Soft-Starter

Arrancador Suave

Soft-Starter

SSW-07

User's Guide
Manual del Usuario
Manual do Usuário



SOFT-STARTER USER'S GUIDE

MANUAL DEL USUARIO DEL ARRANCADOR SUAVE

MANUAL DO USUÁRIO DA SOFT-STARTER

English

Español

Português

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English

The information below describes the revisions in this manual.

Revision	Descripcion	Chapter
1	First Edition	-
2	General Revision	-
3	General Revision	-
4	Size 4 Included	-
5 and 6	Table 3.1 and 8.2 corrected	3 and 8

Español

La información abajo describe las revisiones ocurridas en este manual.

Revisión	Descripción	Capítulo
1	Primer Edición	-
2	Revisión General	-
3	Revisión General	-
4	Inclusión Mecánica 4	-
5 y 6	Correción de las tablas 3.1 y 8.2	3 y 8

Português

A informação abaixo descreve as revisões ocorridas neste manual.

Revisão	Descrição	Capítulo
1	Primeira Edição	-
2	Revisão Geral	-
3	Revisão Geral	-
4	Inclusão da mecânica 4	-
5 e 6	Correções das tabelas 3.1 e 8.2	3 e 8

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English

SAFETY INSTRUCTIONS

This Manual contains the necessary information for the correct use of the Soft-Starter SSW-07.
It was written to be used by qualified personnel with suitable training or technical qualifications to operate this type of equipment.

1.1 SAFETY NOTICES IN THE MANUAL

The following safety notices will be used in the text.



DANGER!
The nonobservance of the procedures recommended in this warning can lead to death, serious injuries and considerable material damage.



ATTENTION!
Failure to observe the recommended procedures in this notice may lead to material damage.



NOTE!
The text intents to supply important information for the correct understanding and good operation of the product.

1.2 SAFETY NOTICES ON THE PRODUCT

The following symbols may be attached to the product as a safety notice.



High Voltages.



Components are sensitive to electrostatic discharge.
Do not touch them.



Mandatory connection to ground protection (PE).

1.3 PRELIMINARY RECOMMENDATIONS



DANGER!
Only personnel with suitable qualification and familiar with the Soft-Starter SSW-07 and associated equipment should plan or implement the installation, start-up, operation and maintenance of this equipment.
These personnel must follow all safety instructions in this manual and/ or defined by local regulations.
Failure to follow these safety instructions may result in personnel injury and/or equipment damage.

NOTE!
In this Manual, qualified personnel are those trained to:
1. Install, ground, power-up, and operate the Soft-Starter SSW-07 according to this manual and the required safety procedures;
2. Use protection equipment according to established regulations;
3. Give First Aid.

DANGER!
Always disconnect the general power supply before touching any electrical component associated to the Soft-Starter SSW-07.
High voltage may be present even after the power supply is disconnected. Wait at least 3 minutes for the total discharge of the capacitors.
Always connect the equipment's heatsink to the protection ground (PE), at the proper connection point.

ATTENTION!
All electronic boards have components that are sensitive to electrostatic discharges. Do not touch these components or connectors directly.
If necessary, first touch the grounded metallic heatsink or use a suitable grounded wrist strap.

Do not apply any high voltage test on the Soft-Starter SSW-07!
If necessary, contact the manufacturer.

NOTE!
Soft-Starters SSW-07 may interfere with other electronic equipment. Follow the measures in Chapter 3 to reduce these effects.

NOTE!
Read this manual completely before installing or operating the Soft-Starter SSW-07.

GENERAL INFORMATION

2.1 ABOUT THIS MANUAL

This manual presents the Soft-Starter installation, how to start it up, its main technical characteristics and how to identify and correct the most common problems. The manuals listed next must be consulted in order to get more information regarding the functions, accessories and working conditions:

☑ Programming Manual, with a detailed description of the parameters and its functions;
☑ RS232 / RS485 Communication Manual.
☑ DeviceNet Communication Manual.

These manuals are supplied in electronic format on the CD-ROM that accompanies the Soft-Starter, or can be obtained at WEG's web site: http://www.weg.net.

2.2 ABOUT THE SOFT-STARTER SSW-07

The Soft-Starter SSW-07 is a high performance product that permits the start control of the three phase AC induction motors. Thus, it prevents mechanical shocks on the load and current peaks in the supply line.

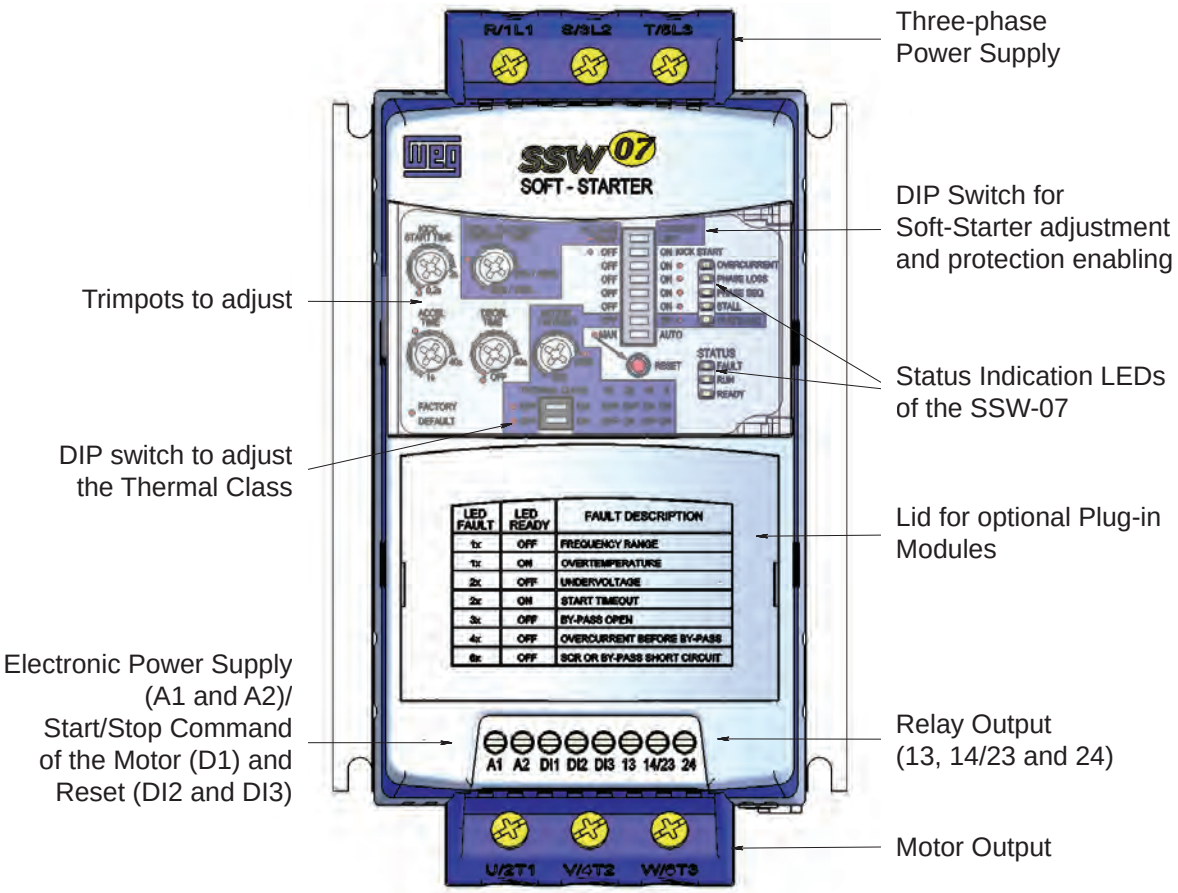


Figure 2.1 - *Frontal view of the SSW-07*

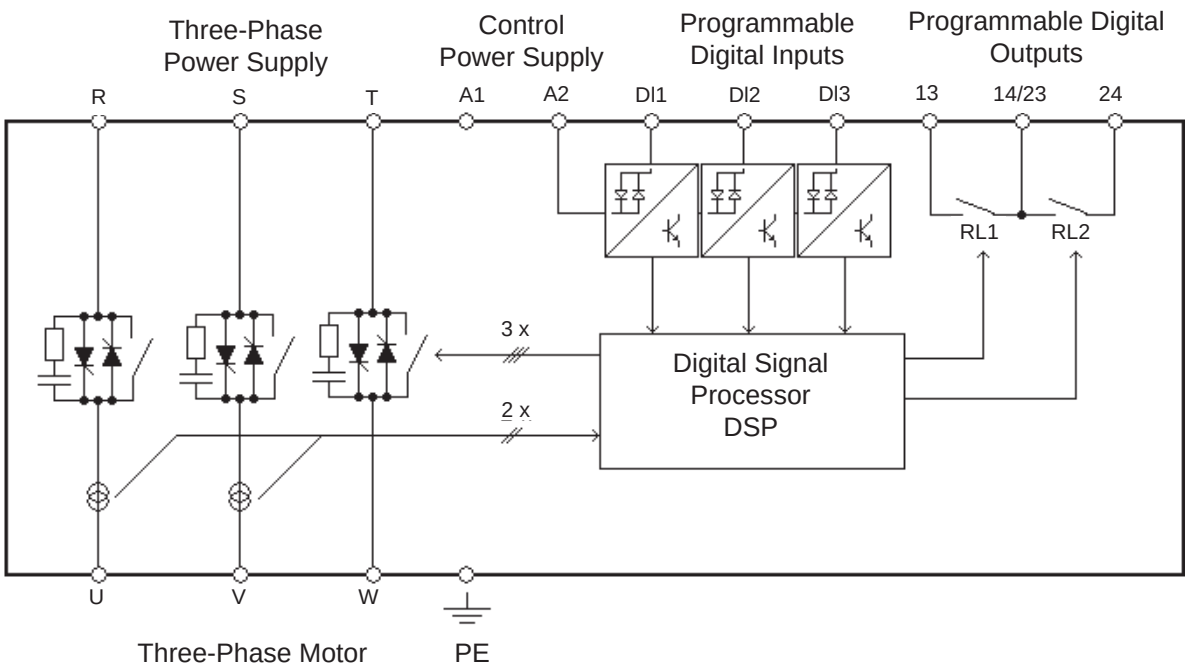


Figure 2.2 - *Soft-Starter SSW-07 block diagram*

2.3 SOFT-STARTER SSW-07 IDENTIFICATION PLATE

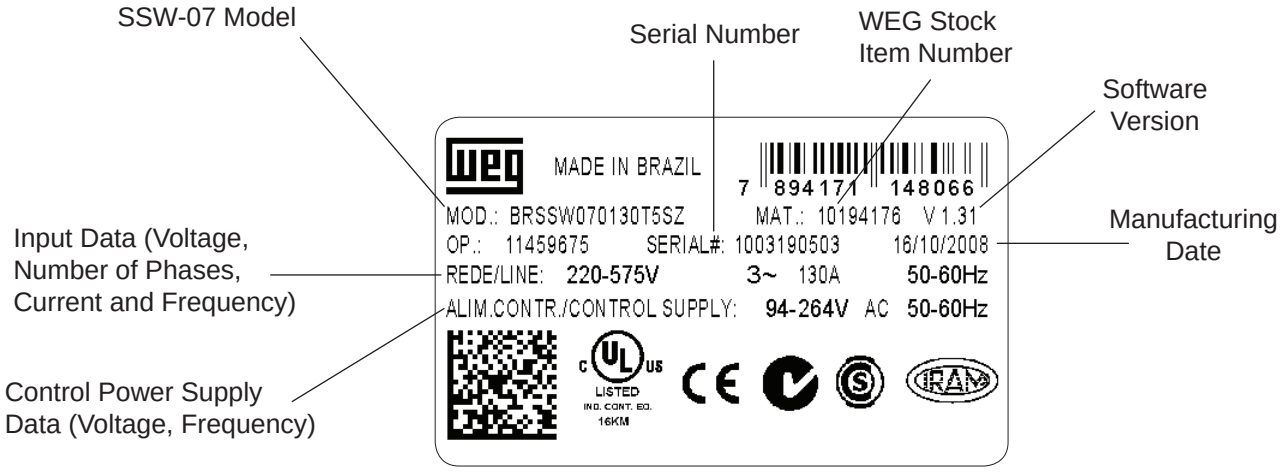


Figure 2.3 *- Soft-Starter SSW-07 identification plate*

Position of the Identification Plate on the Soft-Starter SSW-07:

FRONTAL VIEW

X VIEW

X

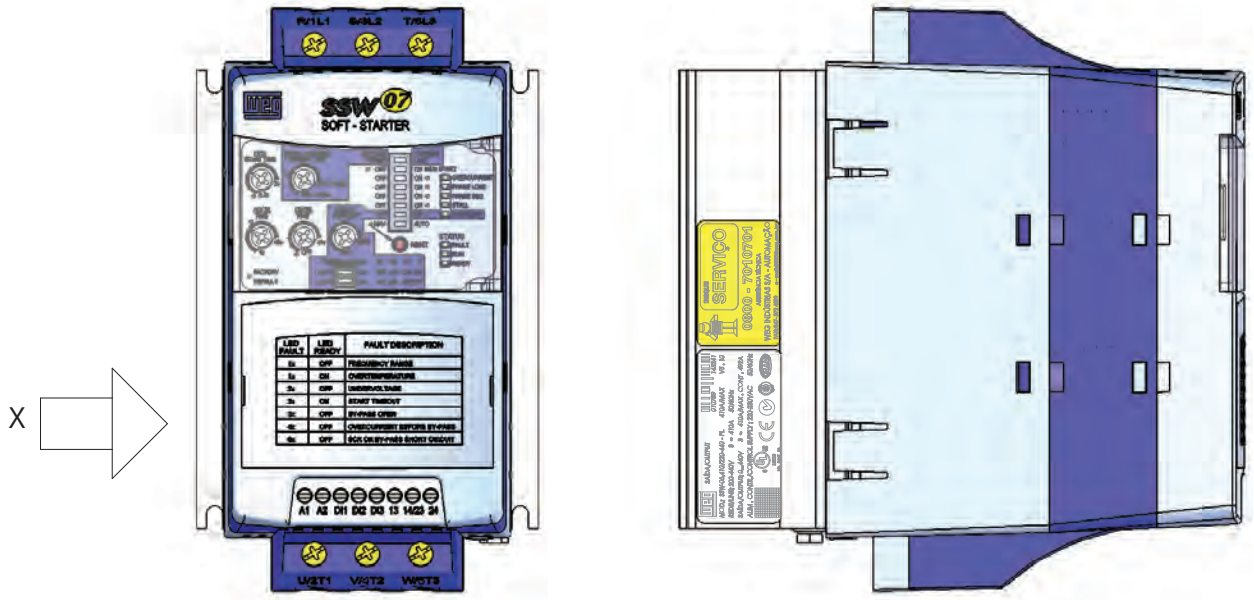


Figure 2.4 *- Location of the labels*

HOW TO SPECIFY THE SSW-07 MODEL:

EX	SSW07	0017	T	5	S	_ _	_ _	_ _	Z
Market BR = Brazil EX = Export	WEG Soft-Starter Series SSW-07	SSW-07 Nominal Current 0017 = 17 A 0024 = 24 A 0030 = 30 A 0045 = 45 A 0061 = 61 A 0085 = 85 A 0130 = 130 A 0171 = 171 A 0200 = 200 A 0255 = 255 A 0312 = 312 A 0365 = 365 A 0412 = 412 A	Three-Phase Power Supply	220-575 Vac	Optional: S = Standard O = with Optional	Degree of Protection Blank = Standard IP=IP20 (1)	Special Hardware Blank = Standard H1 = Electronics supply: 110 to 130 Vac (2) H2 = Electronics supply: 208 to 240 Vac (2)	Special Software Blank = Standard S1 = Special Software	End of Code

(1) Only for models 130 A to 412 A.
(2) Only for the 255 A to 412 A models.

