Soft-Starter

Arrancador Suave

Chave de Partida Soft-Starter

SSW 03 Plus

User´s Guide

Guia del Usuario

Manual do usuário

SOFT-STARTER MANUAL

SSW-03 Plus Series

Software: version 5.XX

0899.5518 E/8

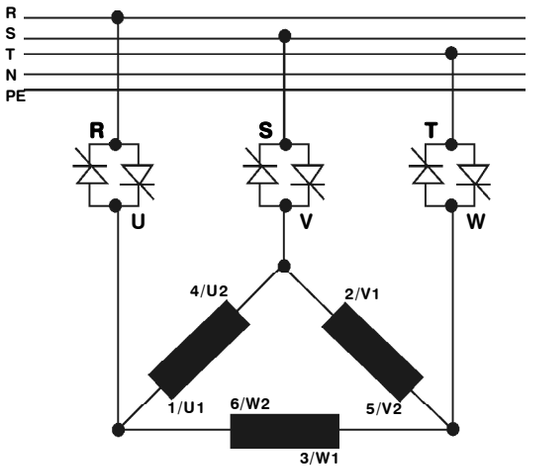
NOTE!

It is very important to check if the Soft-Starter Software is the same as the above.

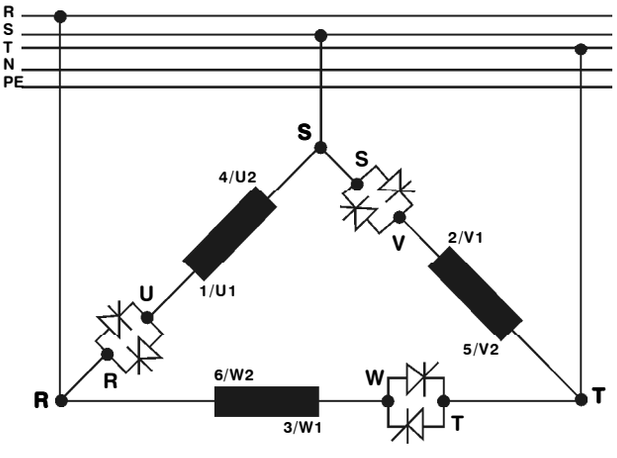
ATTENTION!

Please check which type of connection is used to connect the SSW-03 Plus to the motor: standard connection or SSW-03 Plus is connected within the motor Delta connection.

Standard connection with three cables: the line current of the Soft-Starter is equal to the motor current.



SSW-03 Plus is connected within the motor Delta connection with six leads: the line current of the Soft-Starter is approximately 58% of the motor current.



ATTENTION!

To connect the SSW-03 Plus within the Motor Delta connection, the motor must permit the Delta connection in the desired voltage.

During the start of the motor the current relation of the motor in relation of the Soft-Starter is 1.50. However in full voltage condition (after the start time of the motor) the current relation is 1.73.

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QUICK PARAMETER REFERENCES, ERROR MESSAGES AND STATUS MESSAGES

Software: V5.XX
Application: _____
Type: _____
Serial Number: _____
Responsable: _____ Date: _____/_____/_____.

1. Parameters

Para-meter	Function	Adjustable Range	Factory Setting	User's Setting	Page
P00	Permits parameter changing	OFF, ON	OFF		58
	Regulation Parameter				
P01	Initial Voltage	25...90% U_N	30%U_N		58
P02	Acceleration ramp time	1...240 s	20s		59
P03	Voltage fall step during deceleration	100... 40%U_N	100%U_N		59
P04	Ramp time during deceleration	OFF,2...240s	OFF		60
P11	Current limit during starting	OFF,150...500%I_N	OFF		60
P12	Immediate overcurrent	32...200%I_N	120%I_N		62
P13	Immediate overcurrent time	OFF, 1...20s	OFF		64
P14	Immediate undercur-rent	20...190%I_N	70%I_N		63
P15	Immediate undercur-rent time	OFF, 1...200s	OFF		64
	Motor Parameter				
P21	Motor current setting	OFF, 30.0...200.0%I_N	OFF		84
P25	Overload class	5, 10, 15, 20, 25, 30	30		85
P26	Service factor	0.80...1.50	1.00		89
P27	Auto-reset of the thermal memory	OFF, 1...600s	OFF		90

QUICK PARAMETER REFERENCES, ERROR MESSAGES AND STATUS MESSAGES

Para-meter	Function	Adjustable Range	Factory Setting	User's Setting	Page
	Regulation Parameter				
P22	Rated current	120, 170, 205, 255, 290, 340, 410, 475, 580, 670, 800, 950, 1100, 1400A	According to the Model		64
P23	Rated mains voltage	220, 230, 240, 380, 400, 415, 440, 460, 480, 525, 575V	380V		65
P31	Phase rotation	OFF, ON	OFF		65
P33	Voltage jog level	25...50%U_N	25%U_N		66
P34	DC braking time	OFF, 1...10s	OFF		66
P35	DC braking voltage level	30...50%U_N	30%U_N		67
P36	Time interval between starts	OFF, 1...999s	2s		67
P41	Voltage pulse at start (kick start)	OFF, 0.2...2s	OFF		68
P42	Voltage pulse level during starting	70...90%U_N	70%U_N		69
P45	Pump control	OFF, ON	OFF		69
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	Configuration Parameter				
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P43	By-Pass relay	OFF, ON	OFF		74
P44	Energy save	OFF, ON	OFF		75
P46	Default values	OFF, ON	OFF		75
P50	Function of the RL3 relay	1- disables with fault 2- enables with fault	1		76
P51	Function of the RL1 relay	1 - Operation 2 - Full Voltage 3 - Direction of Rotation	1		76
P52	Function of the RL2 relay	1 - Operation 2 - Full Voltage 3 - DC Braking	2		77
P53	Digital input 2 program	OFF - Without Function 1 - Error Reset 2 - Extern Error 3 - General Enabling 4 - Three Wire Control	1		78
P54	Digital input 3 program	OFF - Without Function 1 - Error Reset 2 - Extern Error 3 - General Enabling 4 - Direction of Rotation	2		79

