

MVATL Medium Voltage Across The Line Starter Specification Guide



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BENSHAW
Applied Motor Controls

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1 INTRODUCTION

Benshaw has prepared this Specification Guide for engineers, plant maintenance personnel, and electrical consultants who need to specify and describe full voltage – across the line (ATL) motor starters

1.1 DESCRIPTION

The Benshaw MV ATL starter is an Across the Line starter for single-phase or three-phase AC induction motors. The starter can be custom designed for specific applications.

1.2 SCOPE

General Information

The MV ATL specification guide outlines the fabrication, performance, and functional specifications for the ATL motor controls designed and manufactured by Benshaw, Inc. for application on NEMA design A through F induction motors. For wound rotor, two speed, or synchronous motors consult Benshaw. The MV ATL starter shall meet the requirements as specified herein.

- Provide all labor, materials, equipment and incidentals required, and install, place in operation and field test MV ATL starter(s).
- The MV ATL starter(s) must fit in the space indicated on the drawings.

How to Use this Specification

The Specification guide is divided into four sections:

- Introduction
- Electrical Specifications
- Mechanical Specifications
- Benshaw Quality

Each section contains subsections with detailed information on the relative topics. The subsections contain general information, details and any necessary precautions about the individual topics. The specific information contained in the subsections can be found quickly and easily by reviewing the subject headings on the left margin.

Specification Guide On-Line

The specification guide can be found on-line at:

<http://benshaw.com>

This manual is available in Adobe Acrobat portable document format (pdf). Adobe and Acrobat are trademarks of Adobe Systems Incorporated.

1.3 QUALIFICATIONS

Manufacturer

The MV ATL starters shall be the product of a manufacturer who has produced MV starters of the same type and size for a minimum of 20 years consecutive. When requested by the Engineer, a Users List, complete with telephone numbers and contact persons shall be furnished for verification.

- Acceptable Manufacturers:
Benshaw
Substitutions: None permitted

Support

The manufacturer shall maintain factory trained and authorized service facilities and shall have a demonstrated record of service for a least the previous ten years.

- Support personnel are to be direct employees of the manufacturer.
- The manufacturer shall provide all required start-up training services. The approved manufacturers are:
Benshaw
Substitutions: None

Certification

cUL/UL347 *
cUL/UL508A *
* Up to 4800V

Codes & Standards

The MV ATL starters are designed and manufactured at Benshaw to conform, where applicable, to the following industry standards and specifications:

ANSI American National Standards Institute
CSA Canadian Standards Association
IEEE Institute of Electrical & Electronic Engineers
UL Underwriters Laboratories
CE Conformité Européene (European Conformity)
NEC National Electric Code
EEMAC Electrical & Electronic Manufacturers Association of Canada
NEMA National Electronic Manufacturers Association
OSHA Occupational Safety & Health Act

1.4 PRE-MANUFACTURE SUBMITTALS (OPTIONAL)
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- A. Submittals shall be furnished in accordance with Spec. Section ____.
- B. Shop Drawings:
- Elementary wiring and interconnection diagrams in accordance with NEMA ICS standards.
 - Enclosure frontal elevation and dimension drawings.
 - Internal component layout diagrams.
 - Available conduit entry and exit locations.
 - Unit descriptions including amperage ratings, frame sizes, trip settings, pilot devices, etc.
 - Nameplate information
- C. Product Data:
- Manufacturer's product data sheets on all major components
 - Publications on ATL starters
- D. Specification Response:
- Detailed response to this specification showing where in the literature each requirement is satisfied.
 - All clarifications and exceptions must be clearly identified.
- E. Testing and Test Reports:
- Testing shall be per manufacturers standard
 - A copy of the test reports shall be provided as part of the closeout documentation