NOTE!
The option field (S or O) defines if the Soft-Starter SSW-07 will be a standard version or if it will include any optional. If standard, the code ends here.
Always put the letter Z at the end. For example:
EXSSW070017T5SZ = Standard Soft-Starter SSW-07 with 17 A and 220 V to 575 V to three-phase input with the User's Guide in English, Spanish and Portuguese.

If there is any optional, the fields must be filled out in the correct sequence until the code is completed with the letter Z.

The standard product as defined by this code is described as:
☑ Degree of Protection: IP20 from 17 A to 85 A and IP00 from 130 A to 412 A.

2.4 RECEIVING AND STORAGE

The Soft-Starter SSW-07 is supplied in a cardboard box. On the outside of the package there is an identification plate which is identical to the one placed on the Soft-Starter SSW-07.
To open the package:
1- Put it on a table;
2- Open the package;
3- Take out the Soft-Starter.

Check if:
☑ The Identification plate of the Soft-Starter SSW-07 matches the model purchased:

☑ Damage has occurred during transport. If so, contact the carrier immediately.

☑ If the Soft-Starter SSW-07 is not installed immediately, store it in its package in a clean and dry place with temperature between -25 °C (-13 °F) and 65 °C (149 °F). 1 hour at -40 °C (-40 °F) is permitted.

SSW-07 Model	Height H mm (in)	Width L mm (in)	Depth P mm (in)	Volume cm^3 (in^3)	Weight kg (lb)
17 A 24 A 30 A	221 (8.70)	180 (7.09)	145 (5.71)	5768 (352.2)	1.65 (3.64)
45 A 61 A 85 A	260 (10.24)	198 (7.80)	245 (9.65)	12613 (770.8)	3.82 (8.42)
130 A 171 A 200 A	356 (14.02)	273 (10.75)	295 (11.61)	28670 (1750)	8.36 (18.43)
255 A 312 A 365 A 412 A	415 (16.34)	265 (10.43)	320 (12.6)	35192 (2147)	12.8 (28.2)

***Table 2.1** - Dimensions of the package in mm (in)*

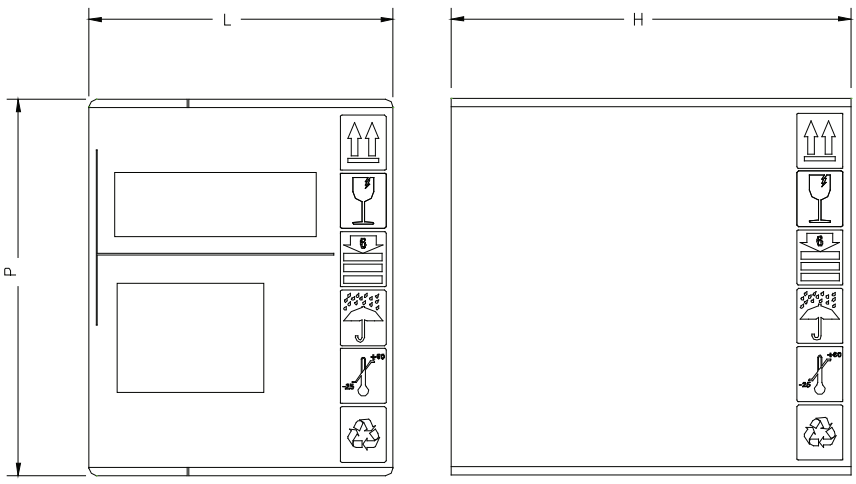


***Figure 2.5** - Dimensions of the package*

INSTALLATION AND CONNECTION

This chapter describes the procedures for the electrical and mechanical installation of the Soft-Starter SSW-07. The guidelines and suggestions must be followed for the correct operation of the Soft-Starter SSW-07.

3.1 MECHANICAL INSTALLATION

3.1.1 Environmental Conditions

The location of the Soft-Starters SSW-07 is an important factor to assure the correct operation and high product reliability.

Avoid:

☑ Direct exposure to sunlight, rain, high moisture and sea air ;
☑ Exposure to explosive or corrosive gases and liquids;
☑ Exposure to excessive vibration, dust or any metallic and/or oil particles in the air.

Allowed Environmental Conditions:

☑ Surrounding air Temperature: 0 ºC to 55 ºC (32 ºF to 131 ºF) - nominal conditions.
☑ Relative air moisture: 5 % to 90 %, with no-condensation.
☑ Maximum altitude: 1,000 m (3,300 ft) above sea level - nominal conditions.
From, 1,000 m to 4,000 m (3,300 ft to 13,200 ft) above sea level - current reduction of 1 % for each 100 m (330 ft) above 1,000 m (3,300 ft).
From 2000 m to 4000 m (6,600 ft to 13,200 ft) above sea level - voltage reduction of 1.1 % for each 100m (330 ft) above 2,000 m (6,600 ft).
☑ Pollution degree: 2 (according to the UL508).
Normally, only non conductive pollution. Condensation must not cause conduction in the particles in the air.

3.1.2 Soft-Starter SSW-07 Dimensions

The external dimensions and mounting holes are shown in figure 3.1 and table 3.1 below.

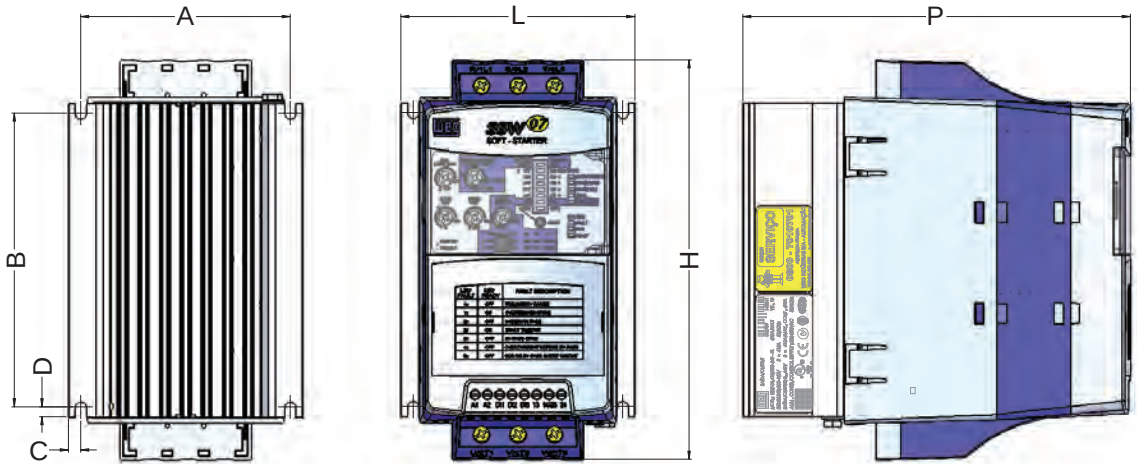


Figure 3.1 - *SSW-07 dimensions*

SSW-07 Model	Height H mm (in)	Width L mm (in)	Depth P mm (in)	A mm (in)	B mm (in)	C mm (in)	D mm (in)	Mounting Screw	Weight kg (lb)	Degree of Protection
17 A 24 A 30 A	162 (6.38)	95 (3.74)	157 (6.18)	85 (3.35)	120 (4.72)	5 (0.20)	4 (0.16)	M4	1.3 (2.9)	IP20
45 A 61 A 85 A	208 (8.19)	144 (5.67)	203 (7.99)	132 (5.2)	148 (5.83)	6 (0.24)	3.4 (0.13)	M4	3.3 (7.28)	IP20
130 A 171 A 200 A	276 (10.9)	223 (8.78)	220 (8.66)	208 (8.19)	210 (8.27)	7.5 (0.3)	5 (0.2)	M5	7.6 (16.8)	IP00 *
255 A 312 A 365 A 412 A	331 (13.0)	227 (8.94)	242 (9.53)	200 (7.87)	280 (11.0)	15 (0.59)	9 (0.35)	M8	11.5 (25.4)	IP00 *

* IP20 with optional.

***Table 3.1** - Installation data with dimensions in mm (in)*

3.1.3 Mounting Specifications

To install the Soft-Starter SSW-07 leave at least the free spaces surrounding the Soft-Starter as in figure 3.2 below. The dimensions of these free spaces are described in table 3.2.

SSW-07 Model	A mm (in)	B mm (in)	C mm (in)
17 A 24 A 30 A	50 (2)	50 (2)	30 (1.2)
45 A 61 A 85 A	80 (3.2)	80 (3.2)	30 (1.2)
130 A 171 A 200 A	100 (4)	100 (4)	30 (1.2)
255 A 312 A 365 A 412 A	150 (6)	150 (6)	30 (1.2)

***Table 3.2** - Recommended free spaces*

Install the Soft-Starter SSW-07 in the vertical position according to the following recommendations:
1) Install on a reasonably flat surface;
2) Do not put heat sensitive components immediately above the Soft-Starter SSW-07.

ATTENTION!
If a Soft-Starter SSW-07 is installed on top of another use the minimum distance A + B and diverge from the top Soft-Starter the hot air that comes from the one beneath it.

ATTENTION!
Independent conduits or cable trays must be planned for physic separation of signal, control and power cables. (Refer to item 3.2 Electric Installation).

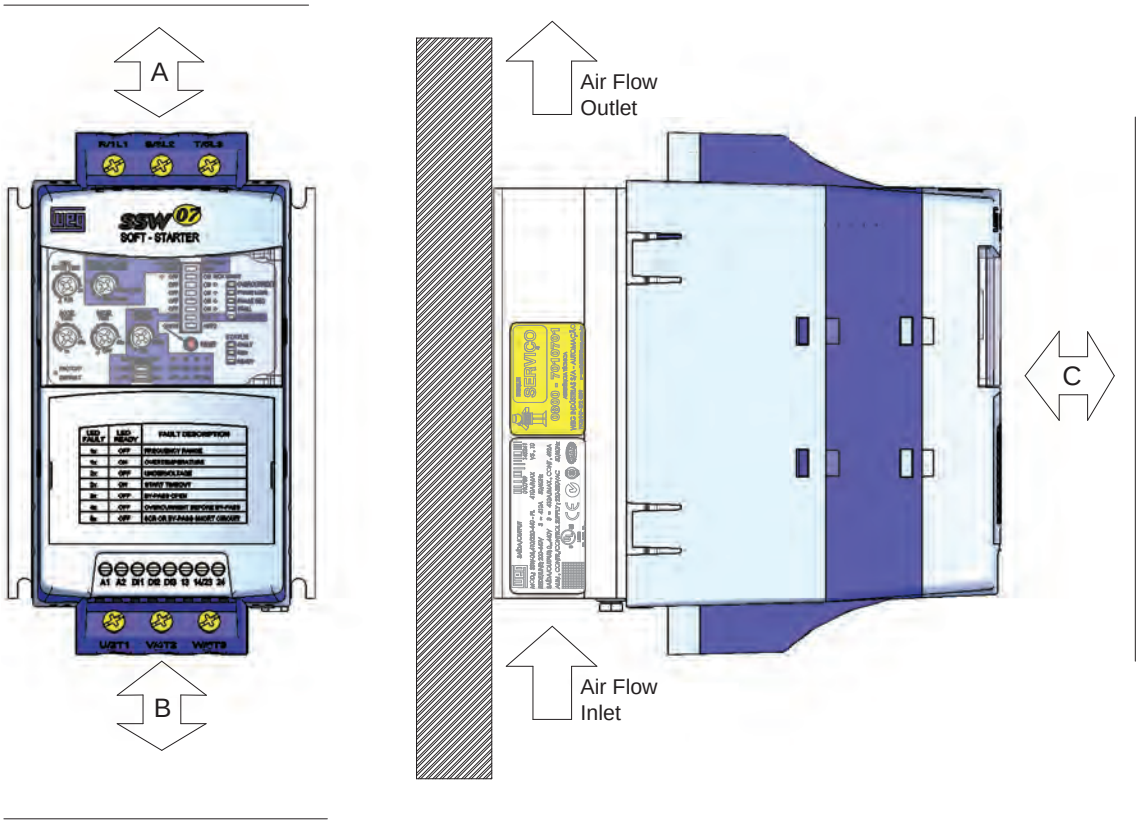


Figure 3.2 *- Free spaces for ventilation*

3.1.3.1 Mounting Inside a Panel

For Soft-Starters SSW-07 installed in panels or closed metallic boxes exhaustion/cooling is required so the temperature does not exceed the maximum allowed. Refer to dissipated nominal power in table 3.3.

SSW-07 Model	Dissipated Power in the electronics (W)	Average Power dissipated 10 starts/h 3 x In @ 30 s (W)	Total Average Power dissipated 10 starts/h 3 x In @ 30 s (W)
17 A	12	15.3	27.3
24 A	12	21.6	33.6
30 A	12	27	39
45 A	12	41	53
61 A	12	55	67
85 A	12	77	89
130 A	12	117	129
171 A	12	154	166
200 A	12	180	192
255 A	12	230	242
312 A	12	281	293
365 A	12	329	341
412 A	12	371	383

Table 3.3 *- Dissipated power for ventilator panel dimensioning*

3.1.3.2 Mounting on Surface

Figure 3.3 shows the installation of the Soft-Starter SSW-07 on the surface of a mounting plate.