QUICK PARAMETER REFERENCES, ERROR MESSAGES AND STATUS MESSAGES

Para-meter	Function	Adjustable Range	Factory Setting	User's Setting	Page
P55	Digital input 4 program	OFF - Without Function 1 - Error Reset 2 - Extern Error 3 - General Enabling 4 - JOG Function	OFF		79
P56	Analog output program	OFF - Without Function 1 - Current %I_N 2 - Voltage %U_N 3 - Power Factor 4 - Thermal Protection	OFF		80
P57	Analog output gain	0.01...9.99	1.00		80
P61	Set the command through HMI/Serial or digital inputs	OFF, ON	ON		81
P62	Soft-Starter address in the comunication NET	1...30	1		82
P63	Watch Dog Time of Serial Communication	OFF, 1...5s	OFF		83
P64	Action after watch Dog Time is elapsed	1 - E29 Indication only 2 - Disable by Ramp E29 3 - General Disabling E29	1		83
	Reading Parameters				
P71	Software version				57
P72	Indication of the %I_N motor current of the switch	XXX %I_N			57
P73	Motor current indication (A)	0...9999A			57
P74	Active power indication supplied to the load (kW)	0...9999kW			57
P75	Apparent power indication supplied to the load (kVA)	0...9999kVA			57
P76	Load power factor	0.00...0.99			57
P77	Soft-Starter output voltage indication % U_N	0...100% U_N			57
P82	Indication of motor Thermal Protection Status	0...250%			57
P96	Last hardware error	1...8			58

Para-meter	Function	Adjustable Range	Factory Setting	User's Setting	Page
P97	Second hardware error	1...8			58
P98	Third hardware error	1...8			58
P99	Fourth hardware error	1...8			58

2. Error Messages

Display	Meaning
E01	Phase failure or thyristor fault or motor not connected
E02	At the end of time of the programmed acceleration time, the voltage does not reach 100% UN due to the current limit.
E03	Overtemperature at the thyristors and in the heatsink
E04	Motor overload
E05	Undercurrent (applicable to pumps)
E06	Immediate overcurrent
E07	Phase rotation
E08	External fault
E24	Programming error
E2X	Serial communication error
E29	Serial communication error

3. Soft-Starter Status

Display	Definition
rdy	Soft-Starter is ready to be enabled
PuP	Loading pump control parameters
EEP	Loading "Default" values
on	Function enabled
oFF	Function disabled

1 SAFETY NOTICE

This Manual contains all necessary information for the correct installation and operation of the SSW-03 Plus Soft-Starter.
This Manual has been written for 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 this Manual:

DANGER!
If the recommended Safety Instructions are not strictly observed, it can lead to serious or fatal injuries of personnel and/or equipment damage.

ATTENTION!
Failure to observe the recommended Safety Procedures can lead to material damage.

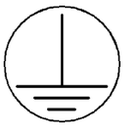
NOTE!
The content of this Manual supplies important information for the correct understanding of operation and proper performance of the equipment.

1.2 SAFETY NOTICES ON THE PRODUCT

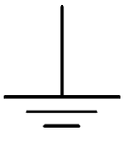
The following symbols may be attached to the product, serving as Safety Notice:

High Voltages

Components are sensitive to electrostatic discharge. Do not touch them without following proper grounding procedures.



Mandatory connection to ground protection (PE)



Shield connection to ground

1.3 PRELIMINARY RECOMMENDATIONS

DANGER!
Only qualified personnel should plan or implement the installation, startup, operation and maintenance of this equipment.

1 SAFETY NOTICE

Personnel must review this entire Manual before attempting to install, operate or troubleshoot the SSW-03 Plus. These personnel must follow all safety instructions included in this Manual and/or defined by local regulations.
Failure to comply with these instructions may result in personnel injury and/or equipment damage.

NOTE!
In this Manual, qualified personnel are defined as people that are trained to:

1. Install, ground, power up and operate the SSW-03 Plus according to this manual and the local required safety procedures;
2. Use of safety equipment according to the local regulations;
3. Administer Cardio Pulmonary Resuscitation (CPR) and First Aid.

DANGER!
Always disconnect the supply voltage before touching any electrical component inside the Soft-Starter.

Many components are charged with high voltages, even after the incoming AC power supply has been disconnected or switched OFF. Wait at least 3 minutes for the total discharge of the power capacitors.

