Medium Voltage Line Up
Top Mounted Horizontal Main Bus with Incoming Line
Two High 400 Amp Induction Motor Starter and One High 800 Amp Induction Motor Starter

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AMPGARD Medium Voltage Starters

Description

General Description

Westinghouse Ampgard medium voltage starters provide complete flexibility in precisely matching a wide range of industrial motor ratings. Rated at 2500, 5000, and 7200 volts, up to 8000 Hp, Ampgard starters are the first motor starters designed as integrated, complete units. Uniformity of design throughout the Ampgard line allows the use of the optimum rating for each application within a plant, with no mixed equipment problems. And the variety of optional features that are available with Ampgard allows a user to obtain a starter unit that exactly meets a motor’s starter and control requirements.

Complete front accessibility to the enclosures allows free standing, back-to-back, or against-the-wall starter mounting.

Ampgard starters are available in 400 amp and 800 amp (open rating) for 2500, 5000 and 7200 volt ratings. The 400 amp rating in a NEMA/EEMAC Type 1 enclosure is 36 inches wide, 30 inches deep and 90 inches high (100” with top mounted horizontal bus) either one or two high construction for full voltage starters. The 800 Amp rating in an enclosure is 40 inches wide, 30 inches deep and 90 inches high (100” with top mounted horizontal bus) in a one high construction for a full voltage starter. These floor-mounted units are uniform in design and easily adapted for reversing, reduced voltage, synchronous, and wound rotor motor starting.

For flexibility and space economy, no other starter can compare with the Ampgard starter line.

Ampgard is industry’s “first family” of high voltage starters.

400 Amp Two High Construction Induction Motor Control

Through 1500 HP at 2200-2400 Volts
Through 2500 HP at 4000-4800 Volts
Up to 4000 HP at 7200 Volts
36” Wide

800 Amp With Protective Relays and Meters in Top 30” of Enclosure
(When Specified)

1501-3000 HP at 2200-2400 Volts
2501-5500 HP at 4000-4800 Volts
Up to 8000 HP at 7200 Volts
40” Wide

Motor Starter Nameplate Data

Main Horizontal Bus (When Specified)

Lifting Eyes for Single Structure Shipments

@ 1000 HP Motor Protection and Monitoring (When Specified)
Personnel Safety Features

One of the most important considerations in designing the Ampgard Starter was personnel safety. The result is an extensive system of interlocks and other safety features.

Interlocks

Interlocking on Ampgard Starters includes:

- Isolating switch handle housing extends over medium voltage door when handle is in ON or OFF position, preventing door from being opened.
- Position for optional key interlocks.
- When door is open, detent prevents operating handle from being moved inadvertently to OFF or ON position.
- When contactor is energized, isolating switch cannot be opened or closed.

Other Safety Features

In addition to the interlock system, Ampgard Starters include many other features designed to protect operating personnel. These features include:

- Provision for three padlocks on isolating switch handle in OFF position.
- Operating handle must be rotated 90° to the horizontal service position in order to open main door, assuring complete isolation from the main power source.
- Shutter barrier between line terminals and fuse stabs are mechanically driven in both directions. (See Photo)
- Distinctive marking on back of switch assembly appears when shutter barrier is in position and starter is completely isolated from the line.
- Visible grounding clips provide a positive ground of the starter and the enclosure when the isolating switch is opened.
- High and low voltage circuits are compartmentalized and isolated from each other.

Illustrated selected safety features, operating instructions and renewal parts information are permanently mounted inside main enclosure door. Refer to page 4.
AMPGARD Medium Voltage Starters
Personnel Safety Features

Ampgard®

OPERATING INSTRUCTIONS

This Westinghouse motor starter has special features for your safety and convenience. Before removing fuses or servicing the starter, be sure to check the GROUNDING CONNECTION, VISIBLE ISOLATING SWITCH, and SHUTTER as described and illustrated below. See Instruction Manual.

GROUNDING CONNECTION
When the isolating switch is in the “OFF” position, the fuse clamps are automatically connected to ground. This assures that the starter is grounded before you open the door.

FUSE CLAMP POSITIONER
FUSE CLAMP GUIDE
Before replacing fuses, make sure that fuse clamps are in proper position. The fuse clamp guide (arrow) should be in the groove in fuse clamp positioner.

FUSE REMOVAL
Hook fuse puller through eye on fuse. Pull fuse forward sharply and slide out over contactor.

FUSE INSERTION
Use fuse puller to install fuse. Make sure fuse is down as far as it will go in bottom fuse clamp. This fuse clamp will tighten automatically when the isolating switch handle is moved to the “ON” position.

ABRIDGED LIST OF RENEWAL PARTS
This motor starter provides improved motor protection. The main fuses, overload relay coils and current transformers are a coordinated protective system specially selected for your motor. To be sure of continuous protection only Westinghouse renewal parts should be used.