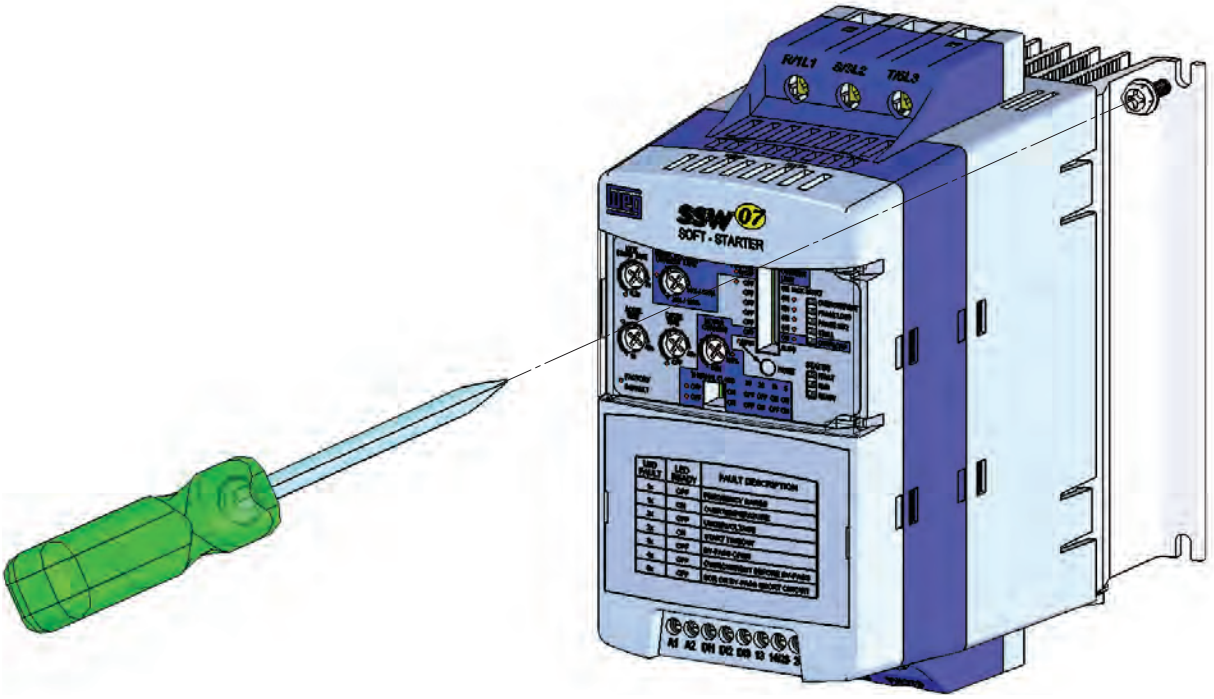


Figure 3.3 *- Installation procedures of the Soft-Starter SSW-07 on a surface*

3.2 ELECTRICAL INSTALLATION

DANGER!
The Soft-Starter SSW-07 cannot be used as an emergency stop device.

DANGER!
Be sure that the AC input power is disconnected before making any terminal connection.

ATTENTION!
The information below may be used as a guide to achieve a proper installation. Follow also the applicable local standards for electrical installations.

ATTENTION!
If a power isolating contactor or circuit breaker with minimum voltage coil is not used at the first power on, then power up the electronics first, adjust the trimpots that are necessary to put the SSW-07 into operation and only after this energize the power section.

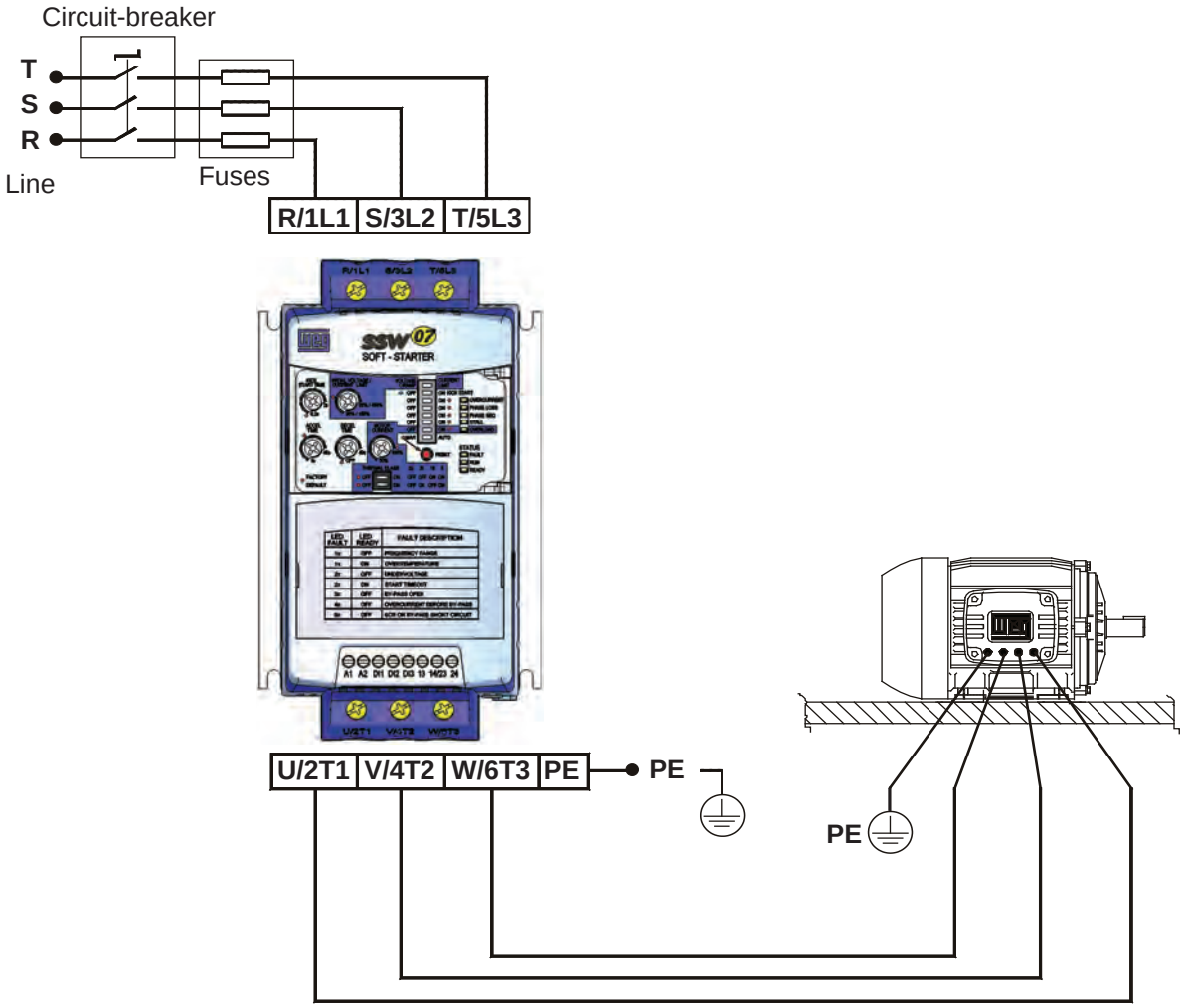
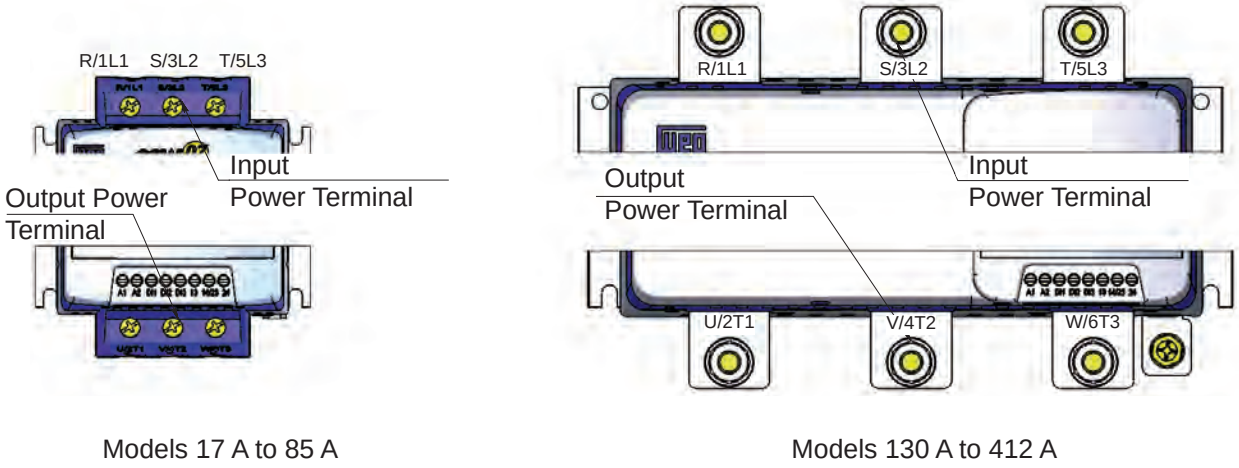


Figure 3.4 *- Standard power/grounding connections*

3.2.1 Power Terminals

The power terminal blocks vary in size and configuration, depending on the SSW-07 soft-starter model, as can be observed at the figures 3.5 and 3.6.

Terminals:
R / 1L1, S / 3L2 and T / 5L3: AC supply line.
U / 2T1, V / 4T2 and W / 6T3: Motor connection.



Models 17 A to 85 A

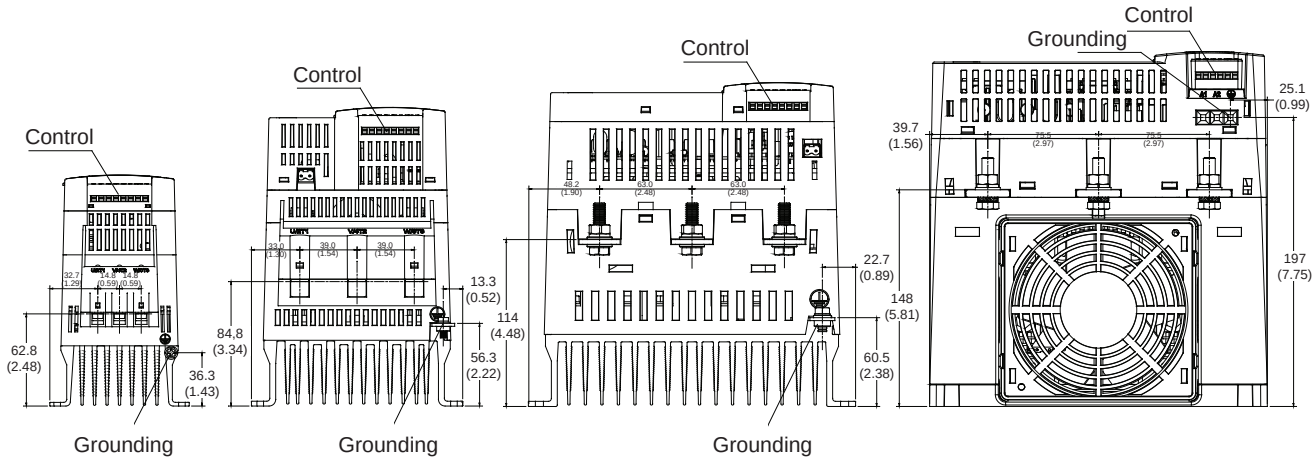
Models 130 A to 412 A

Figure 3.5 *- Power terminals*

SSW-07 Model	Enclosure Size	Line / Motor		Grounding	
		Screw/ Terminal	Torque Nm (in lb)	Screw	Torque Nm (in lb)
17 A 24 A 30 A	Size 01	Terminal	3 (27)	M4 (5/32”)	4.5 (40)
45 A 61 A 85 A	Size 02	Terminal	5.5 (49)	M5 (3/16”)	6 (53)
130 A 171 A 200 A	Size 03	M8 (5/16”)	19 (168)	M6 (1/4”)	8.3 (73)
255 A 312 A 365 A 412 A	Size 04	M10 (3/8”)	37 (328)	Terminal	0.5 (4.5)

Table 3.4 *- Maximum torque for power connection*

3.2.2 Location of the Grounding, Control and Power Connections



Dimensions in mm (in).

Figure 3.6 *- Location of the grounding, control and power connections*

3.2.3 Recommended Power and Grounding Cables

The described specifications in table 3.5 are valid only for the following conditions:

☑ Copper wires for 70 ºC (158 ºF) with PVC insulation for ambient temperature of 40 ºC (104 ºF), installed in perforated and not agglomerated conduits.

☑ Naked or silver coated copper busbars with round edges with 1 mm radius with ambient temperature of 40 ºC (104 ºF) and bus temperature of 80 °C (176 °F).

NOTE!
For correct cable dimensioning, consider the installation condition and the maximum permitted line voltage drop.

SSW-07 Model	Power Cable		Grounding Cable	
	(mm^2)	AWG	(mm^2)	AWG
17 A	2.5	14	4	12
24 A	4	12	6	10
30 A	6	10	6	10
45 A	10	8	6	10
61 A	16	6	10	8
85 A	25	3	10	8
130 A	50	1/0	25	3
171 A	70	2/0	35	2
200 A	95	4/0	50	1/0
255 A	120	250 kcmil	2.5	14
312 A	185	400 kcmil	2.5	14
365 A	240	500 kcmil	2.5	14
412 A	240	600 kcmil	2.5	14

***Table 3.5** - Minimum cable gauge specification*

3.2.4 Power Supply Connection to the Soft-Starter SSW-07

DANGER!
The AC input must be compatible with the voltage range of the Soft-Starter SSW-07.

DANGER!
Provide a power supply disconnecting switch for the Soft-Starter SSW-07. This disconnecting switch must disconnect the AC input voltage to the Soft-Starter SSW-07 whenever necessary (for example: during maintenance services).
If a disconnected switch or a contactor is inserted in the motor supply line never operate these devices with the motor running or when the Soft-Starter SSW-07 is enabled.

ATTENTION!
The overvoltage control in the line that feeds the soft-starter must be done using overvoltage suppressors with a clamping voltage of 680 Vac (phase-to-phase connection) and an energy absorption capability of 40 joules (17 A to 200 A models) and 80 joules (255 A to 412 A models).

NOTE!
Use the wire sizes and fuses recommended in tables 3.5 and 3.7. The connector tightening torque is indicated in table 3.4. Use only copper wires 70 °C (158 °F).

3.2.4.1 Power Supply Capacity

The Soft-Starter SSW-07 is suitable to be used in a circuit capable of supplying not more than X (according to table 3.6) symmetrical rms amperes, Y maximum volts when protected by ultra-rapid fuses.

