

A vertical decorative bar on the left side of the page, composed of five horizontal rectangular segments in various shades of blue and teal.

# SSW7000C

Guide Form Specification  
For  
MV Soft Starter  
Rated 750-3500 HP

**WEG Electric Corporation**

6655 Sugarloaf Parkway

Duluth, GA 30097

1-800-ASK-4WEG

**SPECIFICATIONS FOR  
SSW7000C MEDIUM VOLTAGE SOFT STARTER  
RATED 750 – 3500 HP**



**Table of Contents**

<b>1. GENERAL .....</b>	<b>3</b>
1.1 DOCUMENT AND EQUIPMENT SCOPE .....	3
1.2 CODES AND STANDARDS .....	3
1.3 SOFT STARTER COMPONENTS AND CONFIGURATION .....	4
1.4 SUBMITTALS .....	4
1.5 INSPECTION AND TESTING .....	5
1.6 WARRANTY .....	5
<b>2. PRODUCTS.....</b>	<b>6</b>
2.1 ACCEPTABLE MANUFACTURER.....	6
2.2 PRODUCT DESCRIPTION.....	6
A. MECHANICAL .....	6
B. ELECTRICAL .....	8
C. CONTROL .....	9
<b>3. EXECUTION.....</b>	<b>13</b>
3.1 SITE PREPARATION.....	13
3.2 SHIPPING .....	13
3.3 SYSTEM STARTUP AND COMMISSIONING .....	13



**SPECIFICATIONS FOR  
SSW7000C MEDIUM VOLTAGE SOFT STARTER  
RATED 750 – 3500 HP**



## **1. GENERAL**

### **1.1 DOCUMENT AND EQUIPMENT SCOPE**

- A. This document specifies required features for design, manufacturing, control and testing of Medium Voltage Soft Starter. MV Soft Starter is designed to start squirrel cage induction motors rated for 2.3kV, 3.3kV and 4.16kV, 3Ph, 60Hz supply.
- B. For procurement of a suitably rated soft starter, the Purchaser shall provide relevant motor specifications with specific applications requirements. Preference will be given to suppliers that manufacture, guarantees and provides service for the motor and the soft starter.
- C. Soft starter shall be completely assembled, pre-wired and tested by the soft starter supplier. Applicable project specific data shall be used during factory testing.

### **1.2 CODES AND STANDARDS**

- A. Applicable requirements in the latest edition of the following industry standards and industry practices shall be considered an integral part of this Specification.
  - 1. IEC 62272-200 High Voltage controlgear and switchgear – part 200  
High voltage controlgear and switchgear in metal enclosure for voltages over 1 kV up to and including 52 kV
  - 2. IEC 62272-1 High Voltage switchgear and controlgear – part 1 : Common Specifications
  - 3. IEC 60060-1 High Voltage Test Techniques – Part 1: General Definitions and Test Requirements
  - 4. CISPR-11 Industrial, scientific and medical (ISM) radio-frequency equipment - electromagnetic disturbance characteristics - limits and methods of measurement
  - 5. IEC 61000-4-4 Electromagnetic compatibility (EMC) - Part 4: testing and measurement techniques - section 4: electrical fast transient/burst immunity test. Basic EMB publication
  - 6. IEC 61000-4-18 Electromagnetic compatibility (EMC) - Part 4-18: testing and measurement techniques - damped oscillatory wave immunity test
  - 7. NBR IEC 60529 Protective rates for electric equipment enclosures (IP code)
  - 8. NEMA ICS 6 Industrial Control and Systems Enclosures
  - 9. UL 347 Medium Voltage AC Contactors, Controllers and Control Centers
  - 10. UL 347B Medium Voltage Motor Controllers



**SPECIFICATIONS FOR  
SSW7000C MEDIUM VOLTAGE SOFT STARTER  
RATED 750 – 3500 HP**



- B. Any conflicts between this specification and the Bidder's documents shall be identified in writing to Purchaser for resolution.
- C. Any deviations to specifications given here will be clearly stated in writing at the time of submittal of proposal/quotation documents.

**1.3 SOFT STARTER COMPONENTS AND CONFIGURATION**

Soft Starter shall consist of following major components:

1. Load break disconnect switch with blade grounding bar
  2. MV Fuses – R rated appropriately rated for required overload & number of starts
  3. MV contactors – for line supply and for bypass connections
  4. Phase controlled thyristor power modules – one per phase
  5. CTs for motor current measurement
  6. Ground Fault CT
  7. Control Power Transformer to be able to derive control voltage from line supply
  8. MV control board with line side and motor side voltage measurement,
  9. LV control board for field I/O & communications
  10. Door mounted LCD keypad and indicator lights for operator interface
- A. This specification is for a Soft Starter for starting single motor.
  - B. All components and materials shall be new and of the latest field proven design and in current production. Obsolete components or components scheduled for immediate discontinuation shall not be used.
  - C. If it is necessary to ship thyristor power modules separately then adequate instructions shall be provided for easy field reassembly of the same.

