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# RVS-ST Compact Soft Starter Instruction Manual

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**MAGNETEK**  
UNCOMMON POWER

**Power Control Systems**

April 1, 2004  
Part Number: 188-10038  
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## ***DANGER, WARNING, CAUTION and NOTE* Statements**

*DANGER, WARNING, CAUTION, and Note* statements are used throughout this manual to emphasize important and critical information. You must read these statements to help ensure safety and to prevent product damage. The statements are defined below.



### **DANGER**

*DANGER* indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.



### **WARNING**

*WARNING* indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



### **CAUTION**

*CAUTION* indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It may also be used to alert against unsafe practices.

*NOTE:* A *NOTE* statement is used to notify people of installation, operation, programming, or maintenance information that is important, but not hazard-related.

# Disclaimer of Warranty

Magnetek, hereafter referred to as Company, assumes no responsibility for improper programming of a soft starter by untrained personnel. A soft starter should only be installed by a trained technician who has read and understands the contents of this manual. Improper installation of a soft starter can lead to unexpected, undesirable, or unsafe operation or performance. This may result in damage to equipment or personal injury. Company shall not be liable for economic loss, property damage, or other consequential damages or physical injury sustained by the purchaser or by any third party as a result of such programming. Company neither assumes nor authorizes any other person to assume for Company any other liability in connection with the sale or use of this product.



## **WARNING**

Improper installation of a soft starter can lead to unexpected, undesirable, or unsafe operation or performance.

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### **IMPORTANT**

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1. Read this manual carefully and follow its instructions before operating equipment.
  2. Installation, operation, and maintenance should be in strict accordance with this manual, national codes and good practice. Installation or operation not performed in strict accordance with these instructions will void manufacturer's warranty.
  3. Disconnect all power inputs before wiring or servicing the equipment.
  4. After installation, verify that no hardware (bolts, washers, etc.) have fallen into the power section.
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### **WARNING**

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1. Internal components and printed circuit boards are at main potential when the RVS-ST is connected to main power. This voltage is extremely dangerous, and may cause death or severe injury if contacted.
  2. The control PCB employs CMOS ICs that are easily damaged by static electricity. Use proper electrostatic discharge (ESD) procedures when handling the control PCB.
  3. When the RVS-ST is connected to main power, even if control power is not connected and the motor is stopped, full voltage may appear on the RVS-ST's output terminals.
  4. RVS-ST (31-58 Amps) must be grounded to ensure correct operation, safety, and to prevent damage.
  5. Power factor capacitors must NOT be connected to the output side of the RVS-ST. External overload protection must be used with the RVS-ST soft starter.
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**ATTENTION**

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1. This product was designed for compliance with IEC 947-4-2 for class A equipment.
  2. RVS-ST are listed under UL508C.
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# Installation

## Introduction

The RVS-ST is a miniature, analog softstarter which incorporates two sets of SCR's to start 3-phase, 3-wire, squirrel cage induction motors. The RVS-ST starts the motor by supplying slowly increasing voltage to the motor, providing a soft start and smooth acceleration, while drawing the minimum current necessary to start the motor.

## RVS-ST Selection

When selecting a RVS-ST soft starter for your application, please consider the following:

Motor current and starting conditions—Select the RVS-ST according to the motor's FLA as indicated on its nameplate (even if the motor will not be fully loaded).

The RVS-ST is designed for 4 starts per hour at maximum conditions, and up to 10 starts per hour at light conditions. Maximum conditions for the RVS-ST are 3.5 x FLA for 5 seconds at 40° C. (Consult factory for applications requiring more frequent starting.).

Supply Voltage—(Line to Line),+10%, -15%  
 220-240 volts  
 460-500 volts  
 575-600 volts

*NOTE: All units are suitable for 50/60 Hz. operation.*

Max. FLA	Frame Size	Model Number		
		230V	460V	575V
8	S1	RVS-ST-8-B	RVS-ST-8-C	
8	S2			RVS-ST-8-E
17		RVS-ST-17-B	RVS-ST-17-C	RVS-ST-17-E
22		RVS-ST-22-B	RVS-ST-22-C	RVS-ST-22-E
31	S3	RVS-ST-31-B	RVS-ST-31-C	RVS-ST-31-E
44		RVS-ST-44-B	RVS-ST-44-C	RVS-ST-44-E
58		RVS-ST-58-B	RVS-ST-58-C	RVS-ST-58-E

## Mounting

The RVS-ST should be mounted vertically onto a flat, non-flammable panel allowing sufficient space above and below the RVS-ST for suitable airflow. Enclosure must be selected to allow surrounding air temperature not to exceed 40°C. Recommended enclosure sizing is given in the table below.