Always connect the frame of the equipment to the ground (PE) at the suitable connection point.

ATTENTION!
All electronic boards have components that are sensitive to electrostatic discharges. Never touch any of the electrical components or connectors without following proper grounding procedures. If necessary to do so, touch the properly grounded metallic frame or use a suitable ground strap.

Do not apply High Voltage (High Pot) Test on the Soft-Starter!
If this test is necessary, contact the Manufacturer.

NOTE!
Read this entire Manual carefully and completely before installing or operating the SSW-03 Plus.

2 INTRODUCTION

2.1 - ABOUT THIS MANUAL

This Manual describes how to install, start-up, operate and identify the problems of the SSW-03 Plus Soft-Starters series.

Should you require any training or further info, please contact WEG.

This Manual is divided into 10 Chapters, providing information to the user on how to receive, install, start-up and operate the SSW-03 Plus:

Chapter 1- Safety Notices;
Chapter 2 - Introduction;
Chapter 3 - Installation;
Chapter 4 - Power-up / Commissioning;
Chapter 5 - Use of the HMI;
Chapter 6 - Detailed Parameter Description;
Chapter 7 - Maintenance;
Chapter 8 - Technical Characteristics;
Chapter 9 - Appendix;
Chapter 10- Optional Devices.

This Manual provides information for the correct use of the SSW-03 Plus. The SSW-03 Plus is very flexible and allows for the operation in many different modes as described in this manual.

As the SSW-03 Plus can be applied in several ways, it is impossible to describe here all of the application possibilities. WEG does not accept any responsibility when the SSW-03 Plus is not used according to this Manual.

No part of this Manual may be reproduced in any form, without the written permission of WEG.

2.2 VERSION OF SOFTWARE

It is important to note the Software Version installed in the Version SSW-03 Plus, since it defines the functions and the programming parameters of the Soft-Starter.
This Manual refers to the Software version indicated on the inside cover. For example, the Version 1.XX applies to versions 1.00 to 1.99, where "X" is a variable that will change due to minor software revisions. The operation of the SSW-03 Plus with these software revisions are still covered by this version of the Manual.

The Software Version can be read in the Parameter P71.

2 INTRODUCTION

2.3 - ABBREVIATIONS USED

HMI - Human machine interface (keypad + display)

HMI-3P - Keypad + Display interface - Linked via parallel cable

RLX - Relay output No X

DIX - Digital input No X

I_N - Soft-Starter nominal output current

U_N - Rated mains voltage

LED - Light Emitting Diode

2.4 - ABOUT THE SSW-03 PLUS

The SSW-03 Plus series is a totally microprocessor controlled Soft-Starter series which controls the starting current of three-phase induction motors. In this way mechanical inmpacts on the load and current peaks on the supply network are prevented.

2.4.1 - Introduction

This series includes models from 120 to 1400A, being supplied from 220V, 230V, 240V, 380V, 400V, 415V, 440V, 460V, 480V, 525V or 575V. (The available types are listed in Section 8).

The models up to 205A are fitted with forced cooling and isolated heatsink (thyristor-thyristor modules). The models from 255A up to 1400A have forced cooling and energized heatsink. (Disc thyristors).

The electronic control circuit uses a 16 bit microprocessor with high performance, allowing settings and displaying by means of the interface (keypad + display) of all needed parameters.

Depending on the power, this series (SSW-03 Plus) has 8 different construction forms, as shown in Figure 2.1.

2 INTRODUCTION

MEC	Rated Current	Width L mm (in)	Depth P mm (in)	Height H mm (in)	Weight Kg (Lb)
0	120A	224 (8.82)	244 (9.61)	365 (14.37)	16.8 (37.04)
1	170A 205A	224 (8.82)	257 (10.12)	480 (18.9)	20.2 (44.53)
2	255A 290A 340A	521 (20.51)	315 (12.4)	530 (20.86)	41.8 (92.15)
3	410A	521 (20.51)	325 (12.79)	605 (23.81)	50 (110.20)
4	475A 580A	521 (20.51)	325 (12.79)	655 (25.78)	58.8 (129.60)
5	670A	521 (20.51)	325 (12.79)	705 (27.75)	64 (141.06)
6	800A 950A	521 (20.51)	345 (13.82)	855 (33.66)	71.8 (158.25)
7	1100A 1400A	679 (26.73)	431 (16.97)	1210 (47.63)	180 (396.72)

