

Technical manual

VAREOSOFT SAG

Soft Start Units for 3-phase Asynchronous Motors

IMPORTANT SAFETY INFORMATION - PLEASE READ

This manual contains all the necessary information for the correct application and installation of VAREOSOFT SAG soft start units. It is intended for use by technically qualified personnel. These are persons who, because of their training, experience and position, as well as their knowledge of appropriate standards, regulations, health & safety requirements and working conditions, are authorised to be responsible for the safety of the equipment, at all times, even whilst carrying out their normal duties, and are therefore aware of, and can report, possible safety hazards (Definition of qualified employees according to IEC 364)

Safety Instructions

The following instructions are provided for the personal safety of operators and also for the protection of the described product and connected equipment.



Warning!
Hazardous Voltage
Failure to observe can kill, cause serious injury or damage

- ▶ Isolate from mains before installation or dismantling work, as well as for fuse changes or post installation modifications.
- ▶ Observe the prescribed accident prevention and safety rules for the specific application.
- ▶ Before putting into operation check if the rated voltage for the unit conforms with the local supply voltage.
- ▶ Emergency stop devices must be provided for all applications. Operation of the emergency stop must inhibit any further uncontrolled operation.
- ▶ Electrical connections must be fitted with protective covers.
- ▶ Earth bonding must be tested after installation!
- ▶ It is recommended that semi conductor fuses are used to protect the soft start units

Specified Use

The units described herein are electrical controllers for installation in industrial plant.
They are designed for controlling 3-phase motors.

Typical Applications

The SAG range can be used on

- ✓ Lifts and Elevators
- ✓ Machines with drives, belts and chains
- ✓ Conveying systems
- ✓ Grinding, hobbing and sawing machines
- ✓ Fans, pumps, compressors and air conditioning equipment

Benefits

- ✓ Reduced wear and down time, increased machine and plant efficiency
- ✓ Reduced start up current demand, less drain on supply, better tariffs
- ✓ Lower installation costs
- ✓ Less process waste

Please contact your supplier below if you have any doubt:-

REO UK LTD

Units 8 & 9 Long Lane Industrial Estate

Craven Arms

Shropshire SY7 8DU

Tel: 0044 (0)1588 673411

Fax: 0044 (0) 1588 672718

Email: main@reo.co.uk

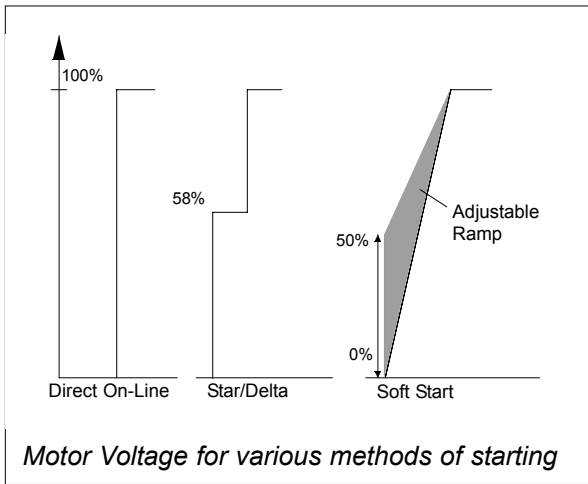
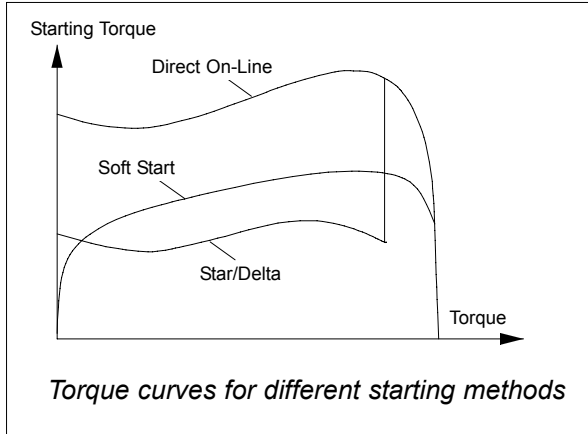
Website: <http://www.reo.co.uk>

Introduction - Why use electronic soft starters ?