RVS-ST Model	Frame	Enclosure Size
RVS-ST-8	S1	8" x 6" x 6"
RVS-ST-17	S2	8" x 6" x 6"
RVS-ST-22	S2	8" x 6" x 6"
RVS-ST-31	S3	12" x 12" x 6"
RVS-ST-44	S3	12" x 12" x 6"
RVS-ST-17	S3	12" x 12" x 6"



## CAUTION

*Do not mount the RVS-ST near a heat source. Protect RVS-ST from dust and corrosive atmospheres.*

### Protection

The RVS-ST should be protected by circuit breaker or fast acting fuses. The  $I^2T$  values of the RVS-ST's SCRs are given in the table below, as well as the recommended circuit breaker sizes.

RVS-ST Amp Rating	RVS-ST $I^2T$ Rating	Circuit Breaker Amp Rating
8	400	15
17	2000	30
22	2500	50
31	3000	50
44	6000	75
58	12000	100

*NOTE: When sizing fast acting fuses, the amp rating of the fuse should be approximately 200% of RVS-ST FLA.*

*NOTE: Power factor correction must **NOT** be installed on the RVS-ST's load side. When required, install capacitors on the line side.*

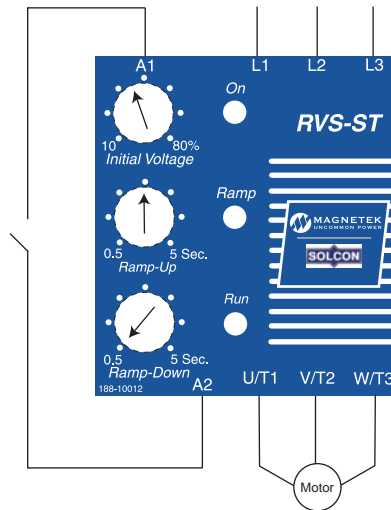
### Internal Bypass After Acceleration

The RVS-ST incorporates two internal bypass relays allowing current flow through SCR's only during starting and soft stopping. At the end of acceleration the built in relays bypass the SCR's and carry the current to the motor. Upon stop signal or fault, the bypass relays will open and stop the motor. If the ramp down potentiometer is set, the relays will open to allow the voltage to be reduced slowly and smoothly to zero (thus soft stopping the motor).

# Wiring, Settings and Start Up

## Wiring

The RVS-ST is easy to set up, wire and operate. There are 2-4 control terminals, 3 terminals for line voltage, 3 motor connection terminals, ground terminal for frame size S3, and 3 adjustment potentiometers.



Control Terminals should be connected as follows:

Frame Size	Terminal	Functions	Description
S1	A1	Start/Stop( <i>Note 1</i> )	Dry contact. Close terminals 1-2 for start command and open for stop.
	A2		
S2	A	Start/Stop( <i>Note 1</i> )	Dry contact. Close terminals 1-2 for start command and open for stop.
	B		
S3	1	Start/Stop( <i>Note 1</i> )	Dry contact. Close terminals 1-2 for start command and open for stop.
	2		
	3	End of Acceleration contact ( <i>Note 2</i> )	Contact closes after the ramp up time (on “Ramp Up” potentiometer). Contact returns to open position on stop signal fault, beginning of soft stop, and upon voltage outage.
	4		
ALL	L1, L2, L3	Line	Connect to line voltage.
ALL	U, V, W	Motor	Connect to motor.