**1.4 SUBMITTALS**

- A. Soft Starter manufacturer shall submit drawings and data as specified below as part of bid information;
  1. Basic description of all major components, control and protection features of Soft Starter
  2. Dimensions and estimated weights clearly stated in the description or via outline drawings
  3. Single-line diagram showing all major components within the system
  4. Recommended spare parts list
  5. Rate schedule for field service
  6. Terms of standard warranty



**SPECIFICATIONS FOR  
SSW7000C MEDIUM VOLTAGE SOFT STARTER  
RATED 750 – 3500 HP**



Following drawings and data will be submitted for engineering review per agreed project schedule;

1. Control schematic for the Soft Starter
2. Mechanical drawing and a Bill of Material
3. Installation, Operation, Programming, and Maintenance Manual(s)

Test reports will be supplied as part of factory testing.

### **1.5 INSPECTION AND TESTING**

- A. Following minimum testing will be performed in addition to Manufacturer's standard testing;
  1. Mechanical checks and tests shall be performed for each Soft Starter to verify satisfactory assembly and safety locking operation.
  2. Electrical functions including Instrumentation check, software, and monitoring tests shall be performed.
  3. Tests shall be performed to ensure proper operation of all devices and components including operation of the Soft Starter by starting an induction motor

### **1.6 WARRANTY**

- A. Seller shall warrant the equipment for a period of 3 years from date of shipment for equipment to be installed and operated in North America. For North American installations, warranty shall cover both parts and labor for required repairs.
- B. For equipment to be installed and operated in other regions of the world, warranty shall be minimum of 12 months after startup, 18 months after shipment. Inclusion of labor for repairs may vary depending on location.
- C. Seller must state clearly the details of warranty offered with his equipment.



**SPECIFICATIONS FOR  
SSW7000C MEDIUM VOLTAGE SOFT STARTER  
RATED 750 – 3500 HP**



## **2. PRODUCTS**

### **2.1 ACCEPTABLE MANUFACTURER**

- A. The MV Soft Starter shall be SSW7000/SSW7000C by WEG Electric Corp.
- B. The Soft Starter supplier shall have a minimum of 10 years of experience in supplying medium voltage soft starters.

### **2.2 PRODUCT DESCRIPTION**

#### **A. MECHANICAL**

##### **1. ENCLOSURE CONSTRUCTION**

- a. The Soft Starter assembly and its enclosure protection class (NEMA 12) should allow indoor or outdoor installation within unclassified area.
- b. Enclosure shall have service entrance rated incoming power section
- c. Doors on the MV power sections shall be mechanically interlocked, either via Guillotine Mechanism or via Kirk-Key interlock to prevent opening of any MV section doors when soft starter is in operation or its load break switch is in closed position.
- d. Enclosure shall have a separate LV compartment, that is isolated from the MV section of the enclosure, such that access to components installed in the LV compartment is permitted and is safe when soft starter is in operation or when the input load break switch is closed
- e. All control boards used within soft starter shall be coated such that there can be no damage from moisture or dust within ambient environment.
- f. If cooling fans are used on thyristor modules, then these fans will be controlled via suitably rated LV circuit breaker. Loss of power to any cooling fan will be indicated as Alarm signal
- g. The maximum noise level of the unit shall not exceed 75 dBA at a distance of 3.3 feet (1 meter) from the unit and at a height of 5 feet (1.5 meters) from the floor.
- h. All enclosures will have manufacturer's standard finish unless otherwise specified by the purchaser.
- i. Enclosures shall be designed to accommodate power cable entry from either top or bottom.



**SPECIFICATIONS FOR  
SSW7000C MEDIUM VOLTAGE SOFT STARTER  
RATED 750 – 3500 HP**



---

**2. ENCLOSURE AUXILIARY COMPONENTS**

- a. If required, space heater elements shall be supplied to avoid any condensation inside the enclosure.
- b. The space heater circuit shall turn on when Soft Starter is not in operation. Thermostatic control cannot determine the dew point.
- c. A circuit breaker for the space heater circuit shall be provided for overload protection and as a disconnecting means.
- d. Enclosures shall be equipped with lighting, if specified by the purchaser.