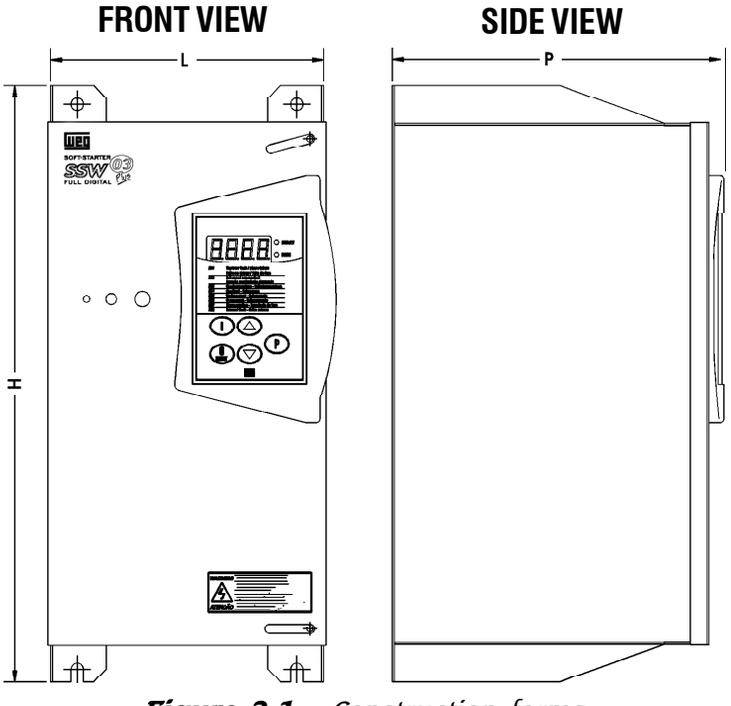


Figure 2.1 *- Construction forms*

2.4.2 - Simplified Block Diagram of the SSW-03 Plus

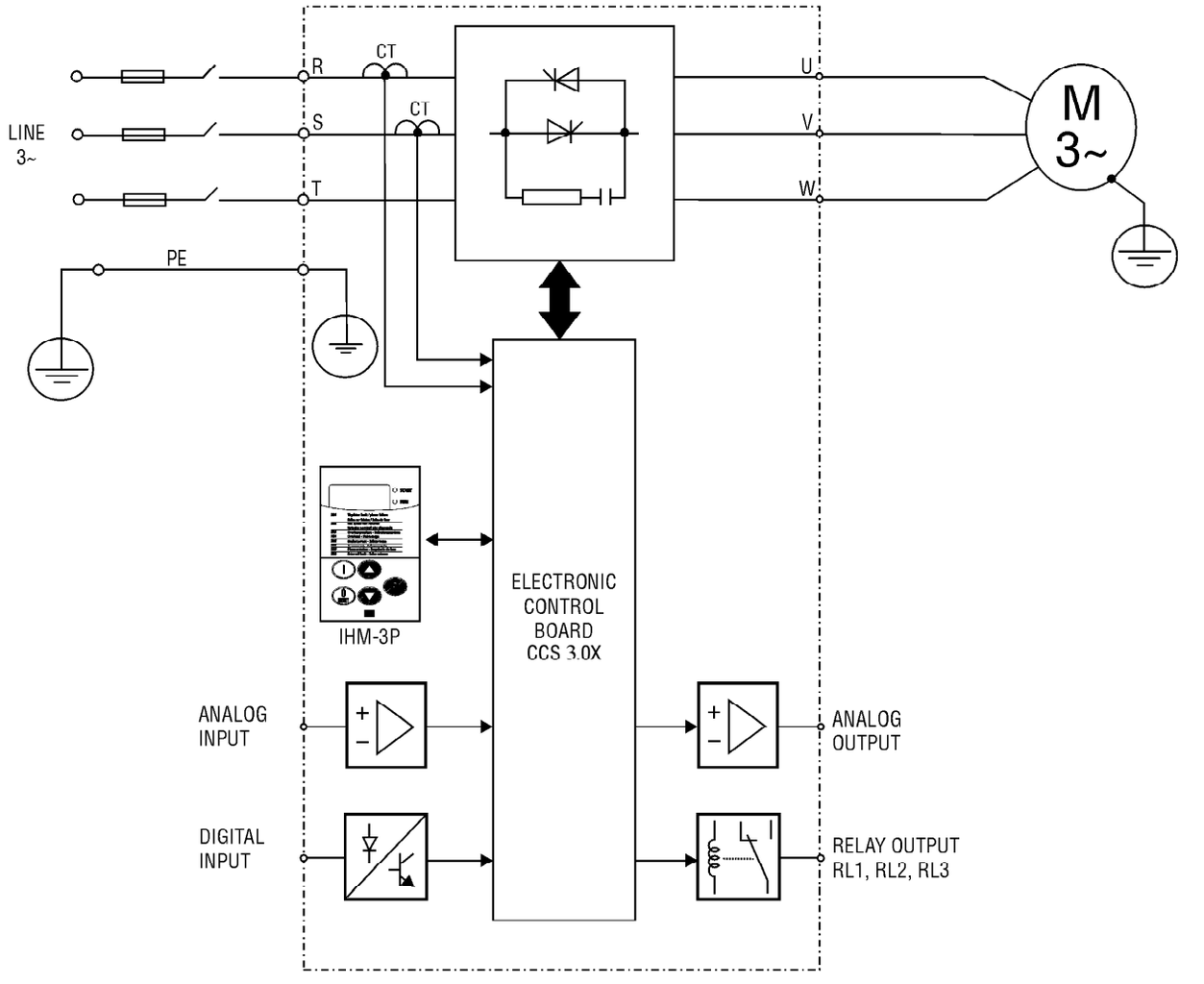


Figure 2.2 - *Simplified Block Diagram of the SSW-03 Plus*

In the power stage, the line voltage is controlled by means of 6 SCR's that allow the variation of the conduction angle of the voltage supplied to the motor.

For the internal supply of the electronics, a linear source is used with several voltages, fed independently of the power supply.