*NOTE 1: The RVS-ST will soft stop when terminals are opened and the “Ramp Down” potentiometer is set.*

*NOTE 2: End of Acceleration contact is voltage free, NO, 8A/250V AC, 2000 VA max.*



**WARNING**

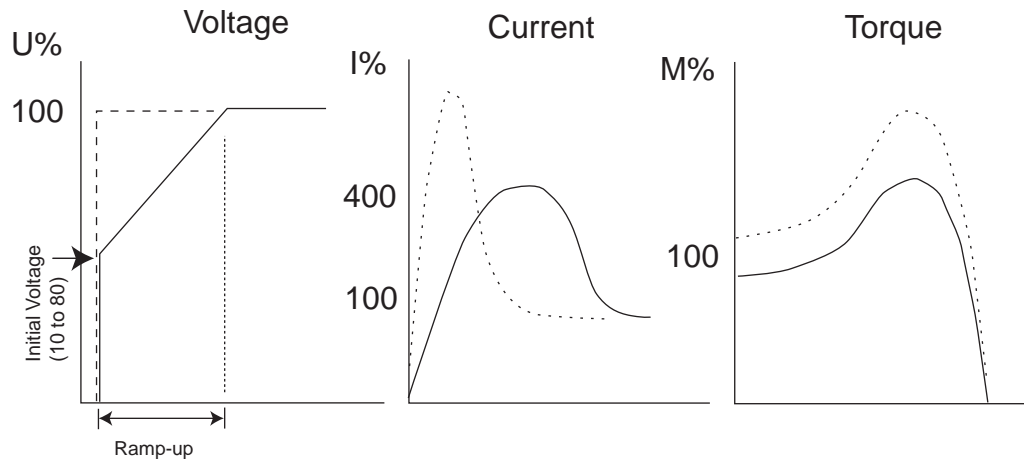
Do not interchange line and load connections.



**WARNING**

When starting and stopping with a maintained contact, if main power is lost the RVS-ST may immediately restart upon power restoration.

## Settings



**Initial Voltage:** 10-80%

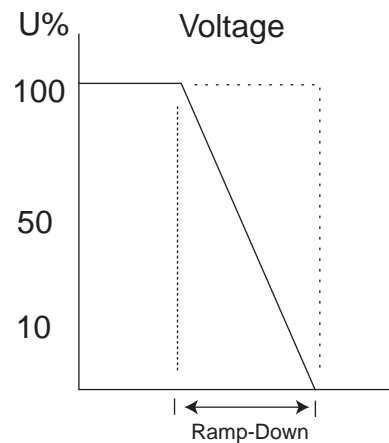
Determines the initial voltage to the motor. (Torque is directly proportional to the square of the voltage.) This adjustment also determines the inrush current and mechanical shock. Too high of a setting may cause high mechanical shock and inrush current; while too low of a setting may result in prolonged start time. The motor should start immediately after the start signal.

**Ramp-Up:** 0.5–5 seconds

Determines the motor's voltage ramp up time from initial voltage to full voltage. Set to the minimum acceptable value.

**Ramp-Down:** 0.5–5 seconds

Used to control deceleration of high friction loads. When Ramp-Down potentiometer is set, upon stop signal the output voltage is gradually ramped down. When the Ramp-Down time is set to 0.5, the motor will stop immediately.

