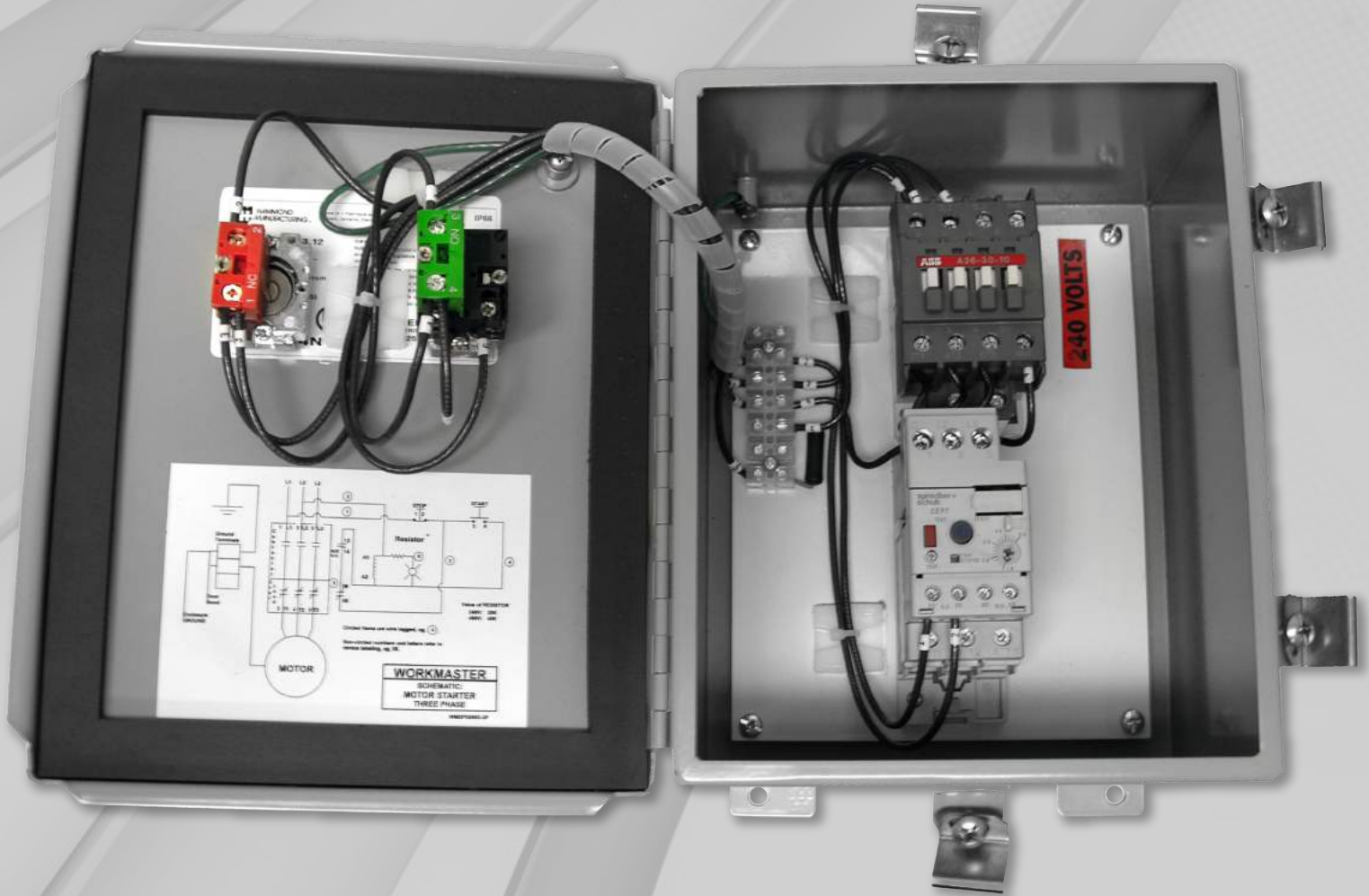


WORKMASTER®

WE FIND A WAY — OR MAKE ONE!