<table>
<thead>
<tr>
<th>FOR THIS STARTER NO.</th>
<th>DESCRIPTION</th>
<th>PART NO.</th>
<th>REQUIRED</th>
<th>DESCRIPTION</th>
<th>PART NO.</th>
<th>REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>XL42310-1 (1F)</td>
<td>MAIN FUSES</td>
<td>200A-9R</td>
<td>151D933G01</td>
<td>2/STATER BOTTLE SUB-ASSY (VACUUM)</td>
<td>2147A47G03</td>
<td>1 CONTACTOR</td>
</tr>
<tr>
<td></td>
<td>OVERLOAD RELAY HEATERS</td>
<td>IQ1000-II</td>
<td>1 STARTER MAIN CONTROL</td>
<td>120 V CONTROL</td>
<td>2147A48G11</td>
<td>1 CONTACTOR</td>
</tr>
<tr>
<td></td>
<td>CURRENT TRANSFORMERS</td>
<td>2147A16G05</td>
<td>1 STARTER CONTROL TRANSFORMER</td>
<td>2147A11G05</td>
<td>1 STARTER</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CURRENT TRANSFORMER RATIO</td>
<td>150/5</td>
<td>1 CONTACTOR PRIMARY FUSES</td>
<td>2147A11G25</td>
<td>3/STATER</td>
<td></td>
</tr>
</tbody>
</table>

PROTECTIVE INTERLOCKING
Positive interference type mechanical interlocks are used exclusively on this starter. They protect you by causing the mechanism to lock if incorrect operation is attempted. If this happens, or if some other symptom of incorrect adjustment is evident, DO NOT FORCE the mechanism. Refer to the instruction book before making changes or applying force.

CAUTION ---- INSTALL 4 PHASE BARRIERS BEFORE OPERATING VACUUM CONTACTOR UNDER LOAD.

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Test-Run Circuit

A built-in test circuit permits the checking of the starter control circuit and pilot circuits. This testing is performed when the high voltage is de-energized and isolated. Thus, both visual, mechanical and electrical inspection may be performed while checking the control circuit.

The plug is disconnected from the secondary side of the control transformer and inserted into an external plug. This prevents the possibility of back feeding through the control transformer from an external test power source.

The control circuit permits testing of the contactor in its normal position or in the drawout position.

In the test mode, the polarized plug connects the control circuit to an external 115 volt, 60 Hertz supply. In the run mode, the control circuit is energized from the secondary of the control transformer.

Vacuum Roll Out Design

Proper contactor load stab connection is important. The Ampgard has two visible checks.

- Contactor must be fully inserted in cell for latch mechanism to be behind contactor rail positioner.
- There is a mechanical interference bar as an additional backup. If the contactor is not in the proper position, the interference prevents closing of the high voltage door.

Receptacle on Secondary Side of Step Down Control Transformer

Feeler Gauge to Check Vacuum Contact Wear

Auxiliary Interlocks Type L-64 2-NO 2-NC Standard

October, 1989
AMPGARD Medium Voltage Starters

User Benefits

Personnel Safety: Equipped with a mechanically driven isolating shutter, the positive mechanical isolating switch completely grounds and isolates the starter from the line connectors, leaving no exposed high voltage when the door is open. The shutter mechanism is visible without the removal of any components. The high voltage door is mechanically locked/closed with the isolating switch handle; the low voltage section is separated from the high voltage section.

Ease of Installation: Current limiting fuses, contactor assembly, and isolating switch are easily removed from the enclosure. There is no need to remove any structural or mechanical barriers for accessibility to motor load terminals.

Ease of Maintenance: Because all components are front accessible, routine inspection and parts replacement is fast and easy. The control circuit permits testing of the contactor in its normal position or in the draw-out position.

Simplicity of Design: Component-to-component design eliminates half of the electrical connections normally required with other motor starters.

Complete Testing: Designed, tested, and verified in the Westinghouse High Power Laboratory, Ampgard Motor Starters comply with ANSI/NEMA, ICS-2, EEMAC E14-1, UL 347, and CSAC22.2 No. 14, published industrial control standards. BIL ratings are established in accordance with ANSI/IEEE standards. Third party labeling is not included as standard. If the starter bill of material fits within certain restrictions, the starters can be supplied with UL, CSA or City of L.A. Certification. Contact the factory to determine if a certain starter meets the requirements for labeling.

For flexibility and space economy, no other starter can compare with Ampgard Starters. All Ampgard Starters feature the same basic design and are installed, operated, and maintained the same way.

Starter Classes are available for the following non-reversing applications:

- Class S/V 202 – Induction Motor Full Voltage
- Class S/V-502 – Induction Motor Primary Reactor
- Class S/V 602 – Induction Motor Autotransformer
- Class S/V W02 – Wound Rotor Motor
- Class S/V F02 – Synchronous Motor Full Voltage
- Class S/V R02 – Synchronous Motor Primary Reactor
- Class S/V A02 – Synchronous Motor Autotransformer

S = Slide Out Contactor
V = Roll Out Contactor
Reversing also available.

Design Features

1. Type SJ 400 Amp Vacuum Contactor
2. Type LFR Mechanical Isolating Switch
3. Current Limiting Type CLS Power Fuses
4. Control Compartment
5. Illustrated Safety Features and Parts List
6. Motor Load Terminals

October, 1989
Component-to-Component Circuitry

All major components of Ampgard starters—mechanical isolating switch, vacuum contac-
tor, current transformers and control trans-
former—were designed specifically to
function together as an integrated starter
unit.

One of the most important design features,
however, is the component-to-component
circuit concept employed to eliminate 50%
of the current carrying junctions.