SSW-07 Model	Y = 220-575 V X (kA)
17 A	5
24 A	5
30 A	5
45 A	5
61 A	5
85 A	10
130 A	10
171 A	10
200 A	10
255 A	18
312 A	18
365 A	18
412 A	30

***Table 3.6** - Maximum current capacity of the power supply*

3.2.4.2 Recommended Fuses

High speed fuses must be used at the input, which will protect the SSW-07 against short circuit. It is possible to use other protection devices that will protect the installation; however, in that case the SSW-07 will remain unprotected.

SSW-07 Model	Nominal Current (A)	Maximum I^2t ($10^3 \times A^2s$)
17 A	50	0.57
24 A	80	3.2
30 A	80	3.2
45 A	100	6.4
61 A	125	8.4
85 A	200	40.9
130 A	315	77.6
171 A	450	134
200 A	500	196
255 A	400	72.5
312 A	500	190
365 A	550	190
412 A	700	256

***Table 3.7** - Recommended fuses*

3.2.4.3 Recommended Contactors

When the SSW07 is used in applications that require an isolator contactor, according to the figure 3.10 (K1), the use of WEG contactors is recommended.

SSW-07 Model	WEG Contactor
17 A	CWM18
24 A	CWM25
30 A	CWM32
45 A	CWM50
61 A	CWM65
85 A	CWM95
130 A	CWM150
171 A	CWM180
200 A	CWM250
255 A	CWM250
312 A	CWM300
365 A	CWME400
412 A	CWME400

Table 3.8 *- Recommended contactors*

3.2.5 Soft-Starter SSW-07 Connection to the Motor



DANGER!
Power factor correction capacitors must never be installed at the output of the Soft-Starter SSW-07. (U / 2T1, V / 4T2 and W / 6T3).



ATTENTION!
To ensure that the protections based on the current reading and display operate correctly, for example the overload, the motor nominal current must not be lower than 50 % of the nominal Soft-Starter SSW-07 current.



NOTE!
Use the wire sizes and fuses recommended in tables 3.5, 3.6 and 3.7. The connector tightening torque is indicated in table 3.4. Use only copper wires.



NOTE!
The Soft-Starter SSW-07 is provided with electronic protection against motor overload. This protection must be set according to the specific motor. When several motors are connected to the same Soft-Starter SSW-07 use individual overload relays for each motor.

3.2.5.1 Standard Three-Wire Connection

Line current of the Soft-Starter SSW-07 is equal to the motor current.

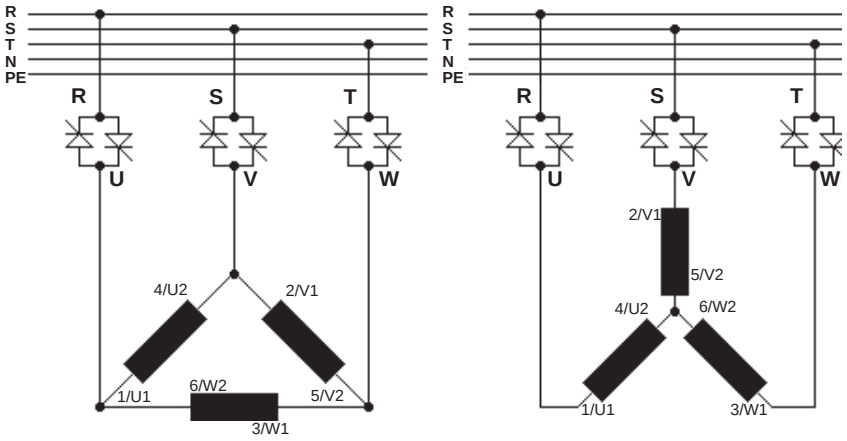


Figure 3.7 *- Soft-Starter SSW-07 with standard connection*

3.2.6 Grounding Connections

DANGER!
The Soft-Starter must be grounded for safety purposes (PE).
The ground connection must comply with the local regulations. Make the ground connection to a grounding bar or to the general grounding point (resistance ≤10 ohms).

DANGER!
The AC input for the Soft-Starter SSW-07 must have a ground connection.

DANGER!
Do not use the neutral conductor for grounding purpose. Use dedicated ground conductor.

ATTENTION!
Do not share the ground wiring with other equipment that operate with high current (for examples: high voltage motors, welding machines, etc.). When several Soft-Starters SSW-07 are used, observe the connections in the figure 3.8.

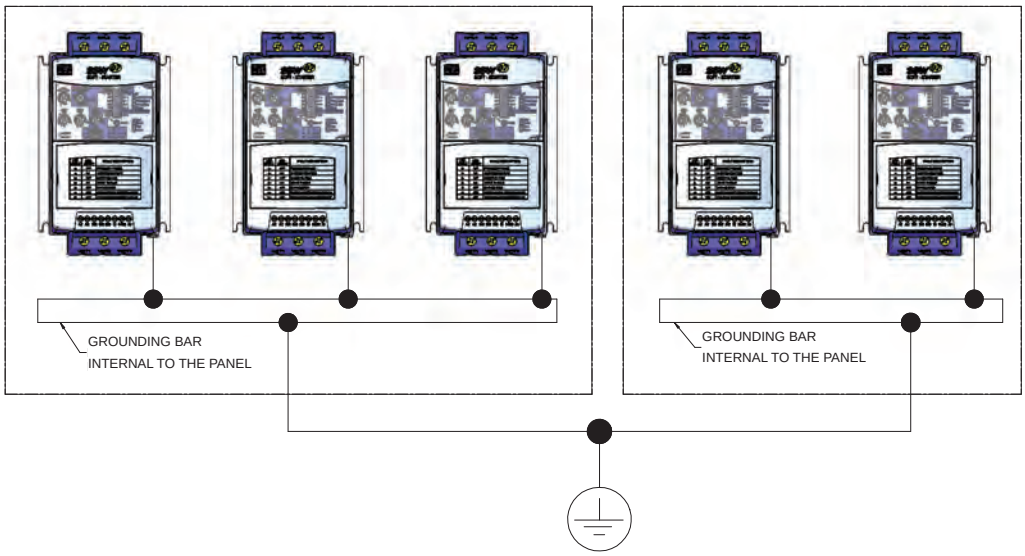


Figure 3.8 *- Grounding connections for more than one Soft-Starter SSW-07*

EMI - Electronic Interference

The Soft-Starter SSW-07 is developed to be used in industrial systems (Class A) according to Standard EN60947-4-2.
It's necessary to have a distance of 0.25 m (10 in) between the Soft- Starter SSW-07 control cables and motor cables.
Example: PLC wiring, temperature controllers, thermocouple cables, etc.

Grounding of the Motor frame

Always ground the motor frame. The Soft-Starter SSW-07 output wiring to the motor must be installed separately from the input wiring as well as from the control and signal wiring.

3.2.7 Control and Signal Connections

The control connections (digital inputs and relay outputs) are made through the terminals (refer to figure 3.9).

Terminal	Description	Specifications	Torque Nm (in lb)
A1	Electronics Supply	Voltage: 110 to 240 Vac (-15 % to +10 %) (models from 17 A to 200 A) 110 to 130 Vac or 208 to 240 Vac (-15 % to 10 %) (models from 255 A to 412 A).	0.5 (4.5)
A2			
⏚	Grounding	Only for the 255 to 412 A models	
Terminal	Factory Default	Specifications	
DI1	Starts/Stops Motor	3 isolated digital inputs Voltage: 110 to 240 Vac (-15 % to +10 %) Current: 2 mA Max.	
DI2	Fault reset		
DI3	Fault reset		
13	Relay 1 output - Operation	Contact capacity: Voltage: 250 Vac Current: 1 A	
14/23	Relay common point		
24	Relay 2 output - Full voltage		

Table 3.9 - *Description of the control connector pins*

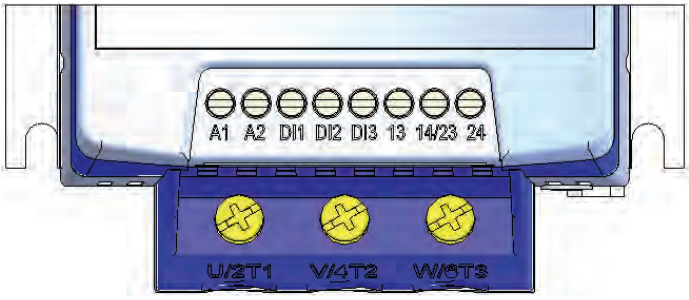


Figure 3.9 - *Control terminals of the Soft-Starter SSW-07*

3.3 RECOMMENDED SET-UPS

Some recommended set-ups are shown here and they can be completely or partly used.
The main warning notes for all the recommended set-ups are shown below and are described in the schemes by their respective numbers.

NOTES!

(1) The use of fuses or circuit breakers at the input circuit is necessary for the entire installation protection. It is not necessary to use ultra-fast fuses for the SSW-07 operation; however, their use is recommended for the soft-starter complete protection.

(2) The transformer “T1” is optional and must be used when there is a difference between the line voltage and the electronic power voltage.

(3) In case that damage at the SSW-07 Soft-Starter power circuit keeps the motor running (e.g., shorted thyristors), the motor protection is obtained with the use of the power isolating contactor (K1) or circuit breaker (Q1).

(4) Start push-button.

(5) Stop push-button.

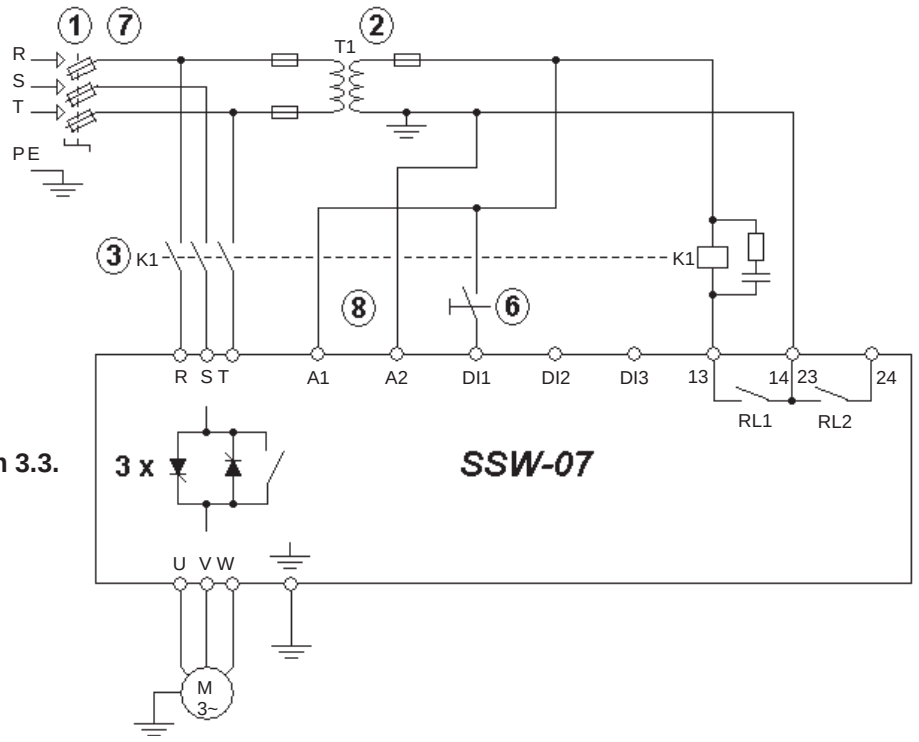
(6) Start/Stop switch. Bear in mind that when using two-wire digital input command (normally open switch with retention), in case of a power interruption, upon return of power, the motor will be started immediately if the switch remains closed.

(7) In case of maintenance of the Soft-Starter SSW-07 or the motor it is necessary to remove the input fuses or disconnect the power supply to ensure the complete equipment disconnection from the power supply.

(8) The emergency stop can be used by disconnecting the electronics power supply.

(9) Undervoltage release for the Q1 power isolation circuit breaker.

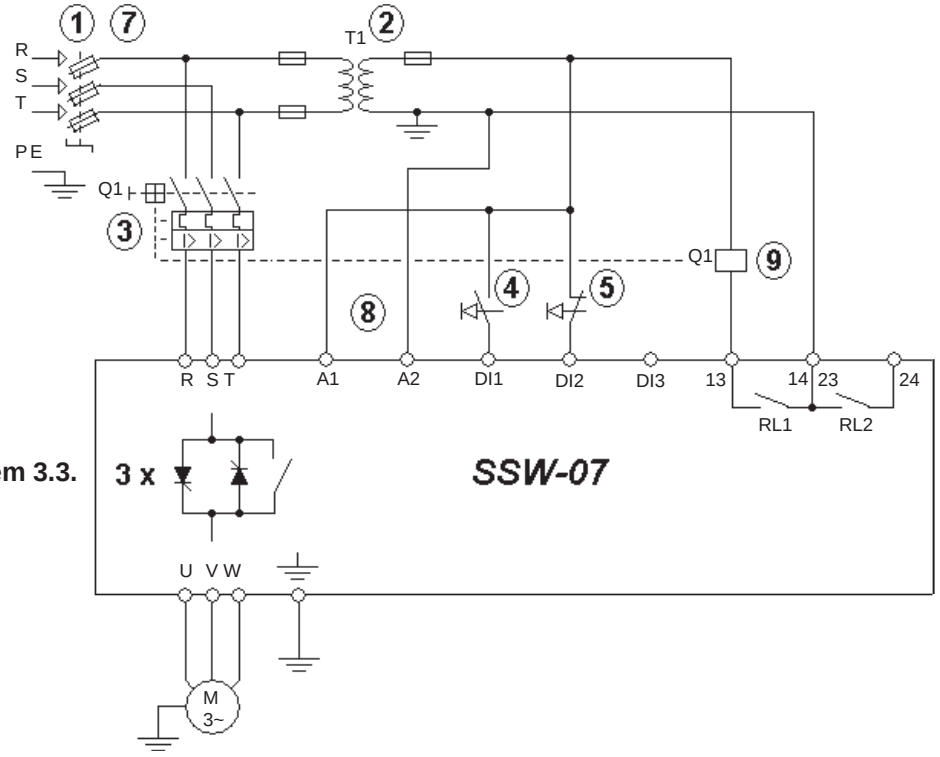
3.3.1 Recommended Set-up with Command via Two-wire Digital Inputs and Isolation Contactor



Refer to notes in item 3.3.