SOLID STATE MOTOR STARTERS



For

ALL VIBRATORS, MOTORS, & DRIVES

Master Distributor

AIRMATIC® INC

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...HELPING PRODUCERS EXCEL!

www.airmatic.com

284 Three Tun Rd Malvern, PA 19355-3981

ELEMENTS OF A MOTOR STARTER

Motor Starters are used to both protect and control industrial electric motors. The control can be manual, in the form of push button controls (START and STOP), interlocked with nearby equipment (sometimes called "slaved"), or activated by a PLC, or PC (normally done through a communications interface). The Motor Starter can be equipped with a multi-position selector switch that allows an operator to choose how the motor will be controlled, eg, a HAND - OFF - AUTO switch.

The HAND position can either allow push buttons to control the motor, or when equipped with momentary spring return, allow the operator to momentarily test run the motor. AUTO would be the normal operating mode, with the motor controlled by external activation, such as synchronization with the powering of an adjacent electrically controlled device.

CONTACTORS

Regardless of the type of control, the device that initiates the energizing of the motor is called a Contactor. A Contactor is a special form of relay, which has been designed to control higher voltage and/or higher amperage equipment.

The Contactors used in WORKMASTER® Motor Starters are approved by NEMA (National Electrical Manufacturers Association), IEC (International Electric Commission) and UL (Underwriter's Laboratory), and have been sized so as to provide both large amperage capacity and longevity.



Our rugged, NEMA-rated Contactor makes and breaks all three legs of three-phase power to control an industrial motor. Within its broad amperage capacity range, it can "make and break" the connection of power to the motor millions of times, before requiring repair or replacement.

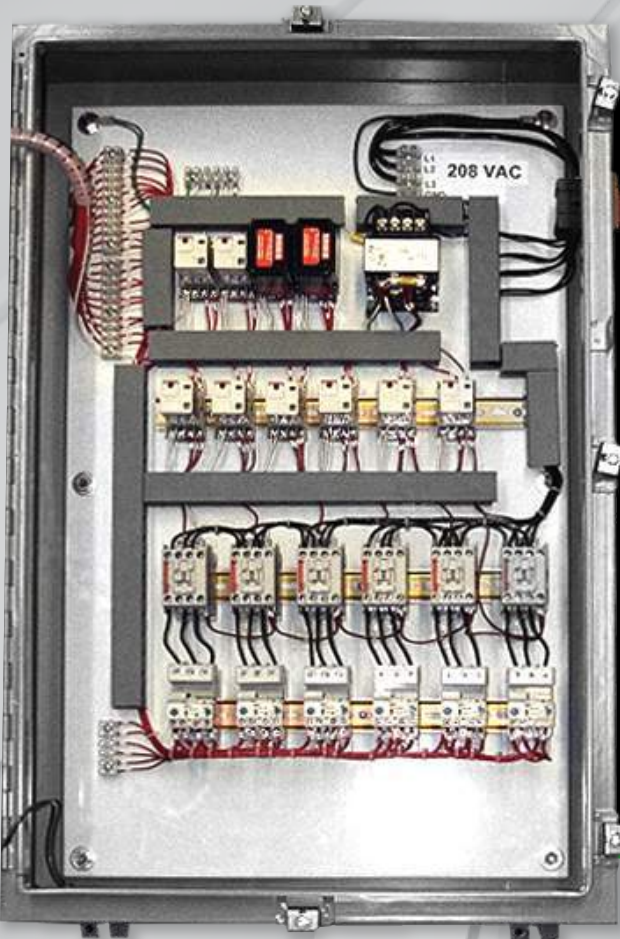
OVERLOADS

The output of the contactor is normally NOT sent directly to a motor, but instead the output is sent through an Overload Relay, which is often just called an Overload. As the name implies, this is also a special form of relay, which has been designed to interrupt the energizing of a motor, prior to the motor suffering from excessive power for too long a time period. The combination of excessive power and time causes heat generation beyond the Motor's ability to dissipate it – the cause of most motor failures.

CUSTOM DESIGNED TO MEET YOUR REQUIREMENTS

WORKMASTER® can also custom design and build a Motor Starter to meet your plant's requirements. Enclosures can be NEMA 4 grade powder-coated steel, NEMA grade 4X fiberglass or stainless steel, or NEMA grade 7 & 9 cast aluminum, explosion-proof.