The flow of power through a vacuum-break
controller can be traced by referring to the
lower portion of this figure where the
starter is shown in the energized position.
The line stab assembly mounted at the back
of the enclosure also serves as the starter
line terminals (1). The stabs themselves are
engaged by the fuse jaws (2) of the isolating
switch which is mounted on rails at the top
of the enclosure. The line ferrules (3) of the
current-limiting motor-starting power fuses
(4), clip into the fuse jaws, and the load fer-
rules (5) fit into the fuse holders (6) which
are part of the contactor line terminals.

Power flow through the contactor is from
the load ferrules of the power fuse, through
the shunts (7), and the vacuum interrupters
(bottles) of the contactor (8), to the contac-
tor load terminals (9).

Spring loaded contact jaws mounted on the
contactor load terminals (rollout only) plug
into the lower stab assembly (10), providing
a convenient connection through the current
transformers to the motor load terminals
mounted on the left hand side wall of the
enclosure.
Ampgard Starters

AMPGARD Medium Voltage Starters
Drawout Vacuum Contactor Features

Type SJA 400 Amp Vacuum Contactor Slide Out

Step Down Control Transformer

Full Apart Terminal Blocks to Works in the Drawer Control Panel

L-64 Interlock

Test Receptacle and Plug

Rear View

400 Ampere Vacuum Bottles Rated 7200 Volts

Mounting For Load Side Main Power Fuses

3 Phase Current Transformer

Zero Sequence Ground Fault Transformer (When Required)

Contactor Load Side Cable Connects to Termination On Left Hand Wall of Structure

The Type SJ Vacuum Contactor was designed and engineered specifically for use in Ampgard Starters. It is a self-supporting, compact, drawout, three-pole, DC Magnet closed contactor. To permit application matching of the starter to the motor rating, the SJ Contactor is available for 2200 through 7200 volts at ratings of 400 and 800 amperes. The 400 amp contactor is available in both the standard slide out configuration and the optional roll out design. The 800 amp contactor is available in the roll out design only.

Design

The Type SJ Vacuum Contactor is a highly versatile, low-chop contactor that has been designed and tested to withstand a 60,000 volt basic impulse level. The contactor complies in all respects with published NEMA Industrial Control standards and is a UL recognized component. The SJ is designed for starting and controlling 3-phase, 50/60 hertz ac motors on nominal 2500, 5000, and 7200 volt systems.

The Type SJ accommodates mechanical interlocks between itself and other contactors and the isolating switch. These time proven interlocks provide unmatched safety and service protection.

The Type SJ Vacuum Contactor consists of a molded chassis with crossbar, magnet, and vacuum interrupters. The contactor is easily positioned into the starter and long-life vacuum bottles provide many operations with a minimal maintenance program. The contactor employs special main contact materials that exhibit an extremely low chopping current which minimizes switching surge. Surge protection is therefore not required due to the use of the vacuum contactor. Surge suppression may be required, however, for reasons other than the vacuum contactor.

The contactor design incorporates fuse clamps for the load side of the current limiting fuses and provides for connection to the high voltage side of the control power transformer. CPT’s of up to 2 KVA capacity are mounted on the contactor. The contactor operating coil has a built-in full wave silicone rectifier which supplies DC power for quiet operation and allows for proper contactor-fuse coordination.

Refer to pages 26 and 27 for complete technical specifications.

Maintenance

Ease of maintenance is one of the outstanding features of the Westinghouse Vacuum Contactor line. A simple go/no go gauge for checking contact wear is included with each contactor. It is not necessary to drawout the contactor to check for contact wear or to replace the main operating coil or electrical interlocks mounted on the contactor. All are front accessible. The vacuum contactors are also much lighter than the previous generation airbreak contactors, which allows for easier insertion and removal from the starter structure.

October, 1989
Type SJA 400 Amp Vacuum Contactor Roll Out with Wheels and Load Fingers

400 Amp Slide Out
The slide out version of the SJ Contactor is supplied as standard for those applications requiring a 400 Amp Contactor. The contactor slides into the Ampgard structure on steel rails. Medium Voltage cables connect the contactor load terminals to the lug landings for the motor load cables. A 3-phase current transformer and, when required, 3-phase potential transformer and ground fault zero sequence current transformer, are mounted on the contactor. A pull apart terminal block connects the contactor to the low voltage control panel.

The contactor is easily removed from the structure by removing 3 bolts securing the load cables, 1 bolt in each of the two mounting rails and one bolt connecting the isolating switch interlock arm.

400 Amp Roll Out
A roll out version of the 400 Amp Contactor is an available option. The roll out contactor is mounted on wheels and simply rolls into the Ampgard structures. Contactor load fingers engage a load stab as the contactor is inserted into the structure. The contactor is latched in position and it can easily be removed by releasing the latch mechanism (refer to Page 5). This allows the contactor to be removed from the starter without disconnecting any medium voltage cables.

The 400A roll out contactor is electrically and mechanically interchangeable with the previous generation 2500/5000V, 400 ampere airbreak contactor.

800 Amp Roll Out
The 800 ampere Vacuum Contactor is available in a roll out design only. It has the same basic features as the 400 amp roll out.

Optional Contactor Features
All Ampgard Medium Voltage Contactors are available with a mechanical latch attachment (mechanically latched versus magnetically held closed). The latched design is used on applications where the contactor must remain closed through a voltage dip or voltage failure. The contactor is opened (triped) by energizing a separate electrically operated solenoid with either one or two operating trip coils of different voltages.