The control board contains the circuits responsible for the control, monitoring and protection of the power components. This board also contains the control and signalling circuit to be used by the user according to its application as a relay output.

All parameters or controls for the operation of the Soft-Starter can be displayed or changed through the HMI.

2.4.3 - Description of the control board - CCS 3.0X

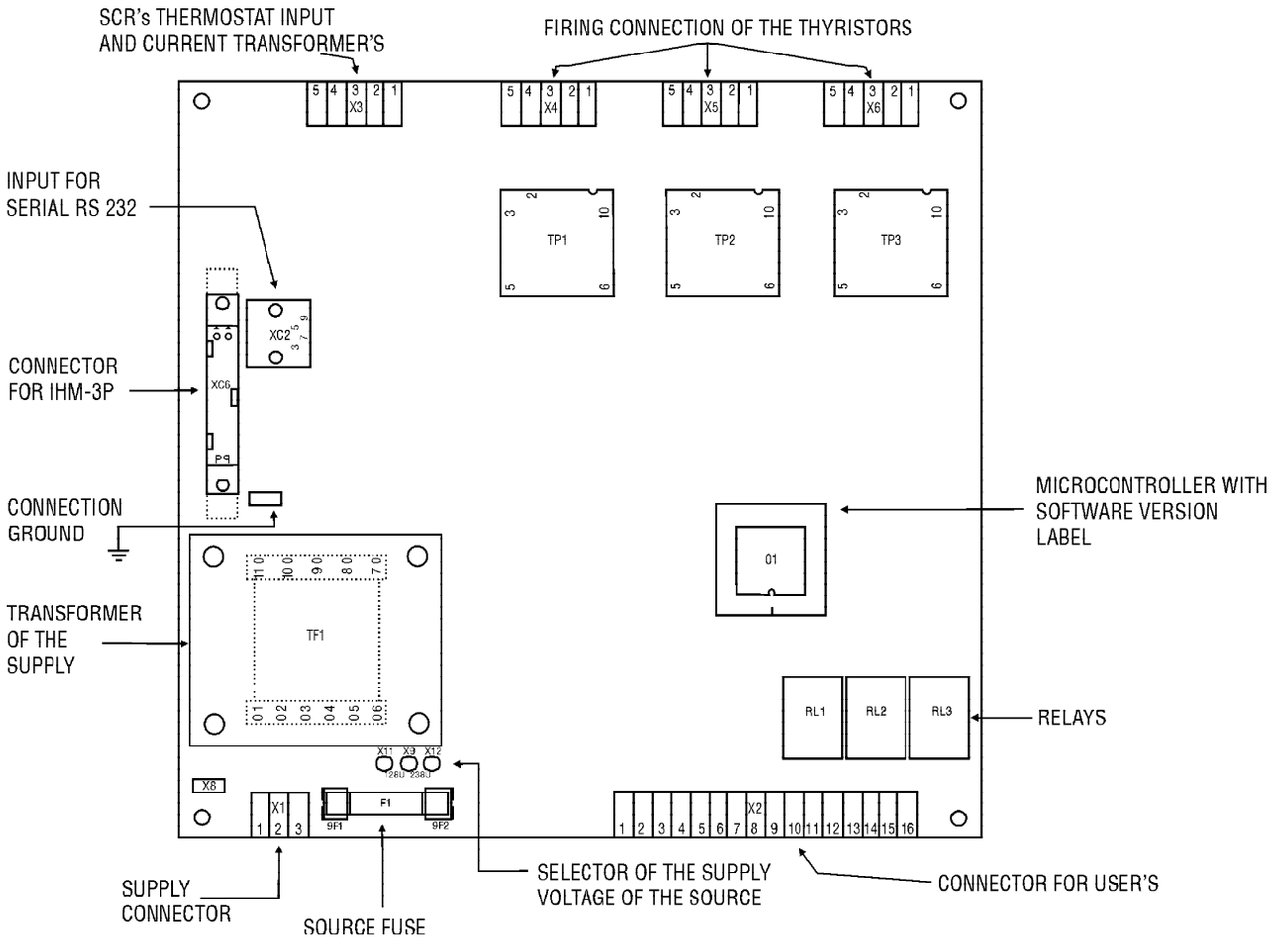
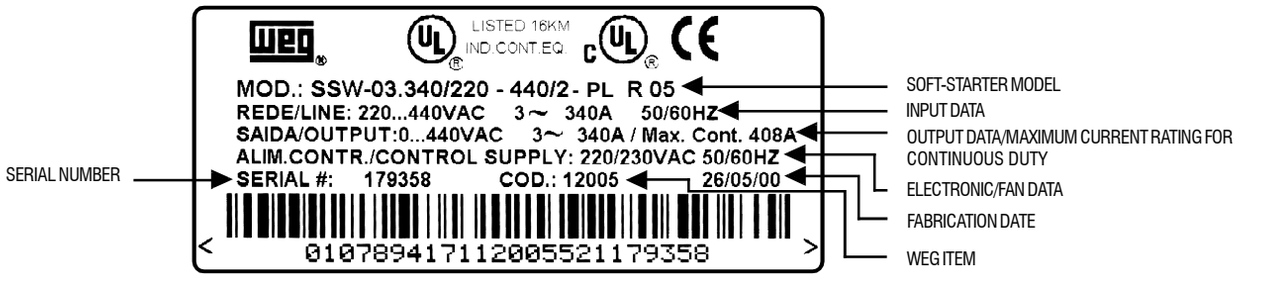


Figure 2.3 *- Layout of the electronic control board CCS 300 or CCS 3.01*

2 INTRODUCTION

2.5 - PRODUCT IDENTIFICATION



Soft-Starter Type

SSW-03 ____/____/__ **- PL** + __ __ Options: + I with remote HMI

Voltage of the electronics { 1- 110/120 V / 2- 220/230 V

Three-phase supply voltage (220 - 440, 460 - 575)

Rated output current (A)

Max. Cont.: It's the maximum current that the Soft-Starter can have in continuous duty. For this current the Soft-Starter can only have 1 start per hour.