When direct on-line starting is used, with a standard AC induction motor, the current, at start up, can be 8 times that of the rated motor current. Furthermore, the starting torque can be increased by up to 400%. This means that any machine drive components have to be much stronger than is necessary.

Reduced voltage methods of starting, such as star/delta or autotransformer, do reduce the start-up current, but severe shock loads are still imposed at the switching moments, leading to increased maintenance; and because the initial starting torque is lower, starting under load can be a problem, in worst cases the motor must be over rated.

The range of SAG units, generate an adjustable volt-age ramp, which provides a smooth start-up and, at the same time, current inrush is limited. Thus motor conductors and fuses can be more suitably rated and the motor and mechanical drive components are protected by the stepless adjustment of the torque.

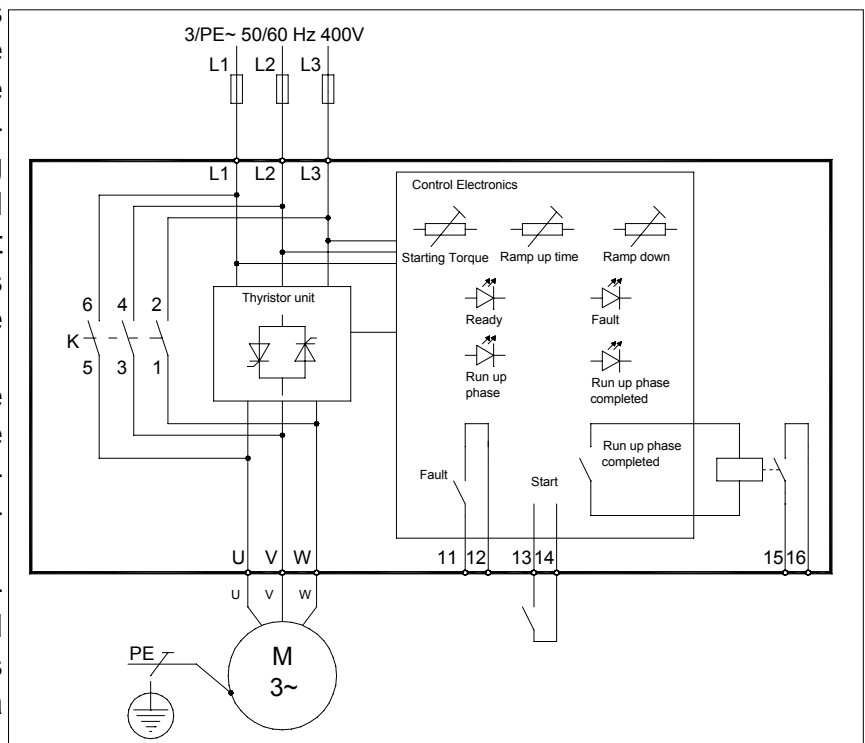


Functional Description of the SAG Electronic Soft Starters

The SAG operates a 6 pulse firing circuit and all 3 phases are controlled. During the adjustable ramp up time, the applied motor voltage is gradually increased, without causing current surges until the full motor speed is achieved. At this point the semiconductors are by-passed with a three phase contactor.


To ensure safe and reliable starting the start-up torque (pedestal voltage) can be adjusted between 0..50% of maximum.

During a soft stop the semi-conductors are controlled again and the motor voltage is smoothly reduced to ensure a safe and jerk free run down.




Block Schematic 1 - VAREOSOFT SAG


Functional Description of the SAG Electronic Soft Starters

The ramp up time is set with the trimmer  clockwise rotation increases the run up time. The longer the run up time setting the greater the reduction in the run up current.