Reversing, reduced voltage and multi-speed contactors are also available.
Descriptive Bulletin
8850
Page 12

AMPGARD Medium Voltage Starters
Low Voltage Control

Isolated Low Voltage Control
(Works in the Drawer)

Mounted on the right side of the enclosure, the low voltage control panel is completely isolated and barriers from high voltage and has a separate low voltage access door.

Low Voltage and High Voltage Doors Closed

The Device Panels, IQ-1000 and IQ Data Plus II All Fit in this Same Size Low Voltage Door Cutout

Low Voltage Panel Completely Extended

October, 1989

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AMPGARD Medium Voltage Starters
Starter Types

400 Ampere Cell with Roll Out Contactor Design

Horizontal Bus Splice Plates
(Bolted in Starter Cell During Shipment)

Fuse Puller

Customer Motor Load Connection for Top Entry

Vacuum Contactor-Roll Out With Wheels and Load Fingers

400 Ampere Cell With Main Power Fuses and Roll Out Contactor Removed

Current Transformer Panel

Contact Guide Rails

Contactor Load Stabs

400 Ampere Cell With Main Power Fuses, Roll Out Contactor and Isolating Switch Removed

Current Transformer Panel

Customer Motor Load Connection for Bottom Entry (Current Transformer Panel Reversed for Top Entry)

Motor Load Cable Space Bottom Entry

October, 1989
AMPGARD Medium Voltage Starters

Starter Types

Reduced Voltage Starting

Starters for synchronous motors are also available in either reactor or autotransformer type. Both provide closed transition from reduced voltage to full voltage.

The 400 ampere 2300-7200 volt reduced voltage starters are structured two wide for a total of 72” width, 30” deep and 90” high (without Main Bus).

Reduced Voltage Starter Reactor or Autotransformer Type Induction Motor Starter

Reduced Voltage Reactor Type Slide Out Contactor Design

Reduced Voltage Autotransformer Type Slide Out Contactor Design
Typical Diagram for Vacuum Type SJ Contactor

System Voltage

L3 → ISW → Main Fuse → GFCT

L2

L1 → Gnd.

IQ-1000

Induction Motor Across-The Line Starter

October, 1989
AMPGARD Medium Voltage Starters
Starter Types
Induction Motor Across-The-Line Starter
400 Ampere Cell Slide Out Design

- 400 Ampere Cell with Main Fuses and Slide Out Contactor Removed

- Extra Capacity 2 KVA Control Transformer (600VA Standard)
- FT-1 Switch (When Required)
- Contactor Slides Out on Guide Rails
- Contactor Guide Rails
- Mechanical Interlock Connection Between Isolation Switch and Contactor
- 400 Ampere Cell with Main Power Fuses, Slide Out Contactor and Isolating Switch Removed
- Shutter Mechanism and Finger Barriers Covering Line Stabs
- Customer Motor Load Connection Same for Top or Bottom Entry
- Motor Load Cable Space Bottom Entry

October, 1989
Synchronous Motor, Brush Type Solid State Field Control

The synchronous motor starter includes the basic induction motor control in the bottom half of the structure. The synchronous control and protection function fit easily in the upper compartment.

The step down static excitation transformer is connected to the load side of the main contactor and is protected by its own current limiting fuses.

The static exciter is an SCR type. Its DC voltage output is adjustable via a door mounted potentiometer.

The synchronous control board monitors the induced field during acceleration and energizes the DC rotor field at the optimum speed and rotor-stator pole relationship.

Solid state, brush type synchronous motor control includes the following protective features:
- Locked Rotor Protection
- Incomplete Sequence
- Failure to Synchronize
- Fuse Failure
- Pull Out Protection

The motor windings are protected by the conventional induction motor control protection (thermal, MOR, IQ-1000).

Also available are controls for:
- Multi-Speed Motors
- Reversing Motors
- Wound Rotor Motors

Screen Enclosed Starting and Discharge Resistor

Shield Covered Heat Sinks of Variable Static Exciter

Static Excitation and Synchronizing Control

Adjustment for Variable DC Field Voltage

Static Exciter SCR Type

Step Down Transformer for Static Excitation

Basic High Voltage Control

Synchronizing Controls and Motor Field Protection

Low Voltage Control Works in the Drawer
AMPGARD Medium Voltage Starters
Optional Modifications

Incoming Line
An incoming line enclosure is recommended, depending upon the size and number of incoming cables. Different designs are available for incoming power for top or bottom entry.

Shown is a 26" Wide Incoming Line Structure
The addition of incoming line metering requires a 36" wide structure in lieu of a 26" wide structure.

Refer to Price List 8810, structure modifications, for different line cable and incoming line switch arrangements.

Draw out Potential Transformer and Fuses
Draw out trunnion-mounted potential transformer design with fuses is available to meet specific application requirements or code regulations.