EXTERN HMI
HMI-3P.1: HMI with LEDs, 1 m (3.28ft) cable
HMI-3P.2: HMI with LEDs, 2 m (6.56ft) cable
HMI-3P.3: HMI with LEDs, 3 m (9.84ft) cable

2.6 - RECEIVING

The SSW-03 Plus is supplied in cardboard boxes up to 205 A, current sizes from 255 to 1400 A are supplied in wood crates. The outside of the packing container has a nameplate that is the identical to that on the SSW-03 Plus. Please check if the SSW-03 Plus is the one you ordered.

Open the box, remove the foam and then remove the SSW-03 Plus.
For sizes above 255 A, open the wooden crate on the floor, remove the fastening bolts on the base and remove the SSW-03 Plus with the aid of a hoist.
Check if:

☑ SSW-03 Plus nameplate data matches the purchase order;
The equipment has not been damaged during transport.
☑ If any problem is detected, contact the carrier immediately.

If the SSW-03 Plus is not to be installed immediately, store it in a clean and dry room (Storage temperatures between -25°C and 60°C). Cover it to prevent dust, dirt or other contamination.

3 INSTALLATION

3.1 - MECHANICAL INSTALLATION

The location of the installation is a determinaning factor for obtaining a good performance and a normal useful life of its components.
Regarding the installation of the Soft-Starter we make the following recommendations:

3.1.1 - Environment

☑ Avoid direct exposure to sunlight, rain, high moisture and sea air.

☑ Avoid exposure to gases or explosive or corrosive liquids;

☑ Avoid exposure to excessive vibration, dust, oil or any (conductive particles or materials).

Environmental Conditions:

☑ **Temperature:** 32...104º F (0 ... 40º C) - nominal conditions. 104...131º F (40 ... 55º C) - current see table 8.2.

☑ **Relative Air Humidity:** 5% to 90%, non-condensing.

☑ **Maximum Altitude:** 3,300 ft (1000m) - nominal conditions. 3,300 ... 13,200 ft (1000 ... 4000m) - with 10% current reduction for each 3,300 ft (1000m) above 3,300 ft (1000m).

Pollution Degree: 2 (according to EN50178 and UL508) (It is not allowed to have water, condensation or conductive dust/ particles in the air)

NOTE!
When Soft-Starter is installed in panels or closed metallic boxes, adequate cooling is required to ensure that the temperature around the Soft-Starter will not exceed the maximum allowed temperature. See Dissipated Power in Section 8.2.

Please meet the minimum recommended panel dimensions and its cooling requirements:

SSW-03 Type	Panel Dimensions			Blower CFM (m^3/min)
	Width	Height	Depth	
120A	600 (23.62)	1500 (59.05)	400 (15.75)	226 (6.4)
170/205A	600 (23.62)	1500 (59.05)	400 (15.75)	885 (25.08)
255 to 580A	800 (31.50)	2000 (78.74)	600 (23.62)	885 (25.08)
670/950A	800 (31.50)	2000 (78.74)	600 (23.62)	1,757.30 (49.80)
1100A	800 (31.50)	2000 (78.74)	600 (23.62)	1,757.30 (49.80)
1400A	800 (31.50)	2000 (78.74)	600 (23.62)	2,648.44 (75.0)

All dimensions in mm (inches)

3.1.2 - Location / Mounting

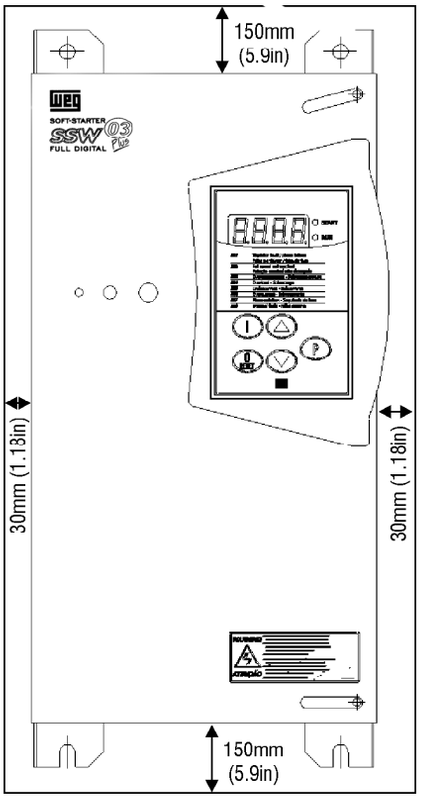


Figure 3.1 - *Free space for ventilation*

Install the Soft-Starter in Vertical Position:

- ☑ Allow for free space around the SSW-03 Plus, as shown in Figure 3.1.
- ☑ Install the Soft-Starter on a flat surface.
- ☑ External dimensions, fastenings drillings, etc. according to Figure 3.2.
- ☑ First install and partially tighten the mounting bolts, then install the Soft-Starter and tighten the mounting bolts.
- ☑ Provide independent conduits for physical separation for signal conductors, control and power conductors (See Electrical Installation).