1.5 CLOSEOUT SUBMITTALS

- A. Refer to Spec. Section _____ for procedure on submittal of closeout documentation.
- B. Contractor shall provide certification that the MV ATL controller has been installed in accordance with the manufacturer's instructions.
- C. The Contractor shall provide certification that the Contractor has properly adjusted any timing devices required in the starting circuitry.
- D. Final Drawings:
 - The manufacturer shall provide final drawings reflecting the "As Shipped" status of the installed equipment.
 - The Contractor shall be responsible for making any changes to the "As-shipped" drawings from the manufacturer to reflect any field modifications.
- E. Maintenance Data:
 - The manufacturer shall provide instructions for storage, handling, protection, examination, preparation, installation, and starting of the MV ATL starter.
 - Provide user's manual, along with installation/operation instructions for major components.
 - Include spare parts listing with name and phone number for a local distributor for the spare parts.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Handling and shipment of the equipment shall be in such a manner to prevent internal component damage, breakage, and denting and scoring of the enclosure finish.
- B. Equipment shall be stored indoors in a clean, dry environment. Energize space heaters if furnished.
- C. The contractor shall protect the units from dirt, water, construction debris and traffic.

1.7 EXECUTION

Testing

- All incoming material shall be inspected and/or tested for conformance to quality assurance specifications.
- All subassemblies shall be inspected and/or tested for conformance to quality assurance specifications.
- Each completed unit shall be functionally tested prior to shipment to assure conformance to the specifications.

Startup & Training

- Bid price shall include two visits, consisting of two consecutive days each, for startup and training. Services shall include startup of equipment and field/classroom training for owner's personnel. Factory direct personnel shall provide startup and training only. The use of agents, manufacturer's representatives, associated integrators or manufacturer's distributors for startup and training shall not be permitted.

Field Measurements

- A. The contractor shall verify all field measurements prior to the fabrications of the MV ATL starter.

1.8 SPARE PARTS (OPTIONAL)

- A. Spare parts shall include, but not be limited to:
 - One (1) of each type and size of Control Fuse
 - Three (3) of each type and size of Power Fuse
 - One (1) complete spare MV Contactor of each type and size used

1.9 WARRANTY

- A. The manufacturer shall provide an eighteen (18) month manufacturer's warranty (from date put into service) on all other equipment of each system.
- B. The manufacturer shall confirm this warranty as part of the submittal.

2 ELECTRICAL SPECIFICATIONS

2.1 MODEL NUMBER FORMAT

Specifying Model Numbers

The starter numbering system for MV ATL is:

Example Part Numbering scheme: **CFMVATL-HP-V-ENC**

CF = Combination Fused, Includes the main disconnect switch with medium voltage fusing. Fusing is based on the motor FLA and must be provided to ensure proper fuse / contactor coordination

MV = Medium Voltage starter

ATL = Across The Line, Full Voltage Non-Reversing starting method

HP = Motor Nameplate Horsepower

V = Line Voltage, 2300, 3300, 4160, 4800, 6000, 6600, 6900, 7200, 10,000, 11,000, 12,470, 13,200, 13,800 VAC

ENC = Enclosure Type rating 1, 12, and 3R

2.2 DESIGN SPECIFICATIONS

General Information

Available in NEMA (National Electrical Manufacturers Association) specified frame sizes, the starter may be used in numerous industrial applications. Each starter can operate within specific voltage and frequency values of 2300 VAC to 7200 VAC and 50 to 60Hz.

Power Requirements

The MV ATL starters are designed to operate with three-phase AC power at the following nominal voltages:

- Line Voltage: 2300 through 13,800 VAC 3 phase, specific to order
- Control Voltage: 120 VAC single phase

All starters are designed for universal operation at 50Hz through 60Hz at ambient temperatures of up to 40 C. Control voltage is specified by the customer at time of order and may not be modified by the customer.

Power Section

Depending on the application, certain power section requirements must be met.

For standard duty applications, the contactor provided is AC3 rated. For severe duty applications, the contactor is AC4 rated.

The contactor and fusing must be able to withstand the starting and operating current draw without damage, tripping or faulting due to thermal overload. Also, the manufacturer must provide test data verifying these ratings.

DESCRIPTION	SPECIFICATION
Starter type	Across The Line
Horsepower HP	(Please specify)
Power ratings	AC3
Starting torque	100%
Maximum BIL rating	60KV – 7200V / 95KV – 10,000 thru 13,800V max.
Nominal ratings	2300, 3300, 4160, 4800, 6000, 6600, 6900, 7200, 10,000, 11,000, 12,470, 13,200, 13,800 VAC 50 to 60 Hz
Standard insulation test	2.25 times voltage plus 2000 VAC minimum
Overall efficiency	99.7%
Control input	120 / 110 VAC or Dry Contact, 2 or 3 wire

Audible Noise

Not to exceed 60dba @ 1 meter at any time

General Logic Control Configuration

Provisions for optional two or three wire 120 VAC remote control are provided at a terminal block on the starter.