ADM Switch Ratings

<table>
<thead>
<tr>
<th>Maximum Voltage (kV)</th>
<th>BIL Rating (kV)</th>
<th>Continuous Current (Amperes)</th>
<th>Interrupting Capacity (Amperes)</th>
<th>Momentary Current</th>
<th>Fault Current Closing Asymmetrical (Amperes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.5</td>
<td>60</td>
<td>600</td>
<td>600</td>
<td>80,000</td>
<td>40,000</td>
</tr>
<tr>
<td>5.5</td>
<td>60</td>
<td>1200</td>
<td>1600</td>
<td>300</td>
<td>25,000</td>
</tr>
<tr>
<td>5.5</td>
<td>60</td>
<td>1200</td>
<td>1600</td>
<td>300</td>
<td>25,000</td>
</tr>
</tbody>
</table>

October, 1989
Main Bus
When starters are grouped together in a line-up, a typical option is the main bus. The Ampgard main bus is mounted in its own 10-inch high enclosure, which isolates it from the starter. The connection from the main bus to the starter is done with rigid vertical bus. Insulated barriers are provided for separate top entry of power and control cables. The main bus is top, side and front accessible, which allows for ease of maintenance or extension of line-ups without disassembling the starters. All bus is braced to withstand the let through energy allowed by the starter fuses during a 50,000 amp (symmetrical) fault.

Type ADM Load Break Switch
For application needs with loads rated 600 or 1200 amps at 2500, 5000 and 7200 volts, Ampgard is available with the Type ADM load-break switch. This device, a three-pole, manually operated, quick make-quick break switch, is used primarily as a disconnect switch in AC power systems. This switch is fixed mounted and will fit in one half of a standard 90-inch high, 36-inch wide vertical structure. Power fuses up to 400E amperes can be mounted within the half high structure. Mechanical interlocks are incorporated so that the door cannot be opened when the switch is on, and when the door is open the switch cannot be closed. A safety screen is supplied behind the switch door. The Type ADM switch can be supplied with a total of four electrical interlocks.

Other Optional Modifications
In addition to the options previously described, Ampgard starters are available with a variety of accessories and modifications to satisfy a wide range of application requirements. Some of the broad areas covered include:
- Bus and cable entrance enclosures (See photos)
- Transformers
- Power factor correction capacitors
- Pilot devices
- Instruments and meters
- Control relays and timers.
- Solid state or selected electro-mechanical protection devices

For more details on available accessories and modifications, refer to PL 8810.

October, 1989
AMPGARD Medium Voltage Starters
Optional Motor Protection, Metering & Communications

IQ-1000 II

Maximizes Motor Utilization
The IQ-1000 II is a microprocessor based multifunction, motor protective relay that monitors three phase AC current and makes separate trip and alarm decisions based on pre-programmed motor current and temperature conditions.

It is capable of combining the effects of temperature, time, current (both positive and negative sequence) and true RMS into a feature set points (eleven RTD inputs are available as an option):
 Six Stator Windings-Overtemperature: Device 49
 Two Motor Bearings-Overtemperature: Device 38
 Two Load Bearings-Overtemperature: Device 38
 One Auxiliary Overtemperature Device 38
 Jam trip level with start and run time delays.
 Underload trip level with start and run time delays: Device 37
 Phase Loss and Phase Unbalance trip and alarm level with run delay: Device 46
 Number of motor “starts” allowed per time period: Device 66
 Anti-backspin time delay.
 Transition signal: Transition based upon current level with a back-up timer and transition or trip selection: Device 19
 Incomplete sequence
 Current Transformer Ratio Selection
 Full load amps
 Trip Mode: Mode 1: Trip relay energizes on trip condition
 Mode 2: Trip relay energizes on power up and de-energizes on trip condition
 Phase reversal for non-reversing starters: Device 46: Selection of non-reversing or reversing starters
 Selection of remote trip, remote reset, or differential trip
 Frequency selection – 50Hz or 60Hz
 Selection of auto or manual reset (for 12t trips)
 Positive and negative (unbalance) sequence current algorithm automatically determines protection curve for a given motor
 Transducer Output, 4-20 mA

IQ-1000 II Monitored and Displayed Values
- Motor current for each phase.
- Motor current as a percent of full load amps for each phase.
- Eleven Resistance Temperature Detectors (RTDs) – optional.
- Operations count.
- Run Timer (in hours).
- Remaining starts.
- Oldest start: Time remaining before “oldest” start is restored to “remaining starts”.
- Percent of full load current.
- Ground current.

IQ Data Plus II™

IQ Data Plus II The Ultimate In Monitoring
The IQ Data Plus II is a microprocessor-based monitoring and protective device that provides complete electrical metering plus affords system voltage protection. In one compact, standard package, the IQ Data Plus II provides an alternative to individually mounted and wired ammeters, voltmeters, ammeter and voltmeter switches, wattmeters, watthour meters, and more.

Direct Reading Metered Values
- AC Amperes: Phase A
- AC Amperes: Phase B
- AC Amperes: Phase C
- AC Voltage: Phase A B C
- AC Voltage: Phase A Neutral
- AC Voltage: Phase B C Neutral
- AC Voltage: Phase C A Neutral
- Watts
- vars
- Power Factor
- Frequency
- Watt Hours
- Demand
- Pulse Initiator
- Demand Synchronizing Pulse

Field Settable Protection Functions
- Phase Loss (Voltage or Current)
- Phase Unbalance (Voltage)
- Phase Reversal (Voltage)
- Overvoltage
- Undervoltage

UL Recognized

Communications

IMPACC
The IQ-1000 II and IQ-Data Plus II can be tied into a local area network with the addition of a communication module: All the data that is available on the Face Plate is also available at a control operators location. The information is transmitted via a two-wire, twisted pair daisy chained between the IQ modules back to a computer.

IMPACC utilizes the Incom chip to provide reliable communications over its local area network. It ties together multiple Ampgards with IQ-1000 II and IQ-Data Plus II. Other Westinghouse Equipment, (DS Switchgear, Motor Control Centers, VCP-W Switchgear) also has the capability of being tied into the IMPACC System.