Multiple sets of motors, with a full array of control options, can be supplied quickly, and for less than you would expect! Many industrial facilities, including many electric utilities, are using WORKMASTER® custom controls in their critical plant operations. Contact your WORKMASTER® distributor with your electric motor control requirements.



This custom-built control installed in a NEMA 4 enclosure is used by an electric utility to power several rotary electric vibrators that assure the flow of coal.

The outputs of sensors used to detect coal, also trigger timers which energize the contactors as long as coal is detected. The timers continue to energize the contactors for a prescribed time period after no coal is present, assuring full coal flow.

Each vibrator can also be test run, using HAND-OFF-AUTO switches on the enclosure door.

An overload event causes a signal to be sent to the terminal strip on the lower left, which can be sent to an alarm or logged for review, complementing their plant's PMP (Preventative Maintenance Program).

RUGGED, INDUSTRIAL GRADE PUSH BUTTONS

Rugged, industrial-grade push buttons with metal housings and gold contacts eliminate corrosion. The Push Buttons are IP65 rated dust-tight and hose-down proof. START button is LED illuminated when motor is energized.

THHN, MACHINE TOOL GRADE CONTROL WIRING

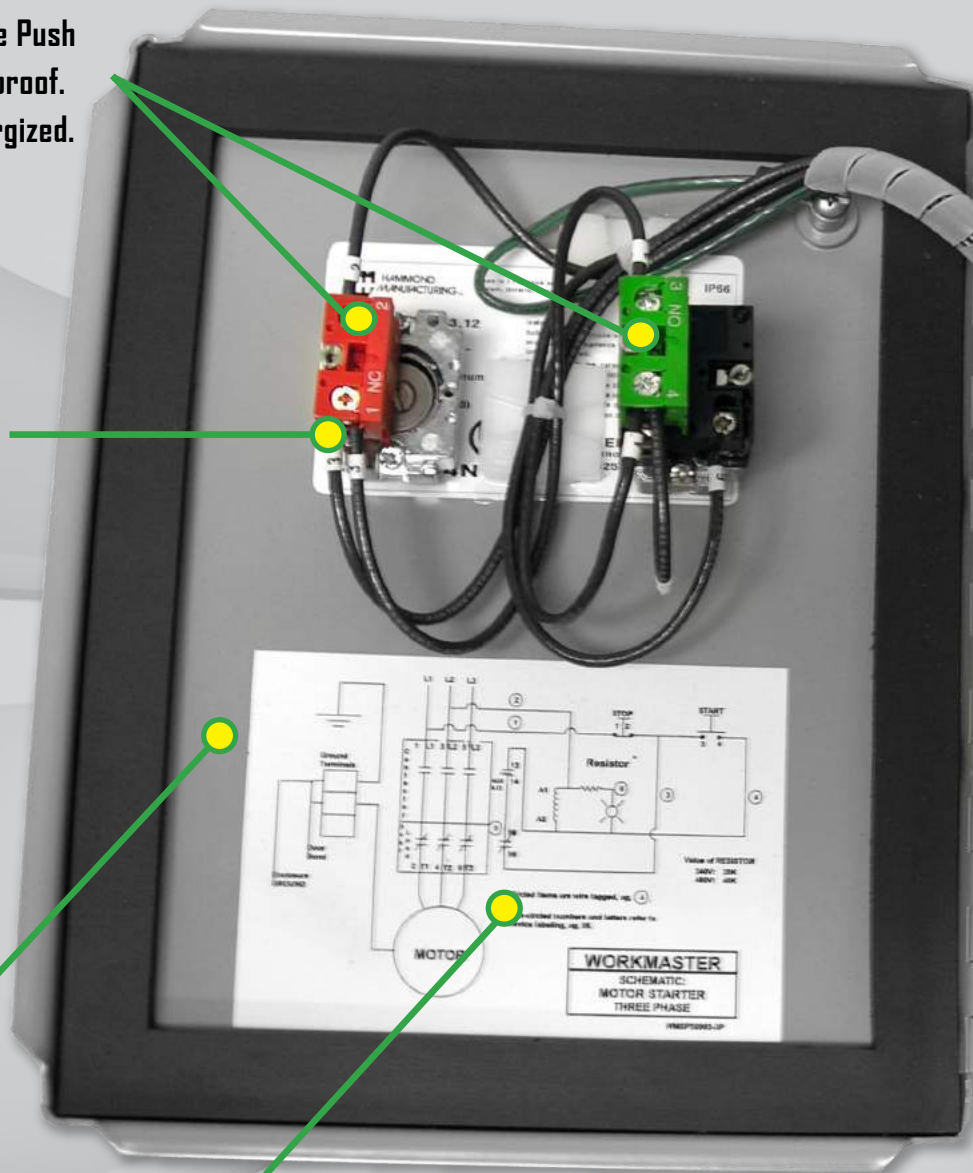
Assures long-life and each wire is clearly labeled for fast, easy identification.

