |
| • 24VAC or 120VAC damper power        |
| • Ground fault protection             |



MSEM and MSTs models are Listed for enclosed industrial control panel (UL/cUL) File E242640

# Motor Starter

## Universal Single Phase



### Features and Functions

The fundamental function of a motor starter is to protect the motor from damage that can occur from overheating. Greenheck motor starters will provide you with the best motor protection available.

#### Disconnect/Physical Interface

An On/Off switch with a concealed Hand/Auto switch is incorporated into the interface of the starter for advanced controllability. The MS-1P includes LED indicator lights that display power, run, fault status and a Lockout/Tagout switch to meet safety regulations.

#### Overload Protection

Electronic Class 10 adjustable electronic overload with protection up to 16A. The use of thermal elements are not required.

#### Easy System Integration

Building automation ready with pre-engineered input and output capabilities specifically designed for fan operation and eliminates interposing relays for wet or dry contacts.

#### Installation

Unit is easy to install in any location in a single gang box for a surface or flush mount.

| MS-1P              |                               |
|--------------------|-------------------------------|
| Phase              | 1Ø                            |
| Voltage            | 120-240V                      |
| Horsepower         | 0.1 - 1                       |
| Amps               | 1 - 16 FLA                    |
| Class              | 10                            |
| Enclosure          | NEMA 1, 4 or 4X               |
| Disconnect         | Yes                           |
| Lockout Ready      | Yes                           |
| Reset              | Manual                        |
| Stall/Locked Rotor | Trips at 2 seconds @ 300% FLA |

| Control Features                      |                             |
|---------------------------------------|-----------------------------|
| <b>Inputs</b>                         |                             |
| Voltage input from BMS                | 12-120V AC/DC               |
| Auxiliary input (run command contact) | N.O. dry contact closure    |
| <b>Outputs</b>                        |                             |
| Motor status output                   | N.O., 0.3A@125VAC; 1A@24VAC |
| Fault alarm output signal             | N.O., 0.3A@125VAC; 1A@24VAC |



MS-1P model is Listed for manual motor controller (UL/cUL) File E258387

**Physical Interface** - Hand/Off/Auto (HOA) keypad with corresponding LED lights. Also, LED status indicators.

**Overload Protection** - Electronic Class 10 overload protection with FLA capability up to 40A. A large dial provides easy and accurate adjustment of full FLA setting. MSAC may be set to Class 10 or Class 20.

**Disconnect** (optional) - Provides short-circuit protection and allows manual control of input power to the motor for fan servicing. Includes a lockable switch and resettable motor circuit protector with phase unbalance protection.

Disconnect must be within 50 feet and in line of sight to motor.

**Easy System Integration** - Building automation ready with pre-engineered input and output capabilities specifically designed for fan operation.

**Magnetic Contactor** - Closes contacts to allow input power to pass through to the motor when it receives the energize signal.

**Enclosure** - 16 gauge steel with industrial polyurethane coating.

- NEMA-1 enclosure is available for indoor installations. Lockable door is standard.
- NEMA-3R enclosure is available for outdoor installations. Door is lockable with full perimeter gasket. Keypad is also lockable.



*Model MSAC shown with optional disconnect switch*

| Horsepower Range<br>(for MSSC/MSAC only) |         |
|--|---------|
| 200/208 V                                | ¾-7½ hp |
| 230 V                                    | ¾-10 hp |
| 460 V                                    | ¾-20 hp |
| 575 V                                    | ¾-25 hp |



MSSC/MSAC models are Listed for enclosed industrial control panel (UL/cUL) File E242640

## Starter Specifications

### Motor Starter Standard Control (MSSC)

Magnetic Motor Starters for 3 phase motors shall be enclosed in a 16 gauge steel, industrial polyurethane coated enclosure with the appropriate environmental rating. Starters shall consist of a horsepower rated magnetic contactor, a minimum of one Normally Open and one Normally Closed auxiliary control contacts and solid state electronic overload relay. Overload relay shall protect all three phases with an adjustable current setting of 1-40 amps to allow field adjustment for specific motor Full Load Amps (FLA). Interchangeable heater elements are not acceptable.

The overload relay must provide the following motor protection features: If the FLA on the overload is set outside an acceptable range to properly protect the motor, the overload must trip and close a contact to indicate fault event. Overload relay shall provide phase failure, phase loss, cycle fault and stall protection. Overload must detect a locked rotor upon startup and trip within 0.5 seconds if such condition is detected. Overload must also monitor motor inrush current on startup and if detected FLA does not reach nominal running amps within 10 seconds, trip and stop the motor. Provide field selectable manual or automatic reset of overload as well as reset pushbutton on the starter cover to restore normal operation after a trip or fault condition. In the event of a power failure, starter shall restart in last known operating mode.