2.3 MOTOR PROTECTION FUNCTIONS

Power Fuses

- Current limiting type R rated 50KAIC symmetrical at max. 7200V.
- Current limiting type E rated 50KAIC symmetrical at max. 13,800V.
- Fuse size shall be manufacturer's standard.
- Fuses shall be vertically mounted in the front of the enclosure for ease of inspection and removal without special tools.
- Provide blown fuse indication.
- Power fuse holders shall be part of starter assembly.

2.4 ZERO SEQUENCE GROUND FAULT PROTECTION EQUIPMENT (OPTIONAL)

Zero Sequence Ground Fault Protection is to be used on isolated or High resistance grounded systems.

- Ground Fault CT
- CT Type: 50:0.025 (2000:1 ratio)
- Measurement range: 1.0A - 25.0 Arms
- Accuracy: +/- 3%
- Burden at 25Amps: 0.0089VA

2.5 MAIN CONTACTOR

- Full NEMA rated (IEC rated contactors cannot be accepted).
- Current ratings: manufacturer standard for horsepower rating.
- Voltage rating: Up to 13,800 VAC, available specific to order.
- The main contactor shall be sequenced by the starter manufacturer for proper operation of the ATL starter.

2.6 CONTROL DEVICES

Control Power Transformer (Optional)

Provide an appropriately rated internal 2300-13,800V to 120 VAC step-down transformer.
Supply two fuses on primary and one fuse on secondary side with one leg grounded.

Control Wiring

Minimum 14 AWG stranded, rated for 600V 105°C.

Terminal Strips

Rated for 600V, suitable for contractor termination of up to 10 AWG wire.

Others

Push buttons, pilot lights, and control relays, heavy duty, rated to 600V.

3 MECHANICAL SPECIFICATIONS

3.1 OPTIONAL FEATURES

Optional Features

Other protective devices and metering equipment may be supplied with the MV ATL starter. These other devices will depend on the system configuration and specific customer requirements. Standard overload protection is provided by means of three-phase solid-state thermal overload relays. As an option, the overload relays can be bi-metallic, ambient compensated and operated through current transformers.

MV ATL Starter

The structure shall consist of a metal enclosed dead front vertical steel assembly. It shall contain:

- A main isolation switch (fused disconnect, circuit breaker, or molded case switch)
- Optional control power transformer with fusing
- Other optional devices required by the end user

Control Power Transformer

The MV ATL starter can be provided with a control power transformer. The transformer will usually be sized for the power requirements of the starter but can also be sized to provide power for customer controls.

Main Contactor

The MV ATL is provided with a main contactor. The main contactor is a HP rated contactor for across-the-line start of the motor.

RTD Monitoring Device

The MV ATL can be provided with an optional RTD monitoring third party device. This device can monitor the customer's motor RTDs.

Optional Protection Systems

In addition to the standard overload protection, the following systems are available for added motor and system protection:

- Over and Under Voltage Relays
- Voltage Unbalance Sensors
- Current Unbalance Sensors (Note, this sensor also detects single-phase fault conditions)
- Ground Fault Relays
- Motor Protection Systems
- Optional Metering Systems

Metering Packages

The starter can be equipped with any optional metering packages including the following:

- Single phase Voltmeter and Ammeters
- Three-phase Voltmeters and Ammeters
- Power Factor Meters

Metering packages include all the necessary CTs and CPTs required for interface to the incoming line power.

Other Options

Benshaw can build custom starter packages for special applications. Contact your local Benshaw representative with a description of the application.

3.2 UL /CUL SHORT CIRCUIT/WITHSTAND RATINGS

All Standard Benshaw CFMVATL starters have a Short Circuit Current Withstand Rating of 50KARMS up to 4800 VAC.

