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## 1.0 Introduction

This specification guide provides detailed information about the RVS-DN soft starter. The RVS-DN soft starter is a microprocessor based soft starter for three-phase AC induction motors. It provides the best method of reducing excess current and torque during starting. The RVS-DN technical manual provides complete instructions for set up and operation of the unit.

## 2.0 Specifications

- 2.1 The soft starter shall have the following **standard performance features**:
  - 2.1.1 Soft Start with standard voltage ramp
  - 2.1.2 Soft Start with pump control curves
  - 2.1.3 Soft Start with torque control curve
  - 2.1.4 Soft Start with current control curve
  - 2.1.5 Soft Start with torque boost (kick start)
  - 2.1.6 Linear Acceleration (with user supplied tachometer)
  - 2.1.7 Soft Stop with standard voltage ramp
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  - 2.1.14 Dual Adjustment (Dual ramp starting & stopping)
  - 2.1.15 Generator Mode starting
  - 2.1.16 Slow speed and slow speed reverse
  - 2.1.17 Energy saver
  - 2.1.18 Software lock of parameters for preventing undesired modifications
  
- 2.2 The soft starter shall have the following **motor protection features** as standard:
  - 2.2.1 Programmable maximum starts and start inhibit period
  - 2.2.2 Stall Detection
  - 2.2.3 Electronic shear pin (instantaneous trip and programmable with time delay) during start and run
  - 2.2.4 Electronic overload with selectable curves
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- 2.3 The soft starter should have the following **programmable inputs and outputs** as standard:
- 2.3.1 Programmable inputs:  
Dual adjustment, Generator starting, Energy saver, slow speed, slow speed reverse, and remote reset.
  - 2.3.2 Programmable output relays:  
Immediate, Shear pin alarm, End of Acceleration, Fault.
  - 2.3.3 End of Acceleration relay shall have a time delay adjustable from 0 to 120 seconds.
  - 2.3.4 Immediate relay shall have an “on” and “off” delay, adjustable from 0 to 60 seconds.
  - 2.3.5 Shear pin alarm relay shall have an “on” and “off” time delay, adjustable from 0 to 5 seconds.
  - 2.3.6 Fault relay shall be programmable to fault or fault-fail safe.
  - 2.3.7 Programmable Analog output related to current
- 2.4 The soft starter shall have the following **user adjustments**:
- 2.4.1 Two Motor full load amp settings with individual adjustments from 50 to 100% of the soft starters full load amp rating.
  - 2.4.2 Two acceleration ramps with individual adjustments from 1 to 90 seconds.
  - 2.4.3 Two deceleration ramps with individual adjustments from 0 to 90 seconds.
  - 2.4.4 Two initial voltage settings with individual adjustments from 5 to 80% of nominal voltage.
  - 2.4.5 Final torque setting adjustable from 0 to 10 (maximum level).
  - 2.4.6 Two current limit settings with individual adjustments from 100 to 500% of motor full load amps.
  - 2.4.7 Three selectable pump control acceleration curves.
  - 2.4.8 Three selectable pump control deceleration curves.
  - 2.4.9 Torque acceleration curve
  - 2.4.10 Torque deceleration curve
  - 2.4.11 Current control ramp
  - 2.4.12 Kick-start (80% voltage boost) shall be adjustable from 0.1 to 1 second.
  - 2.4.13 Energy savings mode shall be adjustable from 0 to 10 (maximum).
  - 2.4.14 Slow speed and slow speed reverse shall have an adjustable torque setting from 1 to 10 (maximum).
  - 2.4.15 Slow speed and slow speed reverse shall have an adjustable operation time from 1 to 250 seconds.
  - 2.4.16 Maximum starting time (stall protection) shall be adjustable from 1 to 250 seconds.
  - 2.4.17 Number of starts shall be adjustable from 1 to 10, in a programmable time period of 1 to 60 minutes.
  - 2.4.18 The start inhibit time period shall be adjustable from 1 to 60 minutes.
  - 2.4.19 Under current trip setting shall be adjustable from 20 to 90% of the motor full load amps. Under current shall be disabled when set to 'Off'.