When the starter is remotely controlled by an automation system, the starter shall include remote run terminals

which accept both a voltage input signal and a contact closure. The voltage run input shall accept both AC and DC signals from 12-250V to allow direct connection of the transistorized automation signal to the starter. Starter must contain an integral current sensor with Normally Open contact which closes to indicate motor run status.

Installed accessories shall include Hand-Off-Auto operation switch with LED pilot light indicators for Hand, Off, Auto, Run and Overload conditions. All pilot devices shall be water tight and dust tight. Manufacturer shall provide and install tags with engraved lettering to designate equipment served. All starters must be provided with a universal power supply capable of a 200 to 600 volt input range.

Enclosed combination starters shall include all of the magnetic starter requirements in addition to a disconnecting method in accordance with National Electrical Code. Each disconnect shall be of the Motor Circuit Protector type, carry a UL 508F rating and provide a minimum interrupting rating of 30,000 Available Interrupting Current (AIC) for the combination starter. All disconnects shall include a lockout mechanism when in the off position.

The starter or combination starter shall be UL Listed.

### Motor Starter Advanced Control (MSAC)

All requirements for MSSC plus the following:

The starter shall provide a provision for Fireman's Override operation. When activated, the starter



# Starter Specifications

must run the motor in any mode (Hand, Off or Auto) regardless of other inputs or lack of inputs either manual or auto. If the starter is controlled by a fire alarm or life safety system, the starter shall include an Emergency Shutdown input which will disable the starter from operating in either Hand or Auto mode regardless of other inputs either manual or auto.

In applications where the motor is interlocked with a damper or valve and 24VDC actuator, control must be available within the starter enclosure. The starter must be able to provide a voltage output to operate the actuator to open the damper or valve without closing the motor circuit. The starter will only close the motor circuit and start the motor after it has received a contact closure from a limit or end switch confirming the damper or valve position.

In the event of a power failure, starter shall also be capable of restart with 10 second delay, or restart in "off" mode.

Starter must contain a Normally Open contact which closes when an overload trip condition occurs.

The starter or combination starter shall be UL Listed.

## **Motor Starter Energy Management (MSEM/MSTS)**

Magnetic Motor Starters shall be enclosed in a general purpose electrical enclosure with the appropriate environmental rating. Starters shall consist of a horsepower rated magnetic contactor with a minimum of one Normally Open and one Normally Closed auxiliary contacts and solid state electronic overload relay. Overload relay shall protect all three phases with a wide range current setting and trip class to allow field adjustment for specific motor FLA. Interchangeable heater elements are not acceptable. Overload relay shall provide phase failure, phase loss, locked rotor and stall protection. Provide a manual reset pushbutton on the starter cover to restore normal operation after a trip or fault condition. Each starter shall include an installed 50VA control power transformer (CPT) with protected secondary. The CPT must accept the available line voltage and the control voltage shall not exceed 120V. Installed accessories shall include Hand-Off-Auto operation switch with 22mm style operator interfaces. Include LED pilot light indicators for Hand, Off, Auto, Run and Overload conditions. All pilot devices shall be water tight and dust tight.

When remotely controlled by an automation system, the starter shall include remote run terminals which accept both a voltage input signal and a contact closure. The voltage run input shall accept both AC and DC signals including 24VAC, 120VAC, 24VDC and 48VDC to allow direct connection of the transistorized automation signal to the starter. In applications where the motor is interlocked with a damper or valve, the actuator control must reside within the starter enclosure. The starter

must provide a voltage output to operate the actuator to open the damper or valve without closing the motor circuit. The starter will only close the motor circuit and start the motor after it has received a contact closure from a limit or end switch confirming the damper or valve position. The starter shall provide a provision for Fireman's Override operation. When activated, the starter will run the motor in any mode (Hand, Off or Auto) regardless of other inputs or lack of inputs either manual or auto. The purpose of the Fireman's Override input is to act as a smoke purge function. Fireman's Override has priority over the Emergency Shutdown input. If the starter is controlled by a fire alarm or life safety system, the starter shall include an Emergency Shutdown input which will disable the starter from operating in either Hand or Auto mode regardless of other inputs either manual or auto. Manufacturer shall provide and install tags with engraved white lettering to designate equipment served.

Enclosed combination starters shall include all of the magnetic starter requirements in addition to a disconnecting method. All disconnects shall include a lockout mechanism when in the off position. Motor circuit protectors (MCP) shall be provided as the acceptable form of disconnecting means. The MCP shall be a UL Listed 508 current limiting manual motor starter with magnetic trip elements only. The MCP shall carry a UL 508F rating (up to 100A frame size) which provides for coordinated short circuit rating for use with the motor contactor and provides a minimum interrupting rating of 30,000 AIC for the combination starter.