Three levels of communication are available with pre-packed software for the operation station.

The utilization of IMPACC gives the operating and maintenance personnel the opportunity to monitor and record

Status
Running Conditions
Alarm and Trip Conditions*

*All the operating data at time of trip is recorded and stored for later evaluation. Now it is possible to not only know what is happening but also what did happen. Valuable information to perform maintenance and keep a system running is always available.

October 1989
AMPGARD Medium Voltage Starters
With IQ-1000 II and IQ Data Plus II Low Voltage Door Mounted

IQ-1000 II – Protection

IQ Data Plus II – Monitoring

IMPACC – Communications

Communication Module (PONII)
Mounted on Rear of IQ 1000 II

October, 1989
AMPGARD Medium Voltage Starters
Starter Configurations

Back to Back Arrangement

Top Entry Incoming Line – No Line Metering

Incoming Line Top or Bottom Entry with Metering
Other Incoming Line Arrangements are Shown in Price List 8810 Structure Modifications

October, 1989
AMPGARD Medium Voltage Starters
Starter Configurations

ADM Load Break Switch and Induction Motor Starter

400 Amp and 800 Amp Motor Starters

Typical Transition to Transformers
NEMA Type 1 Enclosure

October, 1989
AMPGARD Medium Voltage Starters
Enclosure Types

Enclosures

Ampgard medium voltage starters are available in many types of enclosures. These include Type 1 general purpose enclosures for general indoor applications, Type 1A gasketed, Type 3 outdoor walk-in or non-walk-in, and Type 12 for locations with extreme dust conditions.

Ampgard medium voltage starters are mounted in free-standing sheet steel enclosures that meet ANSI/NEMA ICS-6 enclosure standards and specifications. They are completely front accessible, allowing for free-standing, against-a-wall, or back-to-back mounting.

The Type 1 floor-mounted structures are 100 inches high with main bus, 30 inches deep, and either 26, 36 or 40 inches wide for indoor installation.
Coordinated Protection Insures Maximum Motor Utilization

Coordinated with the motor’s characteristics, the protective devices in the Ampgard Starter provide motor protection from overload to full system capacity faults.

The industry standard, bi-metallic overload relay provides motor protection against sustained overloads. The relay’s inverse time characteristic curve normally falls within the motor’s safe allowable stall heating curve. However, the particular application/motor requirements should be reviewed to insure both full utilization and proper protection of the motor. To be considered are excessive accelerating time, locked rotor stalled conditions, changing motor ambient conditions, and varying load conditions. Additional motor protection considerations are over temperature, instantaneous overcurrent, ground fault and phase unbalance. Also, the load protection functions and power source protection functions should also be reviewed.

Such relays as Ground Gard, MOR-A, SVM-3, IQ1000 II and IQ-Data Plus II can easily be factory installed. The use of multifunction relays that can be easily adjusted for each motor application assures maximum motor utilization.

Typical fuse – contactor – overload coordination for a 400 amp vacuum contactor.
# AMPGARD Medium Voltage Starters

## Technical Data

### Type SJ Vacuum Contactor Ratings 400 Amp

<table>
<thead>
<tr>
<th>SJO 72V430</th>
<th>SJA 25V430</th>
<th>SJA 33V430</th>
<th>SJA 50V430</th>
<th>SJA 72V430</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rated Utilization Voltage</strong></td>
<td>2200 to 2500 Volts</td>
<td>3000 to 3300 Volts</td>
<td>3800 to 5000 Volts</td>
<td>6000 to 7200 Volts</td>
</tr>
<tr>
<td><strong>Interrupting Rating</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEMA Unfused (E1)</td>
<td>25 MVA</td>
<td>25 MVA</td>
<td>50 MVA</td>
<td>50 MVA</td>
</tr>
<tr>
<td>NEMA Fused (E2)</td>
<td>200 MVA @ 2300 V</td>
<td>285 MVA @ 3300 V</td>
<td>400 MVA @ 4600 V</td>
<td>570 MVA @ 6600 V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Application Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>Induction Motor</td>
</tr>
<tr>
<td>Synchronous Motor (0.8 PF)</td>
</tr>
<tr>
<td>(1.0 PF)</td>
</tr>
<tr>
<td>Transformer</td>
</tr>
<tr>
<td>Capacitor 3 Phase</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum Insulation Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>7200 Volts</td>
</tr>
</tbody>
</table>

### Max. Interrupting Current (3 OPS.)

- 7600 Amps

### Rated Current

- 360 A Enclosed
- 400 A Open

### Chop Current

- 0.3 Amps Avg.