3.3 MECHANICAL CONSTRUCTION

Enclosure Construction

- Construct to comply with NEMA Part ICS 2.
- Basic standard structure shall be welded type construction utilizing minimum 11 GA sheet metal.
- Doors shall be minimum 12 GA sheet metal, pan type with flanges formed to provide sturdy, rigid structure.
- Door latches and hinges capable of holding door closed during maximum fault condition. Provide door interlocks to prevent doors from being opened with power applied. Provide removable lifting provisions on floor mount enclosures.
- Finish:
 - Metal parts to be given thorough rust resistant treatment.
 - Primer shall be S-W recoatable epoxy primer B-67 Series
 - Finish shall be S-W high solid polyurethane Polane T plus F63 series
 - Color shall be ANSI 61 Gray unless otherwise specified.
 - Complete with internal power and control wires including terminations for external connections. Phase sequencing shall have proper identification and control wires shall have suitable markings at terminations.

Starter Construction

The three-phase ATL starter contains a Main Disconnect Switch, Medium Voltage Fusing, a HP rated Main Contactor and load side landing pads for motor connections

The starter will be supplied in an enclosure with available types in NEMA 1, NEMA 12 or NEMA 3R configurations. For special / custom enclosures –consult factory.

Mechanical Layout

The Benshaw MV ATL consists of the following major components:

- Line and load lugs or landing pads sized to accommodate power wire rated at 125% of continuous current per the National Electrical Code at 75°C
- Provisions for two- or three-wire 120 VAC (optional 240 VAC) control

4 ENVIRONMENTAL SPECIFICATIONS

Operating Requirements

The MV ATL is designed to operate in the following conditions;

- Ambient Temperature: 0 C (32°F) to 40 C (122 F)
- Humidity (non-condensing): 0% to 95%

Storage Requirements

The MV ATL starter may be stored for up to two years before being installed. However, starter power terminations should be connected to full line voltage for one hour per year to maintain the voltage rating on any electrolytic capacitors. This will prevent shortcircuits when the system is powered up.

If the starter is to be stored, the following recommendations apply:

- Storage Temperature: -20 C (-4 F) to 70 C (158 F).
- Temperature Rate of Change: 6 C in 30 minutes
- Humidity (non-condensing): 0% to 95%.
- Humidity Rate of Change: 10% in 30 minutes

Operating Altitude

The operating altitude shall not exceed 3,300 feet (1000 meters) above sea level without de-rating.

Operating Orientation

Upright

Maximum Vibration

5.9m/s² (19.2ft/s²) [0.6G]

5 BENSCHAW QUALITY

5.1 QUALITY INSPECTION

Quality Inspection

All incoming material will be inspected and/or tested for conformance to quality assurance specifications. All subassemblies will be inspected and/or tested for conformance to vendors engineering and quality assurance specifications. The completed unit will be functionally tested before shipment to assure proper operation per this specification.

5.2 START-UP SERVICE

Start-Up Service

Benshaw provides complete field support for initial startup of the MV ATL starters. In most cases the engineering staff responsible for in-house testing will also be assigned to follow the unit into the field for startup assistance. Fees for start-up assistance may be obtained from the current Benshaw Motor Control catalog.

This assistance is available on a daily basis and complete technical support is provided upon request. Additionally, telephone technical support is available to all customers at no charge.

5.3 TRAINING

Training

As requested, Benshaw will supply a quotation for on-site or factory training on its MV ATL starters. This training will provide operating and instruction manuals, training on equipment operation and troubleshooting of the Benshaw equipment.

5.4 DOCUMENTATION

Documentation

Benshaw starters are shipped with a complete set of documentation that typically includes the following items:

- Complete schematics and wiring diagrams
- Instruction Manuals
- Contactor and Disconnect System Data if applicable

If required, special documentation can also be provided. This documentation may include component layout drawings, wiring diagrams, and system interconnect schematics. All drawings and documentation are available to customers on flash drive or via e-mail.

6 REVISION HISTORY

Revision	ECO#	Description	Approval	Date
0		Initial Release	NMK, WGB	2/17/22
1		General Revision	JCS	2/24/22



BENSHAW
ADVANCED CONTROLS & DRIVES

BENSHAW
615 Alpha Drive
Pittsburgh, PA 15238
Phone: (412) 968-0100
Fax: (412) 968-5415

BENSHAW Canada
550 Bright Street
Listowel, Ontario N4W 3W3
Phone: (519) 291-5112
Fax: (519) 291-2595