Figure 3.10 *- Recommended set-up with commands via two-wire digital inputs and isolation contactor*

3.3.2 Recommended Set-up with Command via Three-wire Digital Inputs and Circuit-Breaker



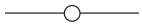
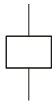
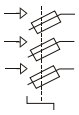
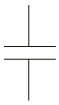
Refer to notes in item 3.3.

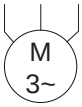
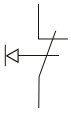
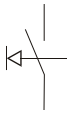
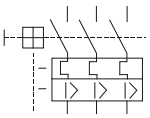
Figure 3.11 *- Recommended set-up with commands via three-wire digital inputs and a circuit-breaker*

NOTE!
It's necessary to program the digital input DI2 for the three-wire command function. Refer to item 4.10.

NOTE!
The RL1 shall be set to the "No fault" function. Refer to item 4.12.

3.3.3 Symbols

	Electrical connection between two signals
	Connection terminals
	Relay or contactor coil
	Normally open contact (NO)
	Indicator light
	Circuit-breaker (opens under load)
	Resistor
	Capacitor

	Fuse
	Thyristor/SCR
	Three-phase motor
	Transformer
	N.O Contact (with retention)
	Normally closed (NC) push-button
	Normally open (NO) push-button
	Circuit-breaker with undervoltage release

SETTING THE SSW-07

This chapter describes how to make the necessary settings for the correct functioning of the SSW-07.

4.1 CONTROL TYPE SETTING

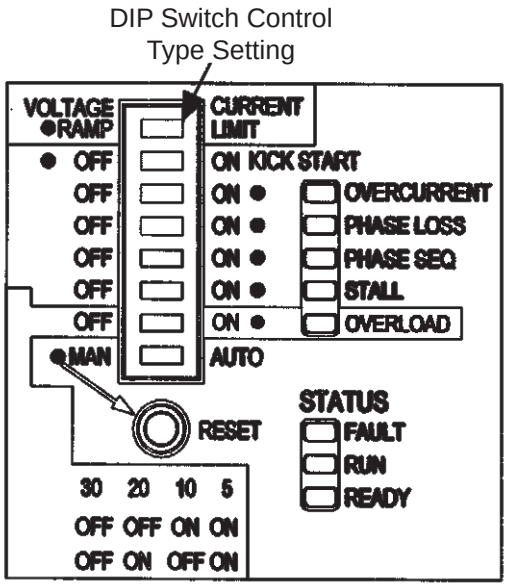


Figure 4.1 *- Control type setting*

Select the type of starting control that best adapts to the application.

Voltage Ramp Starting:
This is the most commonly used method. Very easy to program and set.
The Soft-Starter SSW-07 imposes the voltage applied to the motor.
Generally applied to loads with a lower initial torque or a square torque.
This kind of control can be used as an initial working test.

Current Limit Starting:
The maximum current level is maintained during the start, being set according to the application necessities.
Generally applied to loads with a higher initial torque or a constant torque.
This kind of control is used to adapt the start to the capacity limits of the supply network.

4.2 KICK START

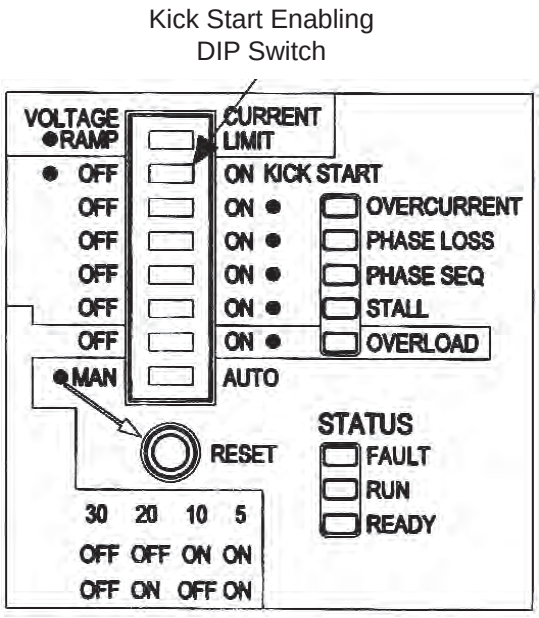


Figure 4.2 *- Kick Start enabling*

Soft-Starter SSW-07 offers a Kick Start function for loads that present a large initial resistance to movement.
This function is enabled through the Kick Start DIP Switch. The duration of the voltage pulse is set through the trimpot Kick Start Time.
The voltage pulse applied is of 80 % Un during the programmed trimpot Kick Start Time.

NOTE!
Use this function only for specific applications and where necessary.

4.3 INITIAL VOLTAGE SETTING

Set the initial voltage to a value that the motor starts to run as soon as the start command is given to the SSW-07.

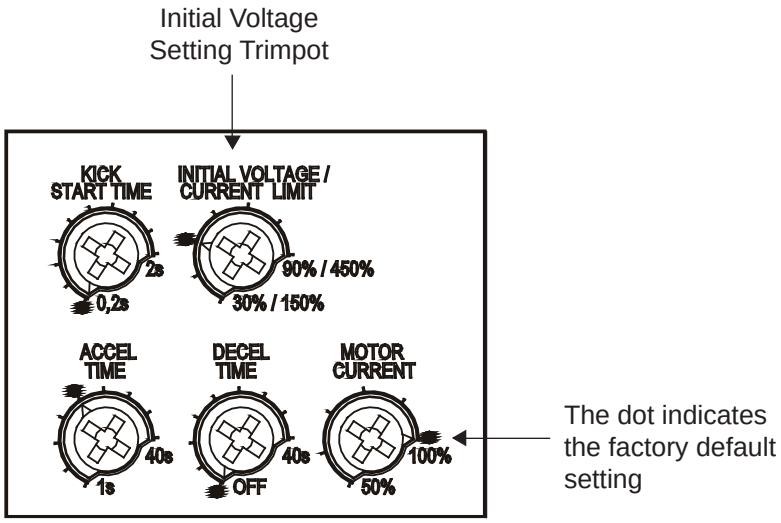


Figure 4.3 *- Initial voltage setting*

NOTE!
The Initial Voltage trimpot has an initial voltage setting function only when the kind of control is programmed to start with a voltage ramp.

4.4 CURRENT LIMIT SETTING

This setting defines the maximum limit of the current during motor starting in percentage of the nominal current of the Soft-Starter.
If the current limit is reached during the start of the motor, Soft-Starter SSW-07 will maintain the current at this limit until the motor reaches nominal speed.
If the current limit is not reached, the motor will start immediately.
The current limitation should be set to a level that the motor acceleration can be observed, otherwise the motor will not start.

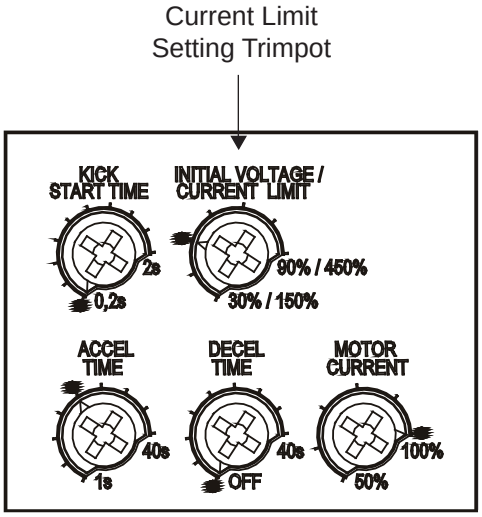


***Figure 4.4** - Current limit setting*

NOTES!
If at the end of the acceleration ramp (set at the Trimpot Acceleration Time), full voltage is not reached, a start timeout Fault will be shown. This fault is indicated through the Fault LED flashing twice with the Ready LED on.

The trimpot Current Limit has a Current Limit setting function only when the kind of control is programmed to start with a Current Limit.

4.5 ACCELERATION RAMP TIME SETTING

When Soft-Starter SSW-07 is programmed to Voltage Ramp control, this is the voltage increment ramp time.

When Soft-Starter SSW-07 is programmed to Current Limit control, this time is used as the maximum starting time, working as a protection against blocked rotors.

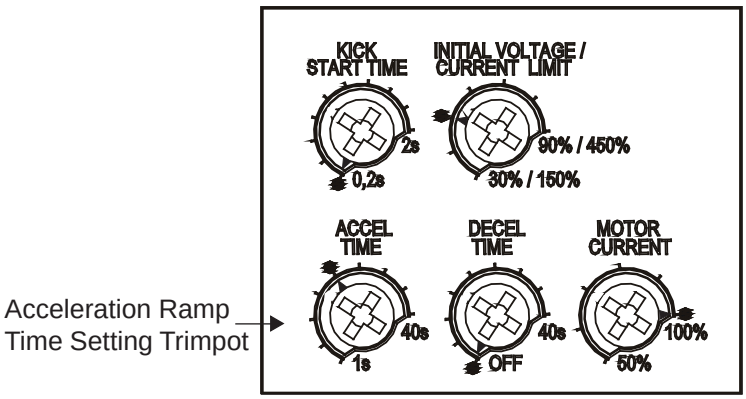


Figure 4.5 *- Acceleration ramp time setting*

NOTE!
The programmed acceleration time is not the exact motor acceleration time, but the time of the voltage ramp or the maximum starting time. The motor acceleration time depends on the motor characteristics and the load.

Please consider that in cases where the relation of the SSW-07 current and the motor nominal current is 1.00, the maximum time that the SSW-07 can work with 3 x In is 30 seconds.

4.6 DECELERATION RAMP TIME SETTING

Enables and sets the time of voltage decrease.
This setting should be used only for the deceleration of pumps to reduce the water hammer. This setting must be made to achieve the best pump performance.

NOTE!
This function is used to lengthen the normal deceleration time of a load and not to force a lower time than that imposed by the load itself.

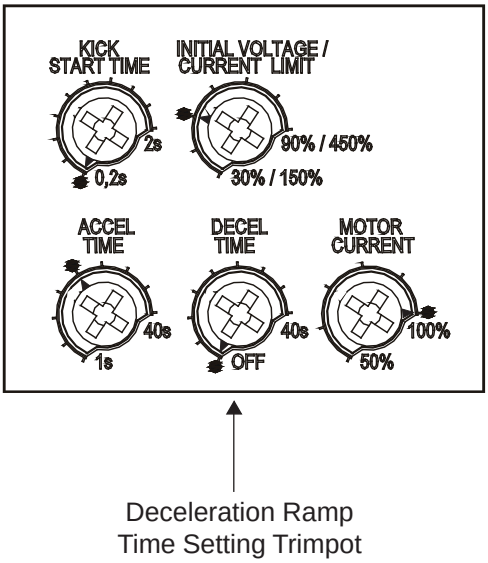


Figure 4.6 *- Deceleration ramp time setting*

4.7 MOTOR CURRENT SETTING

This setting defines the ratio of the SSW-07 current and the motor current. The value of the setting is very important since it defines the protection of the motor driven by the SSW-07. The setting of this function interferes directly in the following motor protections:
-Overload;
-Overcurrent;
-Stall;
-Phase loss.

Calculation Example:
SSW-07 Used: 30 A
Motor Used: 25 A

Trimpot for the Motor Current Setting

$$\text{Motor Current Setting} = \frac{I_{motor}}{I_{SSW\text{-}07}}$$

$$\text{Motor Current Setting} = \frac{25\ A}{30\ A}$$

Motor Current Setting = 0.833

Therefore it must be set at 83 %

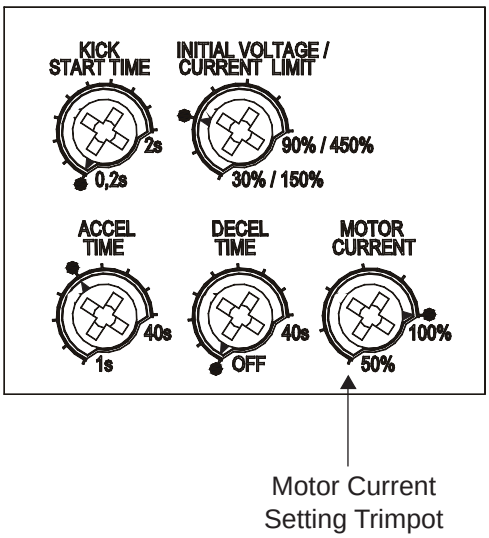


Figure 4.7 *- Motor current setting*

4.8 MOTOR ELECTRONIC OVERLOAD PROTECTION

The motor electronic overload protection simulates the heating and cooling of the motor, also known as thermal image. This simulation uses as input data the True rms current. The curve with the working time in motor overload is defined in figure 4.8.

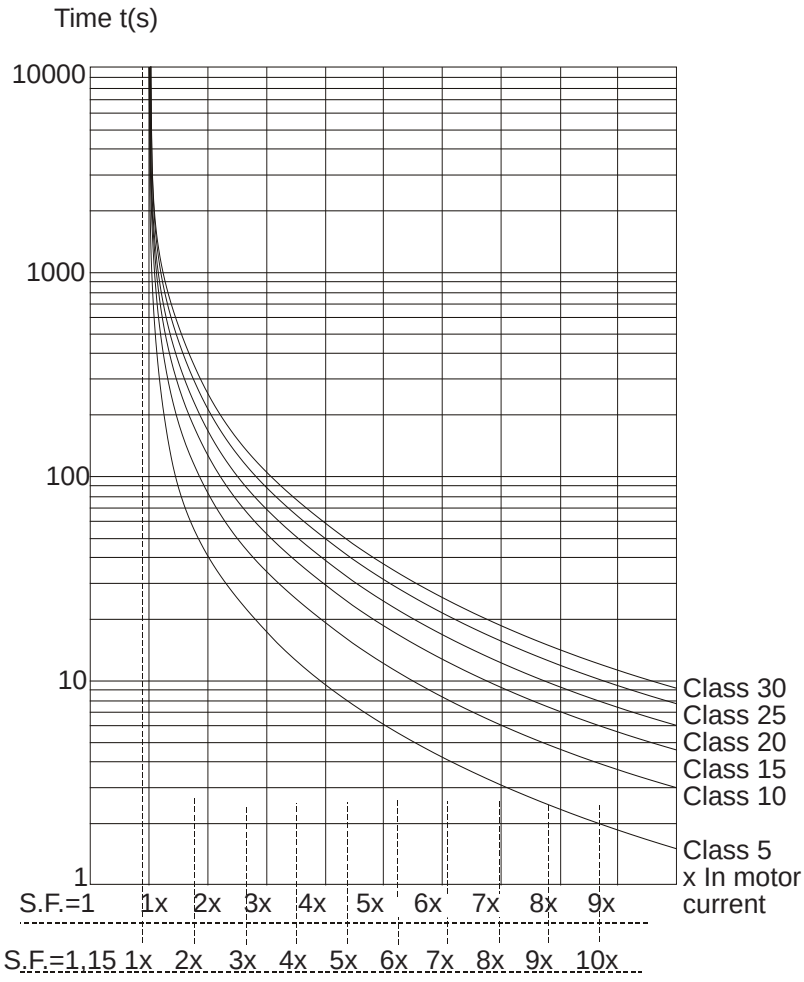


Figure 4.8 *- Thermal classes of motor protection in cold condition*

Motor Current	Class		
	30	20	10
3xIn	101.2 s	67.5 s	33.7 s
5xIn	36.1 s	24 s	12 s
7xIn	18.3 s	12.2 s	6.1 s

***Table 4.1** - Motor protection thermal class time in cold condition at S.F.=1*

Motor Current	Class		
	30	20	10
3xIn	135.1 s	90.1 s	45.1 s
5xIn	47.7 s	31.8 s	15.9 s
7xIn	24.3 s	16.2 s	8.1 s

***Table 4.2** - Motor protection thermal class time in cold condition at S.F.=1.15*

NOTES!