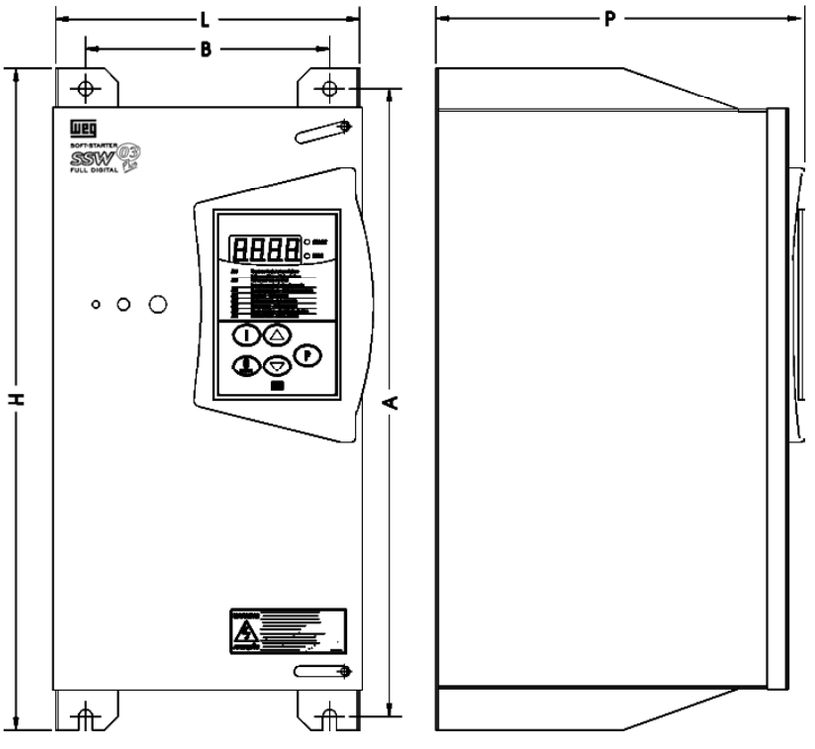


Figure 3.2 - External dimensions for the SSW-03 Plus and its screwing drillings

3 INSTALLATION

Type	Width L mm (in)	Height H mm (in)	Depth P mm (in)	Fasten. A mm (in)	Fasten. B mm (in)	Fasten bolt	Weight kg (lb)	Degree Protect.
120A	224 (8.82)	365 (14.37)	244 (9.61)	350 (13.78)	175 (6.89)	(5/16") M8	(37.04) 16.8	Chassis IP00
170/205A	224 (8.82)	480 (18.9)	257 (10.12)	450 (17.72)	175 (6.89)	(5/16") M8	(44.53) 20.2	Chassis IP00
255...340A	521 (20.51)	530 (20.86)	315 (12.4)	500 (19.68)	350 (13.78)	(5/16") M8	(92.15) 41.8	Chassis IP00
410A	521 (20.51)	605 (23.81)	325 (12.79)	575 (22.63)	350 (13.78)	(5/16") M8	(110.20) 50.0	Chassis IP00
475/580A	521 (20.51)	655 (25.78)	325 (12.79)	625 (24.60)	350 (13.78)	(5/16") M8	(129.60) 58.8	Chassis IP00
670A	521 (20.51)	705 (27.75)	325 (12.79)	675 (26.57)	350 (13.78)	(5/16") M8	(141.06) 64	Chassis IP00
800/950A	521 (20.51)	855 (33.66)	345 (13.58)	775 (30.51)	350 (13.78)	(5/16") M8	(158.25) 71.8	Chassis IP00
1100/1400A	679 (26.73)	1210 (47.63)	431 (16.97)	1110 (43.70)	250/250 (9.84/9.84)	(3/8") M10	(396.72) 180	Chassis IP00

3.1.3 - Kit IP20

The use of the IP20 Kit permits the installation of the input and output cables, ensuring a degree of protection IP20, and consequently not permitting direct access to conductive parts, since it does not have openings larger than 12 mm (0.47 in).