**3. ENCLOSURE NAMEPLATES**

- a. Engraved, laminated plastic nameplates with characters 1/2 inch (12.7 mm) high, or larger, shall be provided for each Soft Starter to identify its nominal ratings.
- b. Nameplates shall have black letters on a white background, unless otherwise specified on the Data Sheet.
- c. All components inside Soft Starter enclosure shall be identified using the tag names as shown on the schematic diagrams



**SPECIFICATIONS FOR  
SSW7000C MEDIUM VOLTAGE SOFT STARTER  
RATED 750 – 3500 HP**



**B. ELECTRICAL**

**1. POWER REQUIREMENTS**

- a. Soft Starter shall operate with input voltage variation of -60% to +10% and frequency variation of +/-10%
- b. Thyristors used within power modules shall be rated for 6.5kV with peak reverse voltage on the power stack of 13kV for 4.16V operation.
- c. Thyristor power modules shall have hardware protection via active dv/dt filter
- e. Thyristor power modules and MV fuse assembly combination shall be rated for minimum 400% of motor rated current for 20 seconds to achieve minimum two starts per hour without affecting thermal stability of either component
- f. Soft Starter bus at 4.16kV operation shall withstand 40kA short circuit current for 10mS with fuses clearing the fault
- g. Soft Starter assembly shall have insulation voltage level of 12.5kV for 4.16kV operation (power frequency withstand for 60s) and BIL of 60kV for 4.16kV operation
- h. Line contactor and bypass contactor shall have same current and voltage ratings

**2. WIRING AND TERMINATIONS**

- a. Bus terminations shall be supplied for input and output connection for external power cable connections and shall be conveniently located, clearly numbered, and identified.
- b. Control wire terminal blocks for field wiring termination shall be compression screw type, designed to accommodate stripped insulation bare wire ends.
- c. Connection points for inputs and outputs of different voltage levels shall be separated to reduce possibility of electrical noise.
- d. Where wiring is run through sheet metal or any barrier, bushings, grommets or other mechanical protection around the sheet or barrier opening shall be provided.
- e. All internal wiring shall be terminated with no more than two (2) conductors per terminal point.





**SPECIFICATIONS FOR  
SSW7000C MEDIUM VOLTAGE SOFT STARTER  
RATED 750 – 3500 HP**



- f. Soft Starter Enclosure shall have an internal ground bus bar suitable for terminating a stranded copper ground conductor of the same size as the incoming phase conductors. Ground connections shall be near the incoming and outgoing power cable termination points and control wiring connections.
- g. Minimum wire bending space shall meet or exceed the value shown in NEC Table 430-10(b) for termination of the power cable.

**C. CONTROL**

**1. CONFIGURATION**

- a. Soft Starter supplier shall supply a software tool to configure, monitor and troubleshoot the Soft Starter. Software tool shall have a trending feature where up to six signals can be displayed in real time.
- b. The software tool shall have a multilevel access feature for configuration of parameter settings.

**2. OPERATOR PANEL, INSTRUMENTS, DISPLAYS, AND INDICATING LIGHTS**

- a. A door-mounted graphic key pad will be provided for local control and monitoring of the Soft Starter. The keypad shall be removable type and can also be remotely mounted. Remote mounted keypad can be available in NEMA 4 protection case.
- b. The removable keypad display shall:
  - 1) have configurable charts and intuitive icons
  - 2) have soft-keys for selection of menu items
  - 3) have Soft Starter control functions that allow local operation of the motor from the keypad
  - 4) have full access to all parameters and variables
- c. The operator keypad shall be used to read and write parameter data, to present operational information, to produce first fault and device indication, to show alarms, and to allow metering of parameters
- d. The operator keypad shall include a level of security
- e. The operator keypad shall have analog input information
- f. Keypad shall be accessible and visible from the front without opening the enclosure



**SPECIFICATIONS FOR  
SSW7000C MEDIUM VOLTAGE SOFT STARTER  
RATED 750 – 3500 HP**



**3. OPERATIONAL CONTROLS**

- a. The Soft Starter shall include the following basic operating adjustments:
  - i. Start/Stop/E-Stop
  - ii. Acceleration/Deceleration times, direction of rotation, jog, local/remote operation,
  - iii. Operating Modes;
    - o Voltage ramp
    - o Current limitation
    - o Pump control
    - o Torque control
    - o Current ramp
  - iv. Guided Starting Sequence (Oriented Startup) to minimize parameter settings
  - v. Direct On Line (DOL) operation selection via software parameter to bypass soft start operation
  - vi. Active Motor Protection: All motor protection control should be active in case of bypassing soft start operation
  - vii. Motor thermal class curve selection without use of separate motor protection relay
- b. Removable graphic keypad shall allow activation of self-diagnostic tests for checking status of control boards and thyristor power modules
- c. Soft Starter shall include necessary instrumentation to monitor the power devices and the motor against overload, internal faults of the motor or the Soft Starter and disturbances in the incoming power supply.
- d. Soft Starter should allow for temperature monitoring of motor windings via RTDs up to 8 signals and allow use of these temperature values as feedback to thermal class protection curve setting calculations
- e. Soft Starter faults that result in tripping or shutting down of Soft Starter operation shall be annunciated on the removable graphic LCD keypad. The Soft Starter shall shut down safely with the output voltage reduced to zero for the following conditions;
  - i. Under-current, Overcurrent and current unbalance
  - ii. Under-voltage, Overvoltage and voltage unbalance
  - iii. Under-torque, Over-torque and active overpower phase loss
  - iv. Reverse phase sequence
  - v. Over-temperature in the thyristor power modules
  - vi. Motor overload or external short circuit
  - vii. Motor over-temperature (via accessory module)
  - viii. Ground fault by voltage or current.