☑ When SSW-07 is without the electronic supply voltage (A1 and A2), the thermal image is saved internally. When the supply (A1 and A2) is re-established, the thermal image value returns to the value prior to the electronic supply loss.

☑ The RESET of the electronic overload protection can be set to manual function (man). In this case the RESET must be made via digital input 2 (DI2) or through the RESET key. If the RESET setting is set to automatic (auto), the fault condition will automatically be reset after the equipment cooling time;

☑ Upon disabling the electronic overload protection, the thermal image is reset at zero.

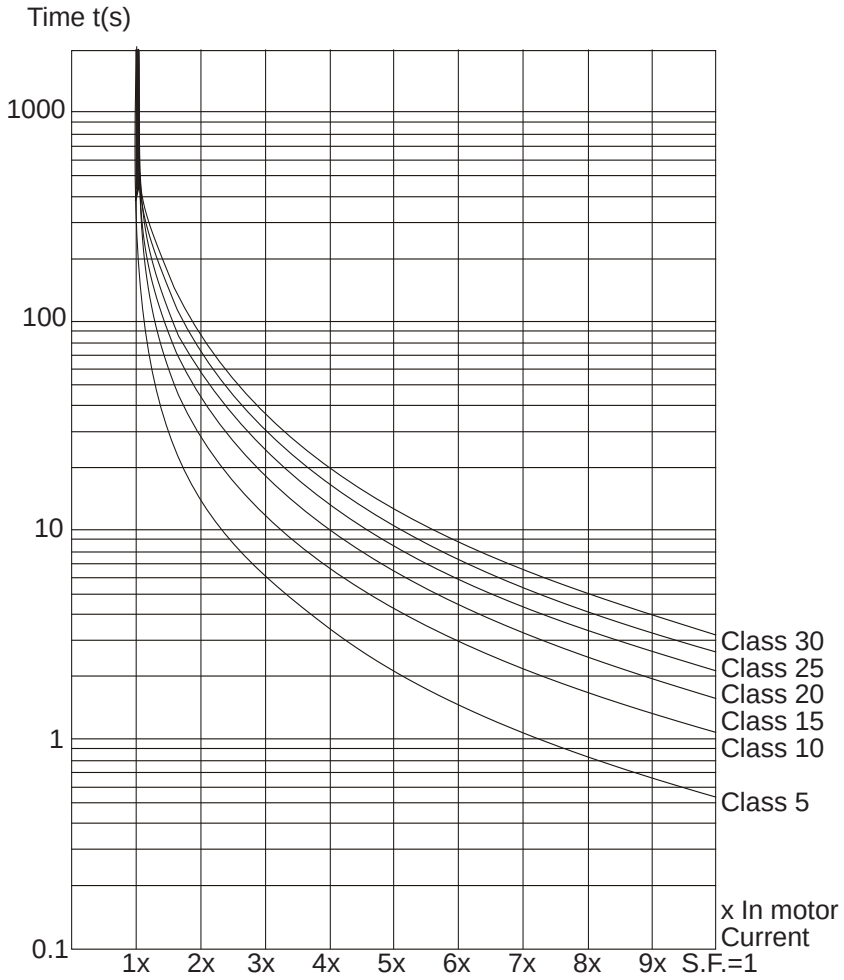


***Figure 4.9** - Motor protection thermal classes in hot condition at 100 % In*

Motor Current	Class		
	30	20	10
3xIn	34.4 s	23.6 s	11.8 s
5xIn	12.6 s	8.4 s	4.2 s
7xIn	6.4 s	4.2 s	2.1 s

***Table 4.3** - Motor protection thermal class time in hot condition*

Current in % of In of the motor	Factor
0 % (cold condition)	1
20 %	0.87
40 %	0.74
60 %	0.61
80 %	0.48
100 % (rated load)	0.35

***Table 4.4** - Multiplication factor of the thermal class times in cold condition to obtain the thermal class times in hot condition*

4.9 RESET

A fault condition can be reset using the RESET key at the front of the SSW-07 or through a push-button (0.5 seconds) at DI3 (digital input for RESET). Another way to reset the SSW-07 is by switching Off/On the electronic power supply (A1 and A2).

NOTE!
The SSW-07 also allows for the possibility of automatic RESET by enabling this function through the DIP Switch (auto):

☑ Automatic RESET occurs after 15 minutes in the following conditions:
-Overcurrent;
-Phase loss;
-Stall;
-Overcurrent before By-pass;
-Frequency out of range;
-Contact of the internal By-pass relay is open;
-Power control supply undervoltage;
-External fault.
☑ For incorrect phase sequence there is no automatic RESET.
☑ For electronic overload of the motor there is a specific algorithm for the automatic RESET time.

4.10 DI2 DIGITAL INPUT SETTING

In the factory default, the DI2 digital input has its function programmed for the reset of faults. DI2 can also be programmed to work as a three wire control.
The three wire control allows the Soft-Starter to be commanded through two digital inputs, DI1 as an ON input and DI2 as an OFF input. This allows for the direct placement of two push buttons. Refer to item 3.3.2.
To change the DI2 digital input, follow the instructions below:

1. To enter in programming mode, maintain the reset key at the front of the SSW-07 pressed for 5 seconds. Maintain the reset key pressed during programming;
2. When in programming mode, two LEDs will turn on (overcurrent and phase loss), indicating that DI2 is programmed for fault Reset. When three LEDs turn on (overcurrent, phase loss and phase sequence), it indicates that the DI2 is programmed for three wire commands;
3. To change the programming to three wire commands, move the overcurrent DIP Switch and return to the previous position. The three LEDs will turn on, indicating that DI2 is programmed for three wire commands;
4. To change the DI2 programming to fault Reset, move the Kick Start DIP Switch and return to the previous position. Two LEDs will turn on, indicating that the DI2 is programmed for fault Reset;
5. Programming is concluded when the reset key is released.

4.11 OUTPUT RELAY OPERATION

☑ The relay of the Operation Function closes its N.O. contact (13-14/23) every time the SSW-07 receives the enable command. This contact is only opened at the end of the deceleration ramp (when it is set via trimpot) or when the SSW-07 receives the disable command.

☑ The relay of the Full Voltage Function closes the N.O. contacts (14/23-24) every time the SSW-07 applies 100 % of the voltage to the driven motor. This contact opens when the SSW-07 receives the disable command.

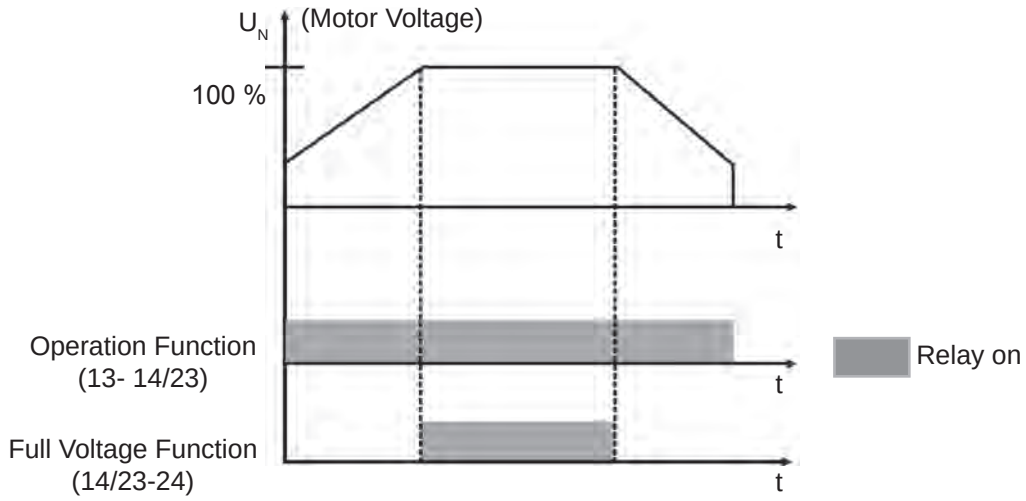


***Figure 4.10** - Output relay operation*

4.12 RELAY OUTPUT RL1 PROGRAMMING

In the factory default programming, the relay output RL1 has its function programmed for “Operation”. RL1 (13/14) can be also be programmed for the “No Fault” function. This function allows the installation of a circuit breaker with an undervoltage release at the SSW-07 input. Refer to figure 3.3.2. In order to change the relay output RL1 programming follow these instructions:

1. To enter in programming mode keep the reset key, at the SSW-07 front cover, pressed during 5 seconds, keeping it also pressed throughout the programming;
2. When in the programming mode two LEDs turn on (Overcurrent and Phase Loss), indicating that DI2 is programmed for Error Reset. If three LEDs turn on (Overcurrent, Phase Loss and Phase Sequence), it indicates that DI2 is programmed for three-wire command. If the Overload LED turns on, then the RL1 function is “No Fault”, otherwise the function is “Operation”;
3. To modify the RL1 function change the Overload DIP Switch and put it back in the previous position. The Overload LED will indicate the new programmed function:
   - Overload LED off: Operation function;
   - Overload LED on: No Fault function.

PROGRAMMING INFORMATION AND SUGGESTIONS

This chapter helps the user to set the types of starting controls according to their applications.

5.1 APPLICATIONS AND PROGRAMMING

ATTENTION!
Suggestions and important notes for each type of starting control.

ATTENTION!
To know the correct programming of the parameters, have your load data on hand and use the WEG (Soft-Starter) Dimensioning Software available at WEG's home page (http://www.weg.net).
If you are unable to use the software mentioned above, you can follow some practical concepts described in this chapter.

Shown below are some characteristic curves with current and starting torque behavior according to some kinds of control.

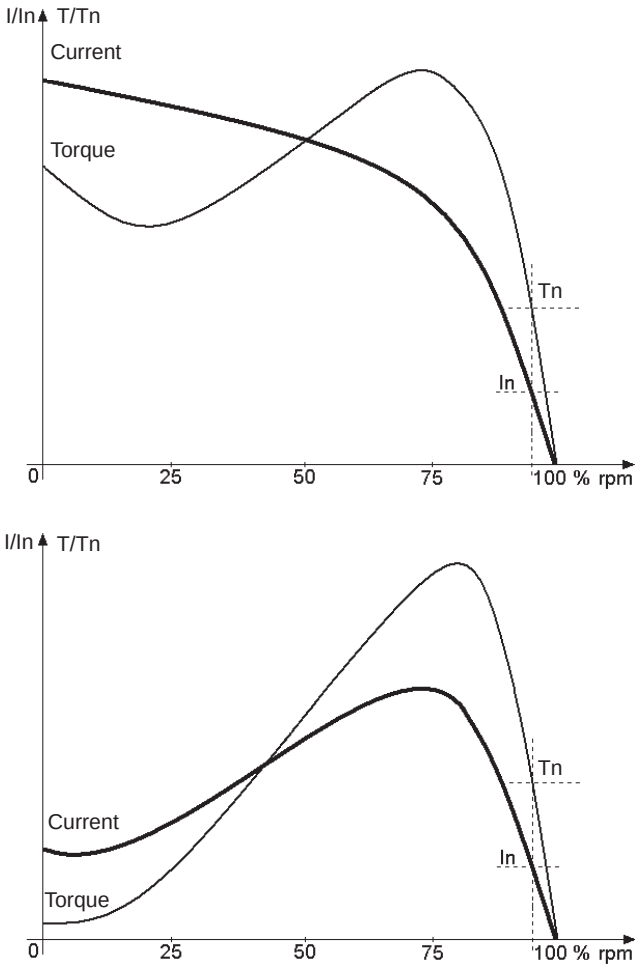


Figure 5.1 *- Characteristic curves of torque and current in a direct on-line start and by voltage ramp*

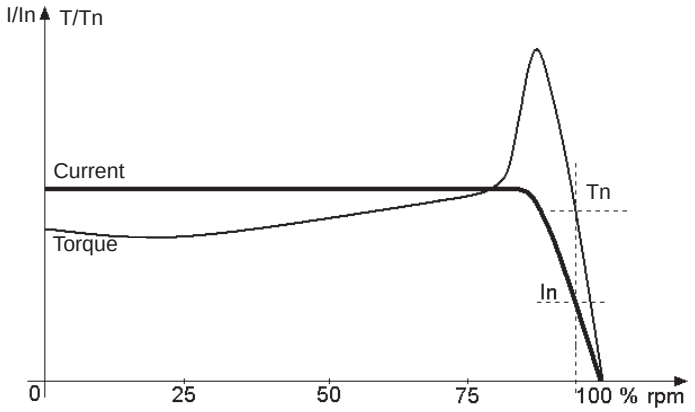


***Figure 5.2** - Characteristic curves of torque and current in a current limitation start*

5.1.1 Voltage Ramp Starting

1) Set the value of the initial voltage to a low value;
2) When a load is applied to the motor, set the initial voltage to a value that makes the motor rotate smoothly from the instant it is started.
3) Set the acceleration time with the necessary start time, initially with short times, 10 to 15 seconds, and afterwards try to find the best starting condition for the used load.