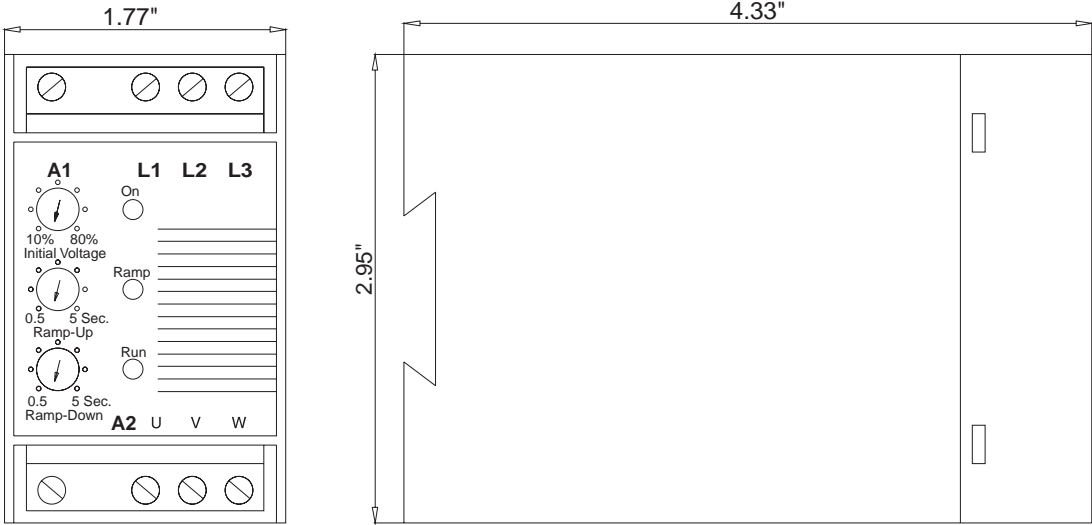


## Start-Up Procedure

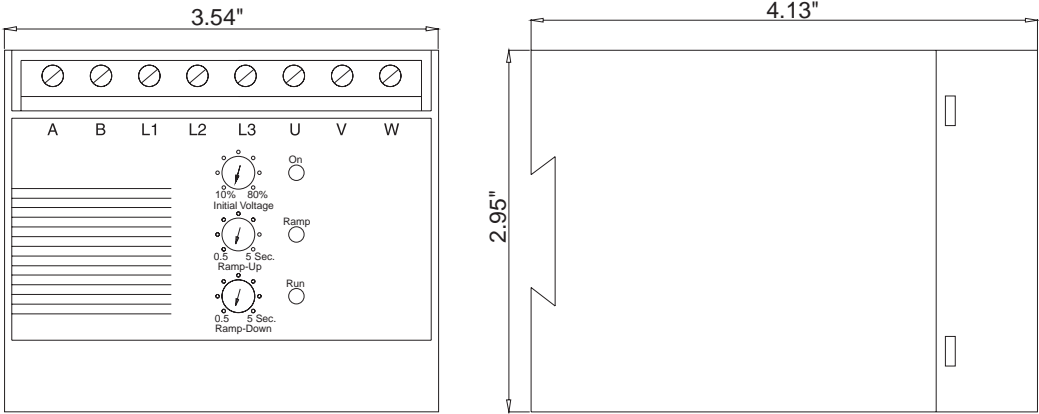
1. Set initial voltage potentiometer to mid scale (approx. 40%).
2. Set ramp-up potentiometer to approximately 3 seconds.
3. Connect mainline voltage to RVS-ST line terminals (L1, L2, L3) and the motor to RVS-ST motor terminals (U, V, W).
4. Close start contact. If motor begins turning shortly after the start signal, proceed to no. 5. If not, increase the Initial Voltage setting until the motor starts to turn shortly after start signal.
5. If initial inrush current and mechanical shock are too high, decrease initial voltage setting and proceed to no. 6.
6. Remove the start command and wait for the motor to stop.
7. Slightly increase initial voltage setting to allow for load variations.
8. Start the motor again to verify the acceleration process to full speed as is required.
9. If acceleration time is too short, increase Ramp-up setting.

When soft stop is required, set the Ramp-Down potentiometer to the required time (minimum deceleration is recommended).