Table for conduits of the Kit IP20

Type SSW-03 Plus (A)	Control Conduit (In)	Power Conduit (In)	Grounding Conduit (In)	Kit IP20 Weg Item-Nº
120	½	1 ½	1	417112100
170	½	2 ½	1	417112101
205	½	2 ½	1	417112101
255	½	3	1 ½	417112102
290	½	3	1 ½	417112102
340	½	3	1 ½	417112102
410	½	3	1 ½	417112103
475	½	4	1 ½	417112104
580	½	4	1 ½	417112104
670	½	5	2	417112105
800	½	6	2 ½	417112106
950	½	6	2 ½	417112106

Table with Kit IP20 Dimensions - See Figure 3.3

Type SSW-03 Plus (A)	Width L mm (in)	Height H mm (in)	Depth P mm (in)	Height H1 mm (in)	Height H2 mm (in)
120	224 (8.82)	365 (14.37)	244 (9.61)	240 (9.45)	605 (23.82)
170	224 (8.82)	480 (18.90)	257 (10.12)	240 (9.45)	720 (28.34)
205	224 (8.82)	480 (18.90)	257 (10.12)	240 (9.45)	720 (28.34)
255	521 (20.51)	530 (20.86)	315 (12.40)	356 (14.01)	886 (34.88)
290	521 (20.51)	530 (20.86)	315 (12.40)	356 (14.01)	886 (34.88)
340	521 (20.51)	530 (20.86)	315 (12.40)	356 (14.01)	886 (34.88)
410	521 (20.51)	605 (23.81)	325 (12.79)	356 (14.01)	961 (37.83)
475	521 (20.51)	655 (25.78)	325 (12.79)	356 (14.01)	1011 (39.80)
580	521 (20.51)	655 (20.86)	325 (12.79)	356 (14.01)	1011 (39.80)
670	521 (20.51)	705 (27.75)	325 (12.79)	406 (15.98)	1111 (43.74)
800	521 (20.51)	855 (33.66)	345 (13.58)	483 (19.01)	1288 (50.70)
950	521 (20.51)	855 (33.66)	345 (13.58)	483 (19.01)	1288 (50.70)

NOTE!
The connection can not be performed within the delta connection of the motor when Kit IP20 is used.

3 INSTALLATION

The Kit IP20 must be installed at the bottom of the SSW-03 Plus after it has been.

This Kit IP20 is fixed to the Soft-Starter by means of screws supplied with the Kit.

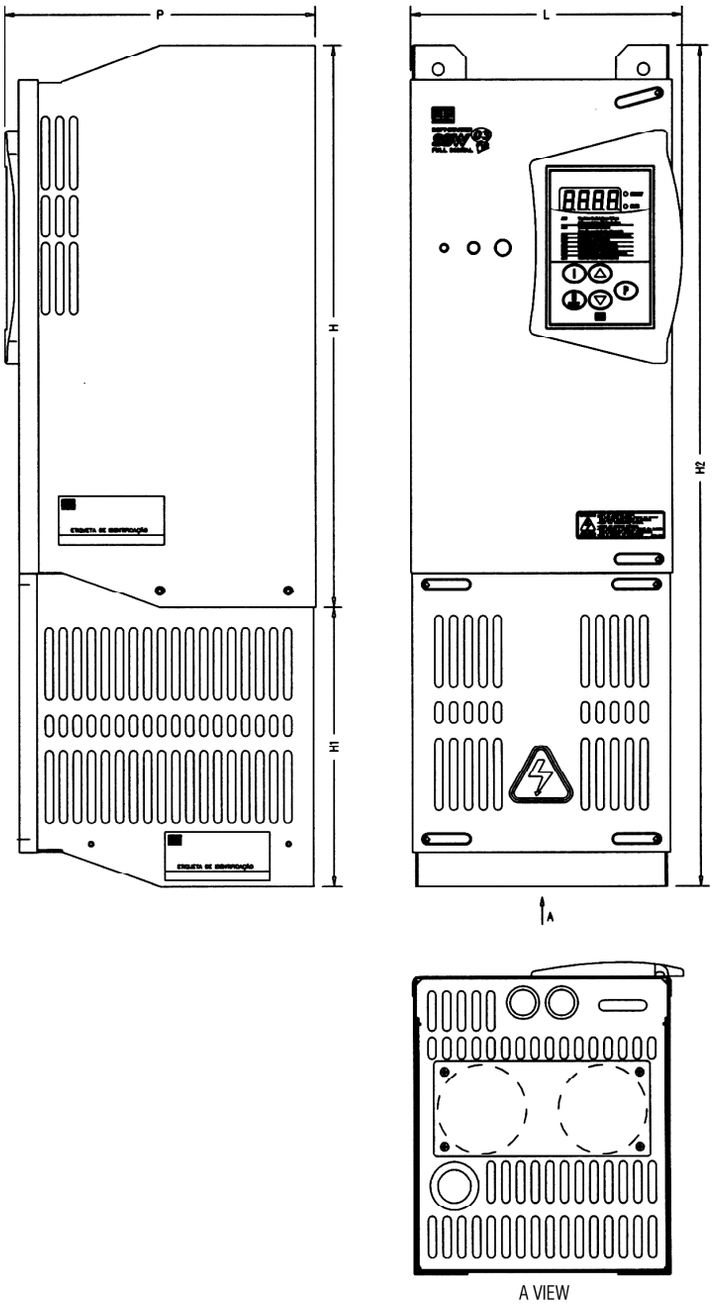


Figure 3.3 *- SSW-03 Plus with Kit IP20*

3.1.4 - Connections Within the Motor Delta Connection

When connection is made within the motor connect as delta connection, follows :

NOTE!

1)The connection cables of the Soft-Starter to the line supply, or the line supply isolation contactor must be able to carry the motor rated current, and the motor connection cables to the Soft-Starter, and/or the bypass contactor must be able to carry 58% of the motor rated current.