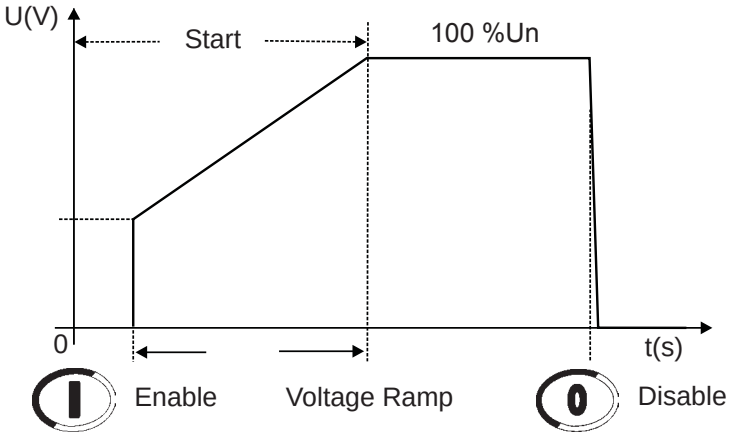


***Figure 5.3** - Voltage ramp starting*

NOTES!

☑ With long starting times, or when the motor is without a load, vibration can occur during the start of the motor, therefore lower the starting time;

☑ If faults occur during the start, check all the connections from the Soft-Starter to the supply network, motor connections, supply network voltage levels, fuses and circuit breakers.

5.1.2 Current Limit Starting

1) To start with a current limitation it is necessary to start with a load. Initial test without load can be done with a voltage ramp;
2) Set the acceleration time with the necessary starting time, initially with short times, 20 to 25 seconds. This time will be used as the stall time in case the motor does not start;
3) Set the current limit according to the conditions that your electric installation allows, as well as to the values that supply enough torque to start the motor. It can initially be programmed with values between 2x and 3x the nominal current of the motor (In of the motor).

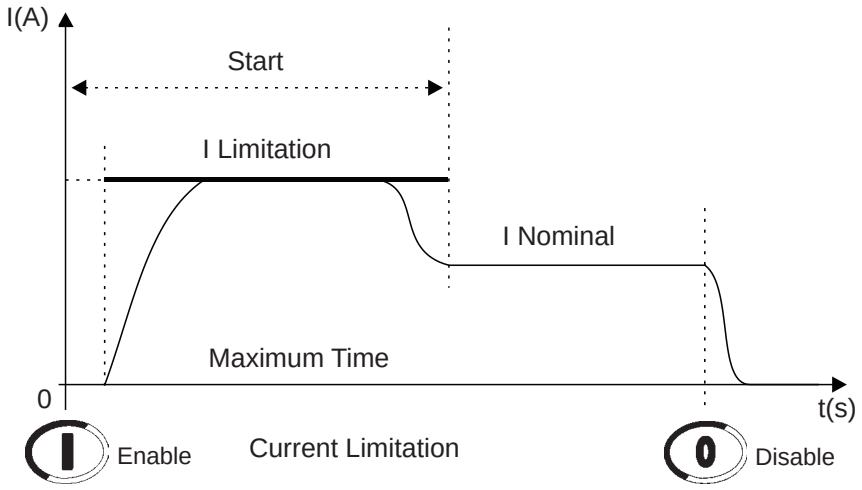


Figure 5.4 *- Current limit starting*

NOTES!

☑ If the current limit is not reached during the start, the motor will start immediately;
☑ Very low Current Limit values do not provide sufficient torque to start the motor. Always keep the motor rotating once it is started.
☑ For loads that need a higher initial starting torque, the Kick Start function can be used;
☑ If faults occur during the start, check all the connections from the Soft-Starter to the supply network, motor connections, supply network voltage levels, fuses and circuit breakers.

5.2 PROTECTIONS AND PROGRAMMING

5.2.1 Suggestion on How to Program the Thermal Class

1) Initially start at the standard thermal class, sometimes, but without the motor overheating;

2) Determine the correct starting time. Find an average of the current using a multmeter with a current probe to measure it;
A current average can be found for any type of starting control;

For example:
Starting an 80 A motor using a voltage ramp. The current starts at 100 A and goes to 300 A, returning afterwards to the nominal value in 20 seconds.
(100 A + 300 A)/2 = 200 A
200 A/80 A = 2.5 x In of the motor
Therefore: 2.5 x In @ 20 seconds.

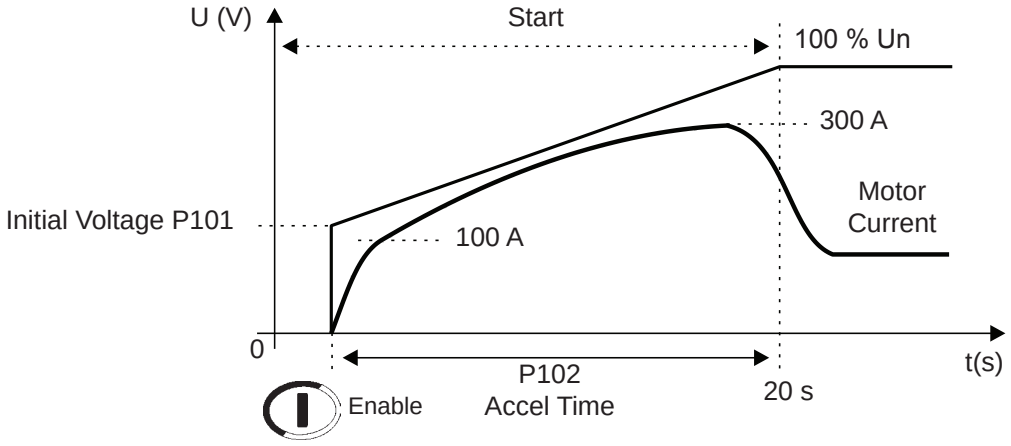


***Figure 5.5** - Typical current curve during a voltage ramp start*

3) Use this time to find the minimum class necessary to start the motor in cold condition. In the item 4.8 Overload Protection it is possible to check the thermal class curves of the motor in cold condition.

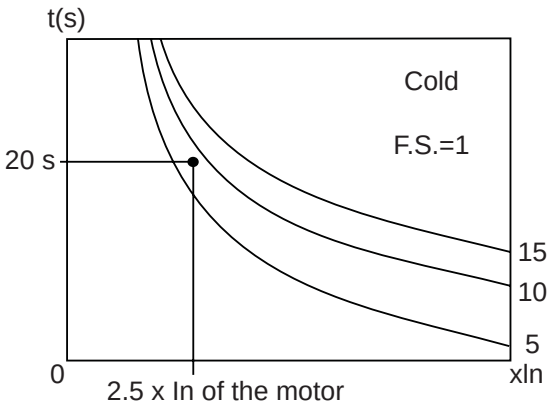


***Figure 5.6** - Checking the minimum class of curves in cold condition*

Therefore the minimum class necessary to start the motor is Class 10. Class 5 has an inferior time for this current.
This class allows motor starting in cold condition.

4) In order to identify the thermal class to start a hot motor, it is necessary to know the locked rotor time that the motor withstand.

NOTE!
To correctly program the Thermal Class that will protect your motor it is essential to have in hands the stall time of the motor. This information is available in the motor manufacturer's catalogue.

With the stall time it is possible to find the maximum thermal class that will protect the motor to start in hot condition. In the item 4.8 Overload Protection, it is possible to check the thermal class curves of the motor in hot condition.
For example: 6.6 x In @ 6 s.

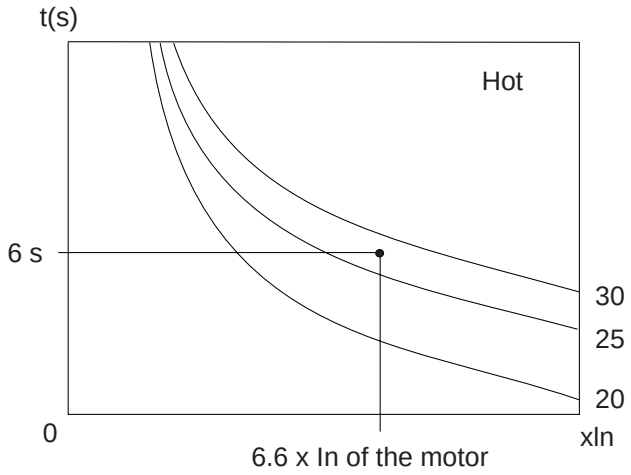


Figure 5.7 *- Checking the maximum class of curves in hot condition*

Class 25 is the highest thermal class that protects the motor and allows its hot start, or in any other condition.

NOTE!
Remember that this protection has as a standard the Three Phase IP55 Standard WEG Motor, therefore if your motor is different, then do not program the thermal class to its maximum, instead, program it near its minimum thermal class to start.

Example of how setting the thermal class:

Motor data:
Power: 50 hp
Voltage: 380 V
Nominal Current (In): 71 A
Service Factor (S.F.): 1.00
Ip/In: 6.6
Stall time: 12 s in hot condition
Speed: 1770 rpm

Motor + load starting data:
Starting by Voltage Ramp, starting current average:
3 x the nominal current of the motor during 25 s (3 x In @ 25 s).

1) In the graph, figure 4.8 in cold condition, one can see the minimum Thermal Class that will allow the start with a reduced voltage:
   For 3 x In of the motor @25 s, the next highest is adopted: Class 10.
2) In the graph, figure 4.9 in hot condition, one can see the maximum Thermal Class that the motor can stand due to the stall time in hot condition:
   For 6.6 x In of the motor @ 12 s, the next lowest is adopted. Class 30.

One now knows that Thermal Class 10 allows a start and Thermal Class 30 is the maximum limit. Thus, a Thermal Class between the two should be adopted, according to the quantity of starts per hour and the interval of time between Off/On procedures the motor.

The closer to Class 10, the more protected the motor will be, the fewer the starts per hour and the greater the interval of time must be between Off/On procedures the motor.

The closer to Class 30, the closer it gets to the maximum limit of the motor, thus there can be more starts per hour and lower intervals of time between Off/On procedures the motor.

5.2.2 Time Reduction from Cold to Hot Starting

To determine the working times of the thermal classes in hot condition, when the motor is running at full voltage with a current lower that 100 % of the In of the motor, use the multiplication factor in table 4.4, according to the current percentage that the motor is operating.
For example:
A motor is running with 80 % In and is turned off.
Immediately afterwards it is turned back on.
The starting current is 3 x In of the motor @ 25 s.
The Thermal Class selected is Class 10 with 33.7 s @ 3 x In of the motor.
In the table, the setting factor to 80 % In of the motor is 0.48.

The final working time will be: 0.48 x 33.7 s = 16.2 s, in other words, the time was reduced from 33.7 s during a start in cold condition to 16.2 s for a start in hot condition. A new start will not be allowed before the thermal image of the motor decreases, in other words, cools down.

5.2.3 Service Factor

When the Service Factor (S.F.) is different from 1.00 and if there is a need to use it, one can check in the graph, in cold condition, the points for S.F.=1.15 and in the table for S.F.=1.15.

If one wishes to know the thermal protection working times for other S.F. values just move the x In line of the motor to the left.

$$\frac{1}{S.F.} \times N \times In = New_Line \times In$$

N= Number of motor nominal current times.

Examples:
Considering the line of 3xIn with S.F.=1.00 to S.F=1.25.

$$\frac{1}{1.25} \times 3 \times In = 2.40 \times In$$

The new line of 3xIn with S.F.= 1.25 must be situated in 2.40xIn.

Considering the line of 3xIn with S.F.=1.00 to S.F.=1.15.

$$\frac{1}{1.15} \times 3 \times In = 2.61 \times In$$

The new line of 3xIn with S.F.= 1.15 must be situated in 2.61xIn.

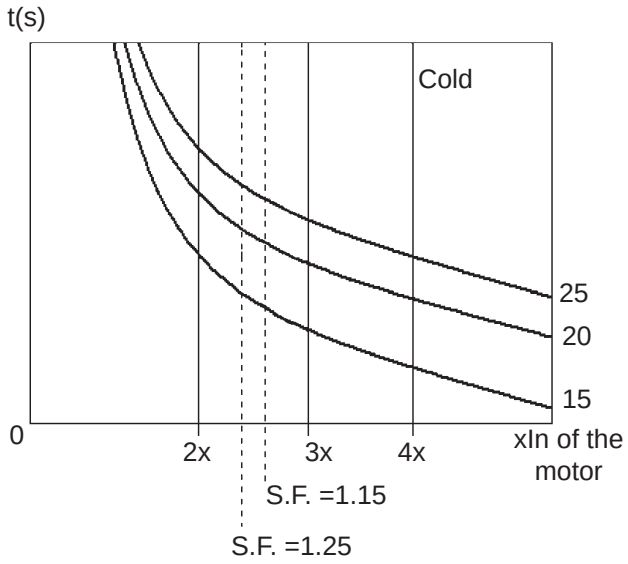


***Figure 5.8** - Using the S.F. to find the new time*

If the optional keypad or serial communication is unavailable to program the service factor parameter, it is necessary to use the nominal current of the motor as the In of the motor x S.F. In this case, the Motor Current trimpot must be programmed considering the service factor.

$$Motor_Current = \frac{In_of_Motor \times S.F.}{In_of_SSW} \times 100$$

Example:
Motor with 80 A and S.F.=1.25
SSW-07 of 130 A

$$\frac{80 \times 1.25}{130} \times 100 = 77\ \%$$

The Motor Current trimpot must then be set to 77 %.

NOTE!
The example and equation above must only be used when the service factor is used, and if the parameter of the service factor is not programmable via the optional keypad or serial communication.

SOLUTION AND TROUBLESHOOTING

6.1 FAULTS AND POSSIBLE CAUSES

When an error is detected, the Soft-Starter is blocked (disabled) and the LED's indicate this error by means of intermittent flashes. In order that the Soft-Starter operates normally again after an error trip, it is necessary to reset it. This procedure is performed in the following ways:

- ☑ Disconnecting and reapplying the AC power (power-on RESET);
- ☑ Pressing the "RESET" key in the SSW-07 front panel (RESET key);
- ☑ Automatically by the automatic RESET. Enable this function via DIP Switch (auto);
- ☑ Via digital input DI2 or DI3.

Protection Description and Fault Display	Activation Description	Probable Causes	Reset
Phase loss or Undercurrent **E03** (LED Phase Loss) Flashing	At starting: It occurs when there is no voltage in the power supply terminals (R/1L1, S/3L2 and T/5L3) or when the motor is disconnected. At full voltage: It trips when the current stays below the programmed value longer than the programmed time. Referring to the nominal motor current. When the parameters are set with the factory default values, then this protection trips after elapsing 1 second with phase loss either at the input or at the output (motor). It trips when the current circulating through the SSW-07 is less than 20 % of the value adjusted at the Motor Current trimpot.	In hydraulic pump applications, it may be running with no load. Phase loss in the three-phase network. Short-circuit or fault at the thyristor or By-pass. Motor not connected. Motor connection is incorrect Loose contact in the connections. Starting problems with the input contactor. Input fuses are blown. Incorrect programming of the Motor Current trimpot. Motor current consumption lower than required for phase loss protection to work.	Power-on. Reset key. Auto-reset. DIx.
Over temperature in the power section **E04** (LED Fault) Flashes once (LED Ready) On	When the heatsink temperature is superior to the limit. Also trips when the temperature sensor is not connected.	Shaft load too high. Elevated number of successive starts. Internal temperature sensor not connected. Starting cycle requires ventilation kit (models from 45 A to 200 A).	Power-on. Reset key. Auto-reset. DIx.