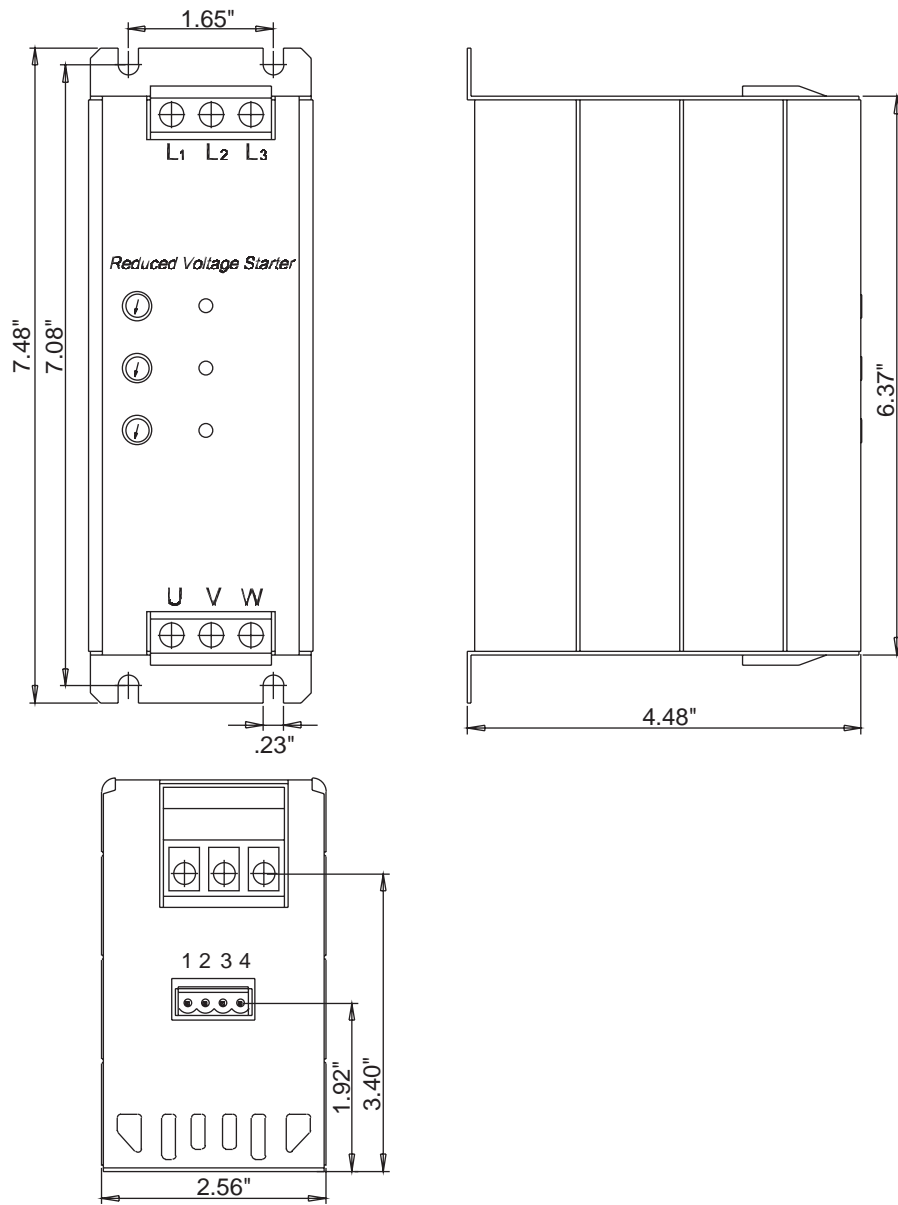
# Dimensions and Weights



Frame Size S1, 8 Amp (230-460V)



Frame Size S2, 8 Amp (575V), 17-22 Amp (230-575V)



Frame Size S3, 31-58A (230-575V)

Size	Width	Height	Depth	Weights (lbs.)	Power Connections	Control Connections
S1	1.77"	2.95"	4.33"	.93	Terminals 4mm <sup>2</sup>	Terminals 1.5mm <sup>2</sup>
S2	3.54"	2.95"	4.13"	1.21		
S3	2.56"	7.48"	4.48"	2.86	Terminals 16mm <sup>2</sup>	

## Environment

Supply	Three-phase, line to line, 220–240 VAC +10%-15% 460–500 VAC +10%-15%* 575–600 VAC +10%-15%	
Frequency	50/60 Hz	
Load	Three-Phase, Three-Wire, Squirrel Cage Induction Motor	
Degree of protection	IP20	
Altitude	3300ft. (1000m) above sea level	consult factory for de-rating

## Adjustments

Starting Torque (Initial Voltage)	10-80% of full voltage	
Ramp Up Time (Soft Start)	0.5–5 sec.	
Ramp Down Time (Soft Stop)	0.5–5 sec.	
Indication light (LED)	On–Green	Lights when main voltage is connected to the RVS-ST
	Ramp Up/Down–Yellow	Lights during Ramp-Up and Ramp- Down
	Run–Green	Lights after end of starting process

## Temperatures

Operating	-10° to 40°C
Storage	-20° to 70°C
Relative humidity	93% - non-condensed

## EMC

Immunity to radio electric interference	EN 1000-4-3 level 3	Conforming to EN 60947-4-2
Electrostatic discharge	EN 1000-4-2 level 3	Conforming to EN 60947-4-2
Immunity to electrical transients	EN 1000-4-4 level 4	Conforming to EN 60947-4-2
Shock waves of voltage/current	EN 1000-4-5 level 3	Conforming to EN 60947-4-2
Radiated and conducted emissions	EN 1000-4-6 level 3	
Radio frequency emissions	According to EN 55011 class A	Conforming to EN 60947-4-2

## Mechanical

Shock resistance	8 gn	Conforming to EN 60947-4-2
Vibration resistance	2 gn	Conforming to EN 60947-4-2

## Output relay—(Starters 31-58A only)

End of Acceleration Control	N.O.
Rated operating current	5 A, 250V