FULLY BONDED DOOR, PANEL, & ENCLOSURE

Fully bonded to grounding terminals to assure operator safety.

FULLY-DRAWN SCHEMATIC

Simplifies testing, troubleshooting, or modifying the easy-to-follow number labeled wiring.



DURABLE, SPIRAL-WRAP SHEATH

Protects and secures the wiring harness across the Enclosure's door to prevent pinched, worn wires.

HEAVY-DUTY, NEMA RATED ABB CONTACTOR

Provides a load-life durability profile of more than 10,000,000 operations.

NEMA RATED STEEL ENCLOSURE

Meets NEMA 3, 12, 4, and 4X Standards which means it's dust-tight, hose-down grade and corrosion resistant.

EURO-STYLE, DEAD-FRONT TERMINAL BLOCK

Keeps wiring tight and organized and provides convenient, "touch safe", meter-probe test points.

SOLID-STATE OVERLOAD PROTECTION

Minimizes nuisance tripping or failure. This state-of-the-art overload even detects phase loss, while generating far less heat, saving energy, and extending life. Auto-reset assures motor 3-minute cool-down.

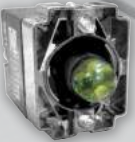
PUSHBUTTONS, SWITCHES, & PILOT LIGHTS

Industrial operating conditions are often challenging to manually operated controls. A combination of rugged mechanical design and anti-corrosive switch contact material has been determined to be ideal. Corroded contacts in switches can not only interfere with operation of a motor, but also cause intermittent momentary contact, so-called "relay chatter". When a motor is subjected to this erratic form of powering, the possibility of motor damage is greatly increased. To address these issues, WORKMASTER® uses a line of industrial pushbuttons and switches that feature NEMA 4 / IP 65 ratings, metal switch bases (which are automatically bonded to the enclosure), equipped with contact blocks with gold-flashed contacts.



ILLUMINABLE PUSHBUTTON

These rugged industrial switches feature LED illumination and gold-flashed contacts, maximizing their longevity and minimizing their maintenance requirements.



LED LIGHT MODULE W/BONDING SCREWS

With metal bases that are automatically electrically-bonded to the enclosure door, and bayonet-style engagement of the pushbutton operators, these are among the most rugged industrial switches available.



3-POSITION OPERATOR FOR HAND-OFF-AUTO CONTROL

All meet NEMA 4 / IP 65 standards for resistance to dust, oil, and moisture.

The illuminated versions of these switches or pilot lights use LED illumination, which is the most reliable form of illumination available, lasting far longer than incandescent or neon illumination, while consuming less power. The likelihood of pilot light burnout is virtually eliminated by using LEDs.

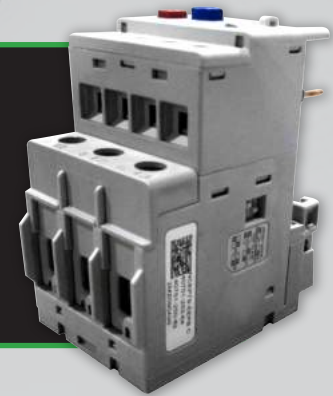
COMBINING THE BEST

WORKMASTER® Motor Starters combine the best of these various elements: NEMA rated enclosures, best-in-class contactors, solid-state overloads, rugged switch bodies with gold-flashed contacts, together with careful, rugged construction, and wire-labeling, all recorded on easy-to-follow schematics, to provide the best means of controlling and protecting the "muscle" that powers your plant operations, and keep production flowing. We offer a standard line of full-voltage Starters, which are manually (pushbutton) operated, and also a line of externally activated Starters, which are designed to be interlocked with nearby equipment.