***Table 6.1** - Faults and possible causes*

Protection Description and Fault Display	Activation Description	Probable Causes	Reset
Electronic motor overload **E05** (LED Overload) Flashing	When the times given by the programmed thermal class curves exceed the limit.	Incorrect setting of the "Motor Current" trimpot (motor current set). The set value is too low for the motor being used. Starting sequence greater than allowed. Programmed thermal class too low. Time between Off/On procedures lower than that permitted by the motor power refrigeration time. Load on the motor shaft too high. Thermal protection value saved when the control is turned off and brought back when turned back on.	Power-on. Reset key. Auto-reset. DIx.
Start timeout during current limit starting **E62** (LED Fault) Flashes twice (LED Ready) On	When the starting time is longer than the time set in the acceleration ramp trimpot. Active only with current limit starting.	Programmed time for the acceleration ramp inferior to what is needed. Value of the programmed current limitation too low. Motor locked, rotor blocked.	Power-on. Reset key. Auto-reset. DIx.
Stall **E63** (LED Stall) Flashing	Activates before full voltage, if the current is greater than twice the nominal motor current.	Programmed acceleration ramp time lower than the actual acceleration time. Motor shaft is locked The transformer that supplies the motor can be saturating and taking too much time to recover from the starting current.	Power-on. Reset key. Auto-reset. DIx.
Overcurrent **E66** (LED Overcurrent) Flashing	It is only monitored when the SSW-07 is at full voltage. When the parameters are set with the factory default values this protection trips when the motor current exceeds 2 times the value adjusted in the trimpot (Motor Current) for a time longer than 1 second.	Momentary motor overload. Motor shaft is locked, rotor blocked.	Power-on. Reset key. Auto-reset. DIx.
Incorrect phase sequence **E67** (LED Phase Seq.) Flashing	When the sequence of synchronism signals interruptions does not follow the RST sequence.	Network phase sequence inverted at the input. May have been changed in another place of the supply network.	Power-on. Reset key. DIx.

Table 6.1** - Faults and possible causes **(cont.)

Protection Description and Fault Display	Activation Description	Probable Causes	Reset
Undervoltage in the control supply **E70** (LED Fault) Flashes twice (LED Ready) Off	Activates when the control supply voltage is lower than 93 Vac.	Electronics supply lower than the minimum value. Electronics power supply with loose contact. Electronics power supply fuse blown.	Power-on. Reset key. Auto-reset. DIx.
Internal By-pass relay contact Open **E71** (LED Fault) Flashes 3 times (LED Ready) Off	When there is a fault with the internal By-pass relay contacts at full voltage.	Loose contact in the starting cables of the Internal By-pass relays. Defective By-pass relay contacts due to an overload	Power-on. Reset key. Auto-reset. DIx.
Overcurrent before the By-pass **E72** (LED Fault) Flashes 4 times (LED Ready) Off	Activates before the closing of the By-pass if the current is greater than: 37.5 A for the models up to 30 A; 200 A for the models from 45 to 85 A; 260 A for the model of 130 A; 400 A for the models from 171 and 200 A. 824 for the models from 255 A to 412 A.	The time programmed for the acceleration ramp is shorter than the actual acceleration time. Nominal motor current higher than the current that can be supported by the Soft-Starter. Motor shaft is locked, rotor blocked.	Power-on. Reset key. Auto-reset. DIx.
Frequency out of tolerance **E75** (LED Fault) Flashes once (LED Ready) Off	When the limit is higher or lower than the limits of 45 to 66 Hz.	The line frequency is out of range. When the Soft-Starter + motor are being supplied by a generator that is not supporting the full load or the start of the motor.	Power-on. Reset key. Auto-reset. DIx.
Closed By-pass contact or shorted SCR's **E77** (Fault LED) flashes 6 times (Ready LED) is off	When there is no opening of the internal By-pass contact circuit.	Bad contact in the relay activation cables, at either internal or external By-pass. Defective contacts due to an overload. A short-circuit in parallel or external.	Power-on. Reset key. DIx.

Table 6.1** - Faults and possible causes **(cont.)

NOTES:
In the case of E04 (over temperature), it is necessary to wait a little before resetting, in order to cool down.
In the case of E05 (motor overload), it is necessary to wait a little before resetting, in order to cool down.

6.2 TROUBLESHOOTING

Problem	Points to check	Corrective action
Motor does not run	Wrong wiring	Check all the power and command connections. For example: The DIx digital inputs programmed as enabling or external fault must be connected to AC supply.
	Wrong programming	Check if the parameters are with the correct values for the application.
	Fault	Check if the Soft-Starter is not blocked to a detected fault condition.
Motor does not reach nominal speed	Motor stall	Increase the current limit level with the control to limit the current (refer to table 6.1).
Motor rotation oscillates (fluctuates)	Loose connections	Switch the Soft-Starter and the power supply off and tighten all the connections. Check all the internal connections of the Soft-Starter to make sure they are well connected.
Motor rotation: Too high or too low	Motor nameplate data	Check if the motor used is in accordance to the application.
LEDs off	Check the power supply voltage of the control board (A1 and A2)	Nominal values must be inside the following limits: Umin. = 93.5 Vac Umax.= 264 Vac
Vibration during acceleration	Soft-Starter Settings	Reduce the acceleration ramp time.

***Table 6.2** - Solving the most frequent problems*

NOTE!
When contacting WEG for service or technical assistance, please have the following data on hand:

☑ Model of the Soft-Starter;
☑ Serial number, production date and hardware revision present in the identification label of the product (refer to item 2.3);
☑ Installed software version (refer to item 2.3);
☑ Application and programming data.

For explanations, training or service, please contact WEG Automação Service Department.

6.3 PREVENTIVE MAINTENANCE



WARNING!
Always disconnect the general power supply before touching any electric component associated to the Soft-Starter SSW-07.

Do not apply any high voltage tests on the Soft-Starter SSW-07! If necessary, consult the manufacturer.

Do not use megometers to test thyristors.

Periodic inspections of Soft-Starters SSW-07 and installations are necessary to avoid operating problems due to unfavorable environmental conditions like high temperature, moisture, dust, vibrations or due to the aging of the components.

Component	Abnormality	Corrective Action
Terminals, Connectors	Loose screws	Tightening(1)
	Loose connectors	
Fans / Ventilation Systems	Dirty fans	Cleaning(1)
	Abnormal noise	Substitute fan
	Fan always off	
	Abnormal vibration	
	Dust in the air filters	Cleaning or substitution(2)
Power Module / Power Connections	Accumulated dust, oil, moisture, etc.	Cleaning(1)
	Screws with loose connections	Tightening(1)

(1) Every six months.
(2) Twice a month.

***Table 6.3** - Periodic inspections after putting into use*

OPTIONS AND ACCESSORIES

This chapter describes the optional devices that can be used with Soft-Starter SSW-07.

Optional Description	WEG Part Number
Plug-in Local Keypad	10935572
Remote Keypad Kit	10935649
1 m SSW-07 - Remote HMI Connection Cable	10050268
2 m SSW-07 - Remote HMI Connection Cable	10190951
3 m SSW-07 - Remote HMI Connection Cable	10211478
5 m SSW-07 - Remote HMI Connection Cable	10211479
7,5 m SSW-07 - Remote HMI Connection Cable	10050302
10 m SSW-07 - Remote HMI Connection Cable	10191029
Plug-in Kit for DeviceNet Communication	10935681
Plug-in Kit for RS-232 Communication	10935578
3 m RS-232 Connection Cable	10050328
10 m RS-232 Connection Cable	10191117
Plug-in Kit for RS-485 Communication	10935573
Ventilation Kit for Size 2 (Currents from 45 to 85 A)	10935650
Ventilation Kit for Size 3 (Currents from 130 to 200 A)	10935559
IP20 Kit for Size 3 (Currents from 130 to 200 A)	10935651
Size 4 IP20 kit (255 to 412 A current)	11059230
Plug-in Kit for Motor PTC	10935663
SuperDrive G2 Kit	10945062

Table 7.1 - *Optional description*

7.1 IP20 KIT

The purpose of the IP20 KIT is to protect the user from the contact with the live parts of the Soft-Starter.



Figure 7.1 *- IP20 kit size 3*

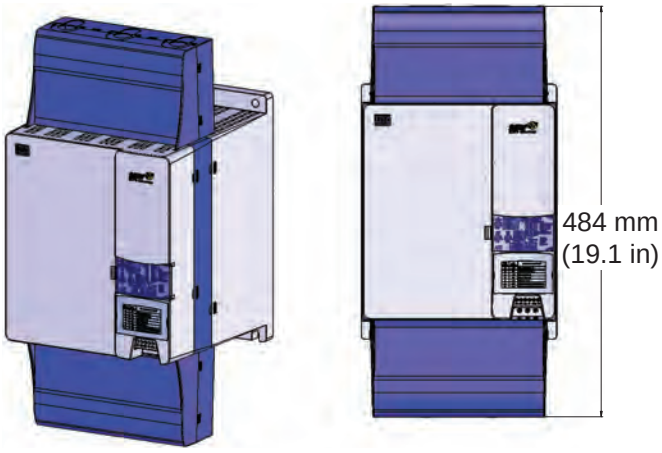


Figure 7.2 *- IP20 kit size 4*

TECHNICAL CHARACTERISTICS

This chapter describes the electric and mechanical technical characteristics of the Soft-Starter SSW-07 line.

8.1 NOMINAL POWERS AND CURRENTS ACCORDING TO UL508

SSW-07 Model	Motor voltage 220/230 V		Motor voltage 380/400 V		Motor voltage 440/460 V		Motor voltage 575 V	
	(Hp)	(kW)	(Hp)	(kW)	(Hp)	(kW)	(Hp)	(kW)
17 A	5	3.7	7.5	5.5	10	7.5	15	11
24 A	7.5	5.5	10	7.5	15	11	20	15
30 A	10	7.5	15	11	20	15	25	18.5
45 A	15	11	25	18.5	30	22	40	30
61 A	20	15	30	22	40	30	50	37
85 A	30	22	50	37	60	45	75	55
130 A	50	37	75	55	100	75	125	90
171 A	60	45	100	75	125	90	150	110
200 A	75	55	100	75	150	110	200	150
255 A	100	75	150	110	200	150	250	185
312 A	125	90	175	130	250	185	300	225
365 A	150	110	200	150	300	225	350	260
412 A	150	110	250	185	350	260	450	330

***Table 8.1** - Powers and currents according to UL508*

8.2 NOMINAL POWERS AND CURRENTS FOR STANDARD IP55, IV POLE WEG MOTOR

SSW-07 Model	Motor voltage 220/230 V		Motor voltage 380/400 V		Motor voltage 440/460 V		Motor voltage 525 V		Motor voltage 575 V	
	(Hp)	(kW)	(Hp)	(kW)	(Hp)	(kW)	(Hp)	(kW)	(Hp)	(kW)
17 A	6	4.5	10	7.5	12.5	9.2	15	11	15	11
24 A	7.5	5.5	15	11	15	11	20	15	20	15
30 A	10	7.5	20	15	20	15	25	18.5	30	22
45 A	15	11	30	22	30	22	40	30	40	30
61 A	20	15	40	30	50	37	50	37	60	45
85 A	30	22	60	40	60	45	75	55	75	55
130 A	50	37	75	55	100	75	125	90	125	90
171 A	60	45	125	90	125	90	150	110	175	132
200 A	75	55	125	90	150	110	200	150	200	150
255 A	100	75	175	132	200	150	250	185	250	185
312 A	125	90	200	150	250	185	300	220	300	225
365 A	150	110	250	185	300	225	350	260	400	300
412 A	150	110	300	220	350	260	440	315	450	330

***Table 8.2** - Powers and currents for WEG motors*

NOTE!
The maximum powers indicated in table 8.1 are based on 3 x nominal current of Soft-Starter SSW-07 during 30 s and 10 starts per hour (3xIn @ 30 s).

8.3 POWER DATA

Power Supply	Power Voltage (R/1L1, S/3L2, T/5L3)	(220 to 575) Vac (-15 % to +10 %), or (187 to 632) Vac
	Frequency	(50 to 60) Hz (±10 %), or (45 to 66) Hz
Capacity	Maximum number of starts per hour (without ventilation)	10 (1 every 6 minutes; models from 17 A to 30 A) 3 (1 every 20 minutes; models from 45 A to 200 A) 10 (1 every 6 minutes; models from 255 A to 412 A)
	Maximum number of starts per hour with optional ventilation Kit	10 (1 every 6 minutes; models from 45 A to 200 A)
	Start cycle	3 x In of the SSW-07 during 30 seconds
Thyristors (SCRs)		Reverse voltage with 1600 V maximum peak
Overvoltage category		III (UL508/EN61010)

8.4 ELECTRONICS AND PROGRAMMING DATA

Power Supply	Control voltage Connector (A1, A2)	☑ (110 to 240) Vac (-15 % to +10 %), models from 17 A to 200 A ☑ (110 to 130) Vac or (208 to 240) Vac (-15 % to +10 %) (models from 255 A to 412 A)
	Frequency	☑ (50 to 60) Hz (±10 %), or (45 to 66) Hz
	Consumption	☑ 15 VA models from 17 A to 200 A ☑ 60 VA continuos 800 VA additional during By-pass closing (models from 255 A to 412 A).
Control	Method	☑ Voltage ramp; ☑ Current limitation.
Inputs	Digitals	☑ 3 Isolated digital inputs; ☑ Minimum upper level: 93 Vac; ☑ Maximum lower level: 10 Vac; ☑ Maximum voltage: 264 Vac; ☑ Input current: 1.1 mA @ 220 V; ☑ Programmable functions.
Outputs	Relay	☑ 2 relays with NO contacts, 240 Vac, 1 A, and programmable functions.
Safety	Protections	☑ Overcurrent; ☑ Phase loss; ☑ Inverted phase sequence; ☑ Heatsink overtemperature; ☑ Motor overload; ☑ External fault; ☑ Open By-pass contact; ☑ Closed By-pass contact; ☑ Overcurrent before By-pass; ☑ Stall; ☑ Frequency out of range; ☑ Electronic supply undervoltage.