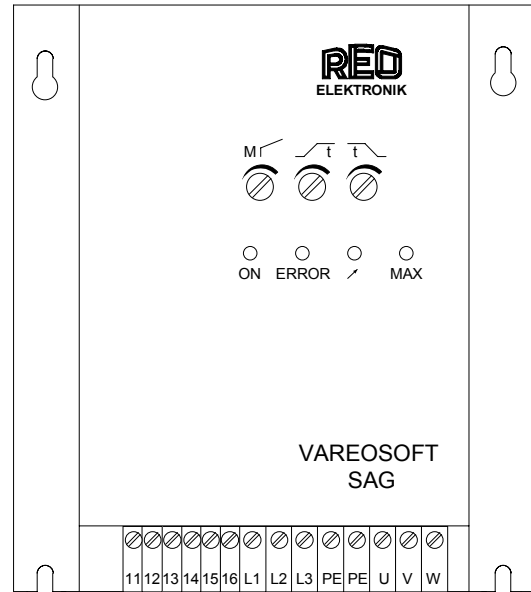
Factory default setting = 1.5 secs

The trimmer M  is used to set the starting point for the mains voltage (starting torque). The voltage value at which the ramp up starts is increased by clockwise rotation.


Factory setting = 20%

The trimmer  is used to set the ramp down time. The run down is increased by clockwise rotation. The longer the run down time, the slower the reduction in motor voltage.

Factory setting = 1.5 secs



Displays

Indicator	Explanation
Green LED `ON`	Unit ready for operation
Red LED `Error`	Error condition present
Yellow LED 	Run up phase active
Green LED `MAX`	Start completed - unit is now by-passed

Control Signals

Terminals	Explanation
Output - 11 and 12	Error signal N/O contacts, open on ERROR
Input - 13 and 14	Unit enable, close to initialise
Output - 15 and 16	Top of ramp contacts, close at MAX

Fault Indications

The Red LED `ERROR` illuminates for three conditions:-

1. Shortly after switching on, when the SAG is inhibited (open circuit between 13 & 14) and mains voltage is applied. This is not a fault condition!
2. The operating temperature is exceeded.
3. Incorrect phase rotation.

Remedy:

- For 1. Self correcting
- For 2. The unit will reset when it cools down.
- For 3. The phases must be changed, so that they are in the correct rotation. The LED will go out when the rotation is correct and the motor can be started as normal.

Installation

The units are designed for panel mounting.

Mount the unit vertically, with the terminals at the bottom. It should be protected from condensation, moisture or loose objects.

Ensure that sufficient cool air is allowed to circulate for convection cooling.