### IEC Make-Break Capability-AC4 Class 3

<table>
<thead>
<tr>
<th>Make</th>
<th>4000 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Break</td>
<td>3200 A</td>
</tr>
</tbody>
</table>

### Short Time Current

- 30 sec | 2160 A
- 1 sec | 5400 A
- 8.7 MS (0.5 Cycle) | 55 KA Peak

### Switching Frequency

- 1200 Hour

### Mechanical Life

- 2.5 Million

### Electrical Life

- 250,000 OPS
- At Rated Current

### Impulse Withstand

- 60 KV (1.2x50 Microseconds)

### Dielectric Strength (60 Hz)

- 18 KV (1 Minute)

### Closing Time (Energization To Contact Touch)

- 50 Milliseconds (3.0 Cycles)

### Closing Time (Energization To Armature Seal)

- 65 Milliseconds (3.5 Cycles)

### Opening Time (Deenergization To Full Open)

- 130 Milliseconds (8.0 Cycles)

### Latch (When Specified)

- Mechanical Life: 250,000 Operations
- Trip Voltages (DC): 24 Volts
- 48 Volts
- 96 Volts
- 110 Volts (50/60 Hz)
- 220 Volts (50/60 Hz)
- Tripping Voltage: 80% Rated Coil Voltage
- Tripping Burden (24 VDC): 600 VA
- (48 VDC & 96 VDC): 200 VA
- (110 VAC & 220 VAC): 250 VA

### Weight

- SJ Assembled: 125 Lbs. Including 600 VA Control Transformer

*Time Stated in Cycles on 60 Hz Base*
### Type SJ Vacuum Contactor Ratings 800 Amp

#### SJO 72V830

<table>
<thead>
<tr>
<th>Rated Utilization Voltage</th>
<th>SJA 25V830</th>
<th>SJA 33V830</th>
<th>SJA 50V830</th>
<th>SJA 72V830</th>
</tr>
</thead>
<tbody>
<tr>
<td>2200 to 2500 Volts</td>
<td>50 MVA</td>
<td>50 MVA</td>
<td>75 MVA</td>
<td>100 MVA</td>
</tr>
<tr>
<td>3000 to 3300 Volts</td>
<td>200 MVA @ 2300 V</td>
<td>285 MVA @ 3300 V</td>
<td>408 MVA @ 4600 V</td>
<td>570 MVA @ 6600 V</td>
</tr>
<tr>
<td>3800 to 5000 Volts</td>
<td>50 MVA</td>
<td>75 MVA</td>
<td>100 MVA</td>
<td></td>
</tr>
<tr>
<td>6000 to 7200 Volts</td>
<td>50 MVA</td>
<td>75 MVA</td>
<td>100 MVA</td>
<td></td>
</tr>
</tbody>
</table>

#### Application Table

<table>
<thead>
<tr>
<th></th>
<th>Induction Motor</th>
<th>Synchronous Motor (0.8 PF)</th>
<th>Transformer</th>
<th>Capacitor 3 Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEMA Unfused (E1)</td>
<td>3000 HP</td>
<td>3000 HP</td>
<td>2500 KVA</td>
<td>2400 KVAR</td>
</tr>
<tr>
<td>NEMA Fused (E2)</td>
<td>4000 HP</td>
<td>4000 HP</td>
<td>3500 KVA</td>
<td>3200 KVAR</td>
</tr>
</tbody>
</table>

#### Maximum Insulation Voltage

- 7200 Volts

### Interruption Ratings

<table>
<thead>
<tr>
<th></th>
<th>SJA 25V830</th>
<th>SJA 33V830</th>
<th>SJA 50V830</th>
<th>SJA 72V830</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Interrupting Current (3 OPS.)</td>
<td>13200</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated Current</td>
<td>720 A Enclosed</td>
<td>800 A Open</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chop Current</td>
<td>0.5 Amps Avg.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IEC Make-Break Capability - AC4 Class 3</td>
<td>Make 8000 A</td>
<td>Break 6400 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short Time Current</td>
<td>4320 A</td>
<td>10800 A</td>
<td>86 KA Peak</td>
<td></td>
</tr>
<tr>
<td>30 sec</td>
<td>1 sec</td>
<td></td>
<td>1200 Hour</td>
<td>Mean</td>
</tr>
<tr>
<td>8.7 MS (0.5 Cycle)*</td>
<td>10800 A</td>
<td>86 KA Peak</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching Frequency</td>
<td>1200 Hour</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical Life</td>
<td>1 Million</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical Life</td>
<td>250,000 OPS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impulse Withstand</td>
<td>60 KV (1.2 x 50 Microseconds)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dielectric Strength (60 Hz)</td>
<td>18.2 KV (1 Minute)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Control Voltages

<table>
<thead>
<tr>
<th></th>
<th>SJO 72V830</th>
<th>SJA 50V830</th>
<th>SJA 72V830</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Circuit Burden</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Closing (AC)/(DC)</td>
<td>2600 VA/3000 VA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holding (AC)/(DC)</td>
<td>50 VA/56 VA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Auxiliary Contact Rating (L-64)

<table>
<thead>
<tr>
<th></th>
<th>SJO 72V830</th>
<th>SJA 50V830</th>
<th>SJA 72V830</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage (Max)</td>
<td>600 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous Current</td>
<td>10 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Making Capacity (AC)</td>
<td>7200 VA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(DC)</td>
<td>200 VA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breaking Capacity (AC)</td>
<td>720 VA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(DC)</td>
<td>200 VA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Latch (When Specified)

<table>
<thead>
<tr>
<th></th>
<th>SJO 72V830</th>
<th>SJA 50V830</th>
<th>SJA 72V830</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical Life</td>
<td>250,000 Operations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trip Voltages (DC)</td>
<td>24 Volts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(DC)</td>
<td>48 Volts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(AC)</td>
<td>96 Volts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tripping Voltage</td>
<td>80% Rated Coil Voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tripping Burden (24 VDC)</td>
<td>1200 VA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(48 VDC &amp; 96 VDC)</td>
<td>400 VA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(110 VAC &amp; 220 VAC)</td>
<td>500 VA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Weight

- SJ Assembled: 210 Lbs.