Another cause of motor failure is: loss of phase. If one of the legs of a 3-phase feed to a motor is interrupted, the motor will continue to receive power through the remaining two legs, but the motor will have no torque. The stationary or coasting-to-a-stop motor will draw excessive power, similar to the power surge that takes place when a motor is started. Another term used to describe loss of phase is: single phasing. Single phasing is another common cause of 3-phase motor failure.

The original designs of overload relays used "heaters" (reset-able conductive elements), which model the heat buildup in the motor by heating up themselves. If the heater is the correct one, and is working properly, it will interrupt the power sent to the motor prior to the motor suffering damage. After cooling off, the heaters can be reset, and allow the motor to be re-energized.

Our solid-state overload electronically simulates the heat build-up in the motor. Power exceeding a motor's nameplate rating for too long a time period will trip the overload, turning off and protecting the motor. Loss of phase is detected by this overload within several seconds, further protecting the motor, without having to subject the motor to high amperage and heat, and then de-energizing it.



SOLID STATE OVERLOADS

In the 1990s, electronic Overload Relays, referred to as Solid State Overloads were introduced. The best versions of these devices have undergone significant evolution in recent years, offering numerous advantages over the older technology overloads with heaters. These include:

- ▶ Reduced power consumption (by a factor of 10) which not only results in energy savings, but also less heat build-up in control cabinets.
- ▶ More accurate modeling of motor over-heat conditions, which reduces motor failures without "nuisance tripping".
- ▶ Greater reliability, because their design is electronic, not electro-mechanical.
- ▶ Ability to detect loss of phase and trip within seconds, which is well before motor damage could occur.

SELECTING YOUR MOTOR STARTER

Power Source	FLA Range of Overload	Motor Horsepower	NEMA Contactor Size	Standard Motor Starter	Dual Motor Starter*	Double Motor Starter**
	AMPS	HP				
Single-Phase 120V	1.00 - 5.00	1/4	00	29-20020	29-20021	29-20022
	3.20 - 16.00	3/4	0	29-20030	29-20031	29-20032
Three-Phase 240V	0.20 - 1.00	1/4	00	29-20040	29-20041	29-20042
	1.00 - 5.00	1	00	29-20050	29-20051	29-20052
	3.20 - 16.00	3	0	29-20070	29-20071	29-20072
Three-Phase 480V	0.20 - 1.00	1/2	00	29-20045	29-20046	29-20047
	1.00 - 5.00	2	00	29-20055	29-20056	29-20057
	3.20 - 16.00	3	0	29-20075	29-20076	29-20077

*Controls two separate motors with one set of buttons **Controls two separate motors with individual buttons

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WORKMASTER® is a manufacturer of unloading equipment for hopper bottom railcars, and other powder and bulk solids handling equipment for industrial, utility and construction applications. Products include hopper car gate openers; connectors for hopper-bottom railcars to undertrack conveyors for safe, pollution-free material flow; hopper car vibrators; aerators and vibrators for bins and silos; pneumatic tool lubricants; and electronic timers and controls. Our products are designed to help Customers increase the lifespan of production critical equipment, operate more safely and efficiently, and decrease operating and maintenance costs of some of industry's most dangerous, difficult, and dirty jobs.

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AIRMATIC INC, founded in 1944, is a woman-owned Industrial Distributor, with installation and maintenance capabilities, offering equipment, machinery, and shop supplies to the Industrial, Construction, Utility, Government, and Commercial Markets. Our products and services are sold through three business units: The MATERIALS MANAGEMENT GROUP provides products and services to industries that convey, store, transport, and process powders and bulk solids — from aggregates, cement, and chemicals to foods, grains, metals, power generation, and waste water treatment applications; The TOOL GROUP provides power tools, personal protective equipment, materials-handling equipment, shop equipment and MRO supplies used for production, fabrication, assembly, metal removal, maintenance, and storage in manufacturing, construction, utility, and commercial applications; The SERVICE GROUP provides fabrication, installation, and maintenance services to improve belt conveyor efficiency; mechanical clean-out services for silos and hoppers to eliminate material flow problems; and shop modifications and repair services of products sold by the Company. Our Customers tell us that by choosing AIRMATIC to solve their problems, they gain increased productivity, decreased costs, and a safer, cleaner work environment.

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