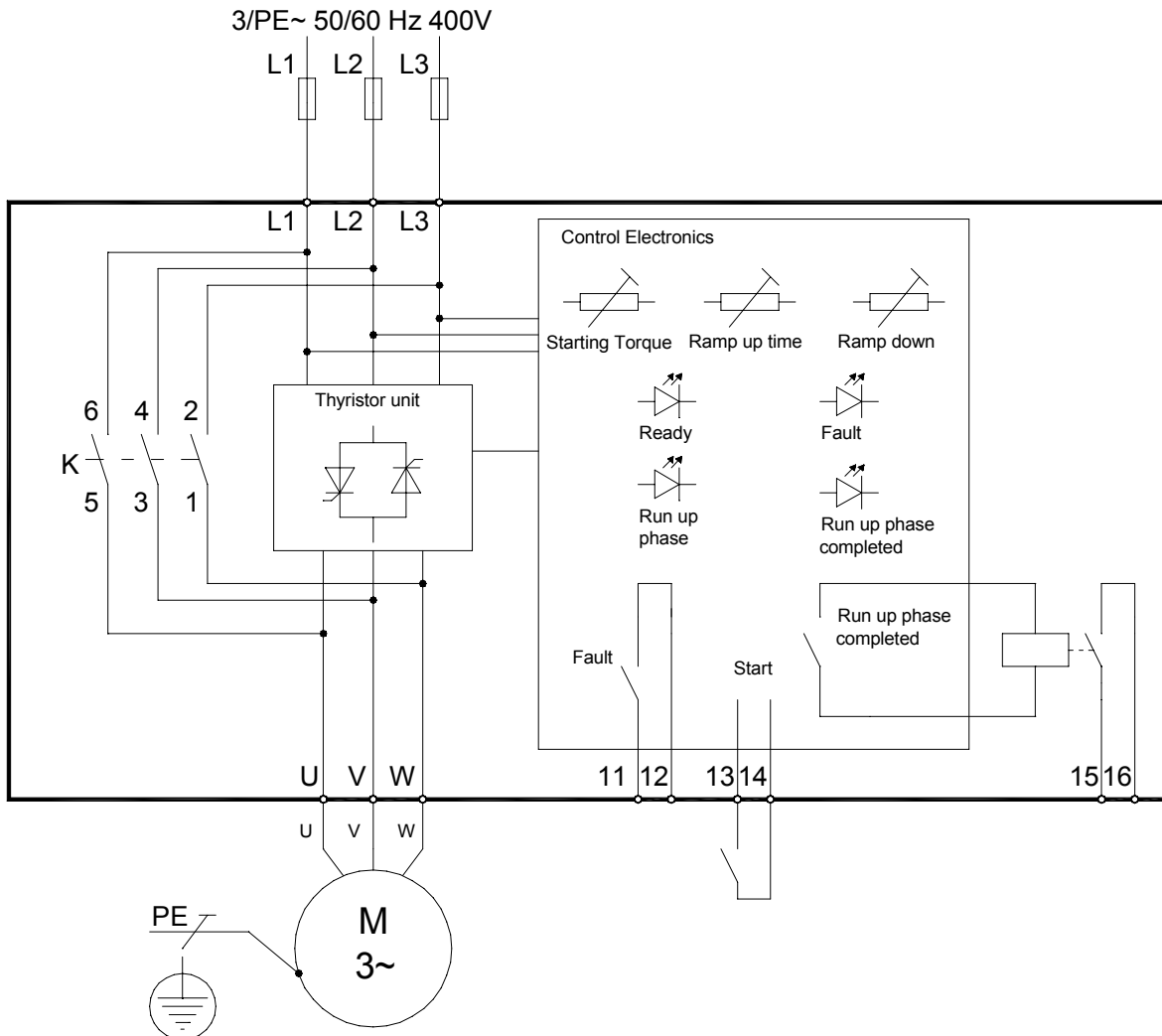
Connections

Connect the unit according to the diagram - block schematic 1

The VAREOSOFT SAG is connected in the motor supply, between the contactors and the motor. The main motor circuit is unaffected.

The unit has no overload protection, the motor and associated cabling should be protected by suitable means. The sizing of the conductors and motor protection devices, depends on the particular motor power and can be determined from the motor current rating.

It is recommended that the unit is protected by semi-conductor fuses.



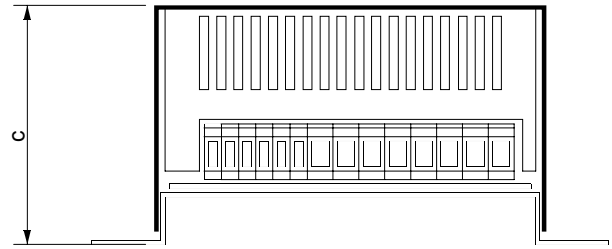
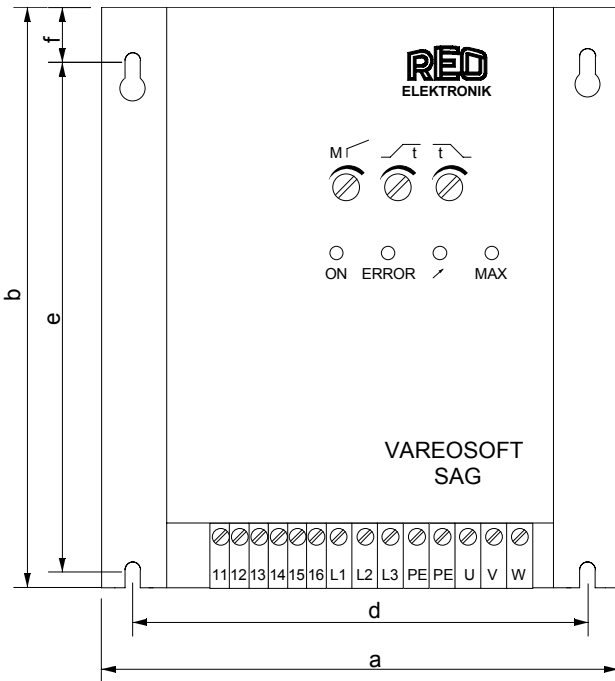
Technical Data