The starter or combination starter shall be UL Listed.

## **Motor Starter Single Phase (MS-1P)**

The single phase motor starter shall consist of a manually operated quick-make toggle mechanism lockable in the "Off" position which can also function as the motor disconnect. The starter shall provide thermal overload protection with an adjustable current setting of 1-16 amps to allow field adjustment for specific motor Full Load Amps (FLA). Starter shall be equipped with LED status lights to indicate power, run and fault status. The starter must include the capability to operate in both manual and automatic control modes. When the starter is remotely controlled by an automation system, the starter shall include remote run terminals which accept both a voltage input signal and a contact closure. The voltage run input shall accept both AC and DC signals from 12-120V to allow direct connection of the transistorized automation signal to the starter. Starter must contain an integral current sensor with Normally Open contact which closes to indicate motor run status as well as a normally open contact which closes when an overload trip condition occurs.

The starter shall be UL Listed.

# Motor Starter Offering

## Model Comparison



|                         | MS-1P  | MSSC   | MSAC   | MSEM / MSTs  |
|-------------------------|--|--|--|--|
| <b>Description</b>      | Hand/Off/Auto (HOA) capability in a single phase package with wide range overload. Universal application.  | An economical starter with advanced motor protection.  | An innovative and versatile starter. Proven for reliability and advanced control capability.   | The most versatile starter. Can be customized and programmed for most applications with extra options. (see page 3)  |
| <b>Ranges</b>           | 1Ø, 110-240V, 0.1-1 hp   | 3Ø, 200-600V, 1-25 hp  | 3Ø, 200-600V, 1-25 hp  | 1Ø up to 15 HP, 3Ø up to 300 hp  |
| <b>User Interface</b>   | On/Off switch, recessed hand-auto mode switch, LED status indicators (power run fault).  | Hand/Off/Auto (HOA) keypad with corresponding LED lights. LED status indicators (power, run, fault).   | Hand/Off/Auto (HOA) keypad with corresponding LED lights. LED status indicators (power, run, fault).   | HOA Keypad with corresponding LED lights, LED status indicators (power, fault, run), and LCD screen for viewing/editing settings.  |
| <b>Overload Type</b>    | Wide range electronic overload (1-16FLA) class 10  | Wide range electronic overload (1-40FLA) class 10  | Wide range electronic overload (1-40FLA) class 10 or 20  | Wide range electronic overload (1-300 amps). Class 5-60  |
| <b>Control Features</b> | Voltage input from BMS<br>Auxiliary input (run command contact)<br>Motor status output<br>Fault alarm output signal  | Voltage input from BMS<br>Auxiliary input (run command contact)<br>Motor status output   | Voltage input from BMS<br>Auxiliary input (run command contact)<br>Motor status output<br>Fault alarm output signal<br>Fireman's override<br>Emergency shutdown<br>Damper control output and limit switch closed loop signal<br>Auxiliary input (stop command contact) | Voltage input from BMS<br>Auxiliary input (run command contact)<br>Motor status output<br>Fault alarm output signal<br>Fireman's override<br>Emergency shutdown<br>Damper control output and limit switch closed loop signal<br>Auxiliary input (stop command contact) |
| <b>Enclosures</b>       | Compact design conceals hand/auto switch behind sliding door. Mounts on a single gang box.<br><br>Indoor (NEMA-1) enclosure.<br>Outdoor (NEMA-4) enclosure is weather resistant. | Indoor (NEMA-1) enclosure constructed of 16 gauge steel. Lockable door.<br><br>Outdoor (NEMA-3R) enclosure is weather resistant with a fully gasketed door. Constructed of 16 gauge steel. Door and keypad are lockable. | Indoor (NEMA-1) enclosure constructed of 16 gauge steel. Lockable door.<br><br>Outdoor (NEMA-3R) enclosure is weather resistant with a fully gasketed door. Constructed of 16 gauge steel. Door and keypad are lockable.   | Indoor (NEMA-1) 16 gauge steel and plastic enclosure. Lockable door.<br><br>Outdoor (NEMA-3R) enclosure is weather resistant with a fully gasketed door. Constructed of 16 gauge steel. Door and keypad are lockable.  |
| <b>Disconnect</b>       | Allows manual control of input power to motor and provides short circuit protection.   | Allows manual control of input power to motor and provides short circuit protection. Lockable handle, no fuses required.<br><i>Optional</i>  | Allows manual control of input power to motor and provides short circuit protection. Lockable handle, no fuses required.<br><i>Optional</i>  | Allows manual control of input power to motor and provides short circuit protection. Lockable handle, no fuses required.<br><i>Optional</i>  |