- 2.4.20 Under current trip shall have an adjustable delay from 1 to 40 seconds.
  - 2.4.21 Shear pin shall have an adjustable trip level from 100 to 850% of motor full load amps.
  - 2.4.22 Shear pin trip shall have an adjustable delay from 0.0 to 5 seconds.
  - 2.4.23 Overload trip shall have an adjustable trip current from 75 to 150% of motor full load amps.
  - 2.4.24 Overload trip shall have an adjustable delay of 1 to 10 seconds at 500% of motor full load amps.
  - 2.4.25 Under voltage trip shall be adjustable from 120 to 600 volts.
  - 2.4.26 Under voltage trip delay shall be adjustable from 1 to 10 seconds.
  - 2.4.27 Over voltage trip shall be adjustable from 150 to 750 volts.
  - 2.4.28 Over voltage trip delay shall be adjustable from 1 to 10 seconds.
- 2.5 The soft starter shall have the following means of **monitoring**:
- 2.5.1 LED indicators for On, Start, Run, Soft Stop, Stop, Energy Save, Slow speed, Dual Adjustment, Slow Speed Reverse, and Fault.
  - 2.5.2 A two line, sixteen character LCD display shall be available for monitoring the “% of Motor FLA” at all times of operation, as well as viewing all parameters settings, statistical data, and fault diagnostic. Statistical Data shall provide Last start period, Maximum current during last start period, Total run time, Total number of starts, Last trip/fault, Current at the time of last fault, and Total number of faults.
  - 2.5.3 All monitoring may be done through serial communications if an option card is provided (Modbus RS-485, Profibus DP, or Modbus TCP/IP).
- 2.6 The soft starter shall have the following **electrical ratings**:
- 2.6.1 Main voltage supply:
    - 230 Volts; +10% / -15%
    - 480 Volts; +10% / -15%
    - 600 Volts; +10% / -15%
    - 690 Volts; +10% / -15%
    - 1000 Volts; +10% / -15%
    - 1200 Volts; +10% / -15%
  - 2.6.2 Control power supply: 115 volts; +10% / -15% (optional 230V as required)
  - 2.6.3 Frequency: 45 to 65 Hz (fixed or variable frequency source). Soft starter must be able to start while the frequency is changing.
  - 2.6.4 Output relays: Three Form C relays rated at 8A, 250VAC, 2000VA
  - 2.6.5 Codes and Standards:
    - Dielectric test: 2500VAC
    - Emissions: EN55011 CISPR 11 Class A
    - Immunity: EN55082-2
    - ESD 8 KV air, IEC 801,2
    - Electric RF field 10 V/m, 20-1000 MHz, IEC 801-3
    - Fast transients 2KV, IEC 801-4
    - Safety: EN600947-1 Related to Safety requirements.
    - UL508C

- 2.7 The soft starter shall meet the following **construction requirements**:
- 2.7.1 The soft starter must have a digital keypad capable of programming and monitoring parameters as well as resetting faults. Analog potentiometers, switches, or plug-in jumpers are not acceptable.
  - 2.7.2 The Digital operator shall have the option to be remote mounted.
  - 2.7.3 The soft starter must be of heavy-duty construction, designed to operate at 400% current for 30 seconds at 50°C.
  - 2.7.4 SCR's shall have a minimum repetitive peak inverse voltage rating of:
    - 1200 PIV for 230 volt units
    - 1600 PIV for 460 volt units
    - 1800 PIV for 575 volt units
  - 2.7.5 Low voltage soft starters (rated up to and including 820 amps) shall be built for continuous operation without the need for bypass contactors. Bypass contactors will be used when the soft starter is mounted in a non-ventilated enclosure.
  - 2.7.6 The soft starter (when rated 85 amps and above) shall have a modular design, providing an easily removable control module that is compatible for all units rated 85 amps and larger.
- 2.8 The soft starter shall be able to operate continuously in the following **environmental conditions**:
- 2.8.1 Temperature ratings:
    - Operating temperature: -10°C to +50°C
    - Storage temperature: -20°C to +70°C
  - 2.8.2 Humidity should not exceed 95% at 50°C or 98% at 45°C (none condensing).
  - 2.8.3 Altitude of up to 3300 feet (1000 m). Consult the factory for use at higher altitudes.
- 2.9 The soft starter shall have the following **options** available:
- 2.9.1 Serial communication for programming, operation, and monitoring via Modbus RS-485, Profibus DP, or Modbus TCP/IP.
  - 2.9.2 Analog output and Thermistor input card, providing a programmable analog output (0-10VDC, 4-20mA, 0-20mA) related to motor current providing a programmable input (PTC or NTC) and an adjustable trip level.
  - 2.9.3 Motor Insulation card providing both an alarm and trip setting for the insulation level of the motor windings. Option card provides an additional insulation alarm output relay.
  - 2.9.4 Complete motor protection during bypass is provided with Preparation for bypass option.
  - 2.9.5 Remote mounting of the soft starter's digital operator.
  - 2.9.6 Back-lit LCD display.
  - 2.9.7 Tachometer feedback card for synchronized multi-motor starting applications.
  - 2.9.8 Custom panel design to meet customer requirements.