**SPECIFICATIONS FOR  
SSW7000C MEDIUM VOLTAGE SOFT STARTER  
RATED 750 – 3500 HP**



- ix. Fault within thyristor power modules
- x. Fault in the operation of power contactors
- xi. Faults within the control boards (self-monitoring)
- xii. Communication faults of HMI and between controls boards
- xiii. Faults in the communication networks
- xiv. Programming errors such as incorrect parameter setup, limit setting, data entry etc.

**4. CONTROL POWER TRANSFORMERS (CPT)**

- a. A Control Power Transformer (CPT) shall be provided within the enclosure. CPT shall be rated for 4.16kV / 120V for generating control voltage for the Soft Starter controls
- b. The KVA rating of the CPT shall be determined by the Manufacturer and shall have a minimum of 25% spare capacity.
- c. In case CPT is not desired by the purchaser, then 120V, 1Ph supply should be available at site to power Soft Starter control

**5. INPUT AND OUTPUT CONTROLS**

- a. Discrete Interface to field controls and field signals shall be provided by the Soft Starter supplier
- b. Soft Starter control system shall be capable of following INPUT signal interface;

Digital INPUTS: Programmable  
6 Programmable Isolated Inputs: 24Vdc

Analog INPUTS: Programmable  
2 differential inputs insulated by differential amplifier; AI1 resolution: 12 bits, AI2 resolution: 11bits + signal, (0 to 10) V, (0 to 20)mA or (4 to 20) mA

- c. Soft Starter control system shall be capable of following OUTPUT signal interface;

Digital OUPUTS: Programmable  
3 NO/NC relay contacts, 240 VAC, 1A

Analog OUTPUTS: Programmable  
2 isolated outputs, (0 to 10V), 0 to 20mA or 4 to 20mA, 11-bit resolution,



**SPECIFICATIONS FOR  
SSW7000C MEDIUM VOLTAGE SOFT STARTER  
RATED 750 – 3500 HP**



- 
- d. If specified, a communication network to the Purchaser's network shall be MODBUS, DeviceNet or Profibus.

**6. FAULTS AND ALARMS**

- a. The latest 10 faults and alarms are logged and time stamped with date record. The trace data can be uploaded to PC tool for display/analysis in the trend window.



**SPECIFICATIONS FOR  
SSW7000C MEDIUM VOLTAGE SOFT STARTER  
RATED 750 – 3500 HP**



### **3. EXECUTION**

#### **3.1 SITE PREPARATION**

- A. Soft Starter shall be installed in an indoor, unclassified area. Ambient factors such as maximum temperature, humidity, air quality etc. shall not exceed maximum ambient values as listed in the soft starter specification and/or manuals.
- B. A stable foundation/base shall be prepared for installation of the soft starter equipment. Cable entry exit points are to be setup either via conduit installation or cable tray/cable guide installation.
- C. All power wiring and control wiring shall be done by the installation contractor per manufacturers drawing.

#### **3.2 SHIPPING**

- A. Unless specified otherwise, preparation for shipment shall be in accordance with Manufacturer's standards.
- B. Loose parts and components shall be properly packaged and secured for shipment inside the enclosure or shipping container. These items shall be properly tagged for easy identification.
- C. Soft Starter shipping units can be export packaged when required

#### **3.3 SYSTEM STARTUP AND COMMISSIONING**

- A. Commissioning and Startup Services must be available from the supplier's local field engineering service group. A field service engineer shall be available 24 hours per day, 365 days per year.
- B. Supplier shall provide a start-up and commission plan for the supplied Soft Starter. The startup plan shall include check of installation, check of power and field signal wiring, power-up / no-load testing (load uncoupled) and load testing (coupled testing).
- C. The Supplier shall provide a software tool with operational, maintenance and diagnostic features. Using a Purchaser supplied Windows PC, this software shall permit programming of parameters, display trends, report adjustment data, provide troubleshooting guidance using first fault data and trace back data.