---

*Time Stated in Cycles on 60 HZ Base
AMPGARD Medium Voltage Starters

Typical Specification for Medium Voltage Starters

General
- These specifications define requirements for vacuum medium voltage starters of the sizes, types and ratings indicated herein.
- All starters shall be designed and tested to meet the latest applicable Industrial Control NEMA and ANSI standards. The starters shall be fused type, NEMA Class E2, as defined by NEMA Industrial Control Standard ICS2-324.
- Starters shall be equipped with current limiting power fuses, and shall have integrated interrupting ratings of 200 MVA on 2300V systems through 2500 HP, and 400 MVA on 4600V systems through 5500 HP.

Construction
- Isolating switch and contactor assemblies, including current limiting fuses, shall be of the component-to-component design without any interconnecting cables or flexible shunts. They shall be easily removed from the front of the enclosure. Line and load cable terminations shall be completely accessible from the front.
- The isolating switch shall be externally operated manual three-pole draw-out, such that in the open position it completely grounds and isolates the starter from the line connectors with a mechanically driven isolating shunt leaving no exposed high voltage. Integral mechanical interlocks shall prevent entry into the high voltage areas while the starter is energized and shall block accidental opening or closing of the isolating switch when the door is open or contactor is closed. The isolating switch handle shall have provisions for padlocks in the off position.
- Current limiting power fuses shall be of the self-protecting type with visible fuse condition indicators, and with special time/current characteristics for motor service allowing proper coordination with the contactor and overload relay for maximum motor protection. This coordination shall be such that under a low fault condition the interrupting rating and drop-out time of the contactor shall be properly coordinated with all possible fuse sizes to eliminate contactor racing. The power fuses shall be located to permit easy inspection and replacement without starter disassembly.
- The vacuum contactor shall be of the drawout type either slideout or rollout with single-break high pressure type main contacts with weld-resistant alloy contact faces. The 400 ampere contactor design shall limit chop current to 0.3 ampere average and have an E1 unfused rating capable of interrupting 7600 amperes from 2300 volts to 7200 volts. The vacuum contactor contact wear shall be easily checked from the front with the use of a feeler gauge.
- A built-in test circuit shall be included to permit checking of the starter control and pilot circuit with the high voltage de-energized and isolated, with the contactor in its normal position or in the draw-out position. In the test mode, the control circuit shall be capable of being energized through a polarized plug connector from an external 115 volt supply.
- Control power shall be 120 volt AC and obtained from individual starter cubicle control power transformers.
- Enclosures for the high voltage starters shall meet NEMA ICS-6 enclosure standards and shall be NEMA 1, unless otherwise noted, completely front accessible and allowing free-standing against a wall or back-to-back mounting. Standard indoor floor-mounted structures shall be 90 inches high and 30 inches deep. Where multiple starter/structure installations are required, the horizontal power bus to connect between structures shall be copper rated a minimum of 1000A and located on the top in a separate 10-inch high enclosure with removable front, top and end panels, including a barriered section for top entry cables. An incoming line structure shall have provisions for terminating cables. Vertical bus to connect tiered starter units shall be insulated and integral to the enclosure’s 30-inch depth.

Equipment Details
- Each squirrel cage motor full voltage starter shall include:
  1 – Drawout three-pole vacuum contactor
  1 – Control circuit transformer
  1 – Control circuit secondary fuse
  1 – Run-test circuit
  3 – Spare electrical interlocks
  3 – Isolated vertical line connectors
  1 – Drawout three-pole gang-operated line isolating switch
  3 – Current limiting power fuses

3 – Current transformers
3 – Load terminals
1 – Operating and maintenance instructions mounted inside M.V. door

Motor Protection (When Specified)
- The protection and metering function are to be provided by using a multi-purpose microprocessor module. The protection shall calculate the effects of positive and negative (unbalance) sequence currents of true current RMS.
- Protection functions shall include:
  - Instantaneous overcurrent – Device 50
  - Locked Rotor current – Device 51
  - Time Current – Device 49
  - Maximum allowable stall time
  - Ultimate trip current level
  - I2T Alarm level – Device 74
  - Zero Sequence Ground Fault – Device 50G/51G
  - Phase Loss or Phase Unbalance – Device 46
  - Number of Motor Starts – Device 66
  - Anti Backspin Time Delay
  - Phase Reversal for Non-Reversing Starters – Device 46
  - Separate alarm and trip for 6 motor RTD inputs, 2 motor bearing RTD inputs, 2 load bearing RTD inputs, and 1 aux. input (optional).
- The metering functions shall include:
  - Motor current in each phase
  - Motor current as a percent of full load amperes
  - Eleven resistance temperature detectors (optional)
  - Operation counts
  - Run Time (Hours)
  - Remaining Starts
  - Oldest Start

Further Information
- Price List 8810
- Renewal Parts Data 8855A
- 8855V
- 8855C
- 8855S
- Catalog 55-000
- Catalog 25-000
- Service Guide 8800

WESTINGHOUSE AMPGARD CONTROL GOAL:
TO KEEP MOTORS RUNNING

Westinghouse Electric Corporation
Distribution and Control Business Unit
Construction Equipment Division
Asheville, North Carolina, U.S.A. 28813

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