Operating Voltage	380...400 V +/- 10%; 50/60 Hz										
SAG Model	09	16	23	32	45	63	75	100	140	200	290
Max motor power [kW]	4	7.5	11	15	22	30	37	55	75	110	160
Rated motor current [A]	8.5	15.5	22.5	30	43	58	72	104	142	204	292
Starts / h	60 x 15...20 secs (33% duty cycle)										
Soft Start time	0...10 secs (adjustable)										
Soft Stop time	0...10 secs (adjustable)										
Start up torque	0...50% (adjustable)										
Relays	Fault and top of ramp										
LED indicators	Unit ready / error / run-up / top of ramp										
Fault detection	Over temperature / Incorrect phase rotation										
Ambient temperature	0...+45 degrees C										
Storage temperature	-15...+65 degrees C										
Climate	Humidity 93% without dew										
Altitude	Up to 1000 m above sea level, derate by 1% for each 100 m above maximum										
Cleanness category	1, IEC 664										
Vibration level	10...55 Hz / 0.15 mm / 12 cycles (XYZ)										
Protection	IP 00 - with contact protection										
EMC data	Interference immunity to EN 50082 Part 2 - Radiated interference to EN 50081 Part 2 (without suitable filter) Interference immunity to EN 50082 Part 2 - Radiated interference to EN 50081 Part 1 (with suitable REO mains filter)										

Conductor Cross Section

Unit Type	Main Power Circuit	Control Power Circuit	Terminal Position	
			Input	Output
VAREOSOFT SAG 09	1.5 mm ²	1mm ²	Bottom	Bottom
VAREOSOFT SAG 16	2.5 mm ²	1mm ²	Bottom	Bottom
VAREOSOFT SAG 23	4 mm ²	1mm ²	Bottom	Bottom
VAREOSOFT SAG 32	6 mm ²	1mm ²	Bottom	Bottom
VAREOSOFT SAG 45	10 mm ²	1mm ²	Bottom	Bottom
VAREOSOFT SAG 63	16 mm ²	1mm ²	Bottom	Bottom
VAREOSOFT SAG 75	25 mm ²	1mm ²	Bottom	Bottom
VAREOSOFT SAG 100	35 mm ²	1.5 mm ²	Bottom	Bottom
VAREOSOFT SAG 140	50 mm ²	1.5 mm ²	Bottom	Bottom
VAREOSOFT SAG 200	Bus Bar 25 x 3 - M8 terminals	1.5 mm ²	Top	Bottom
VAREOSOFT SAG 290	Bus Bar 30 x 4 - M8 terminals	1.5 mm ²	Top	Bottom

Dimensions



Model	a [mm]	b [mm]	c [mm]	d [mm]	e [mm]	f [mm]	Hole dia for fixing
VAREOSOFT SAG 09	222	270	120	200	240	22	6.5 (M6)
VAREOSOFT SAG 16	222	270	120	200	240	22	6.5 (M6)
VAREOSOFT SAG 23	252	270	140	230	240	22	6.5 (M6)
VAREOSOFT SAG 32	252	270	140	230	240	22	6.5 (M6)
VAREOSOFT SAG 45	252	270	140	230	240	22	6.5 (M6)
VAREOSOFT SAG 63	282	270	170	260	240	22	6.5 (M6)
VAREOSOFT SAG 75	282	270	170	260	240	22	6.5 (M6)
VAREOSOFT SAG 100	362	400	185	334	320	71	8.5 (M8)
VAREOSOFT SAG 140	362	400	195	334	320	71	8.5 (M8)
VAREOSOFT SAG 200	362	400	300	334	320	71	8.5 (M8)
VAREOSOFT SAG 290	362	400	300	334	320	71	8.5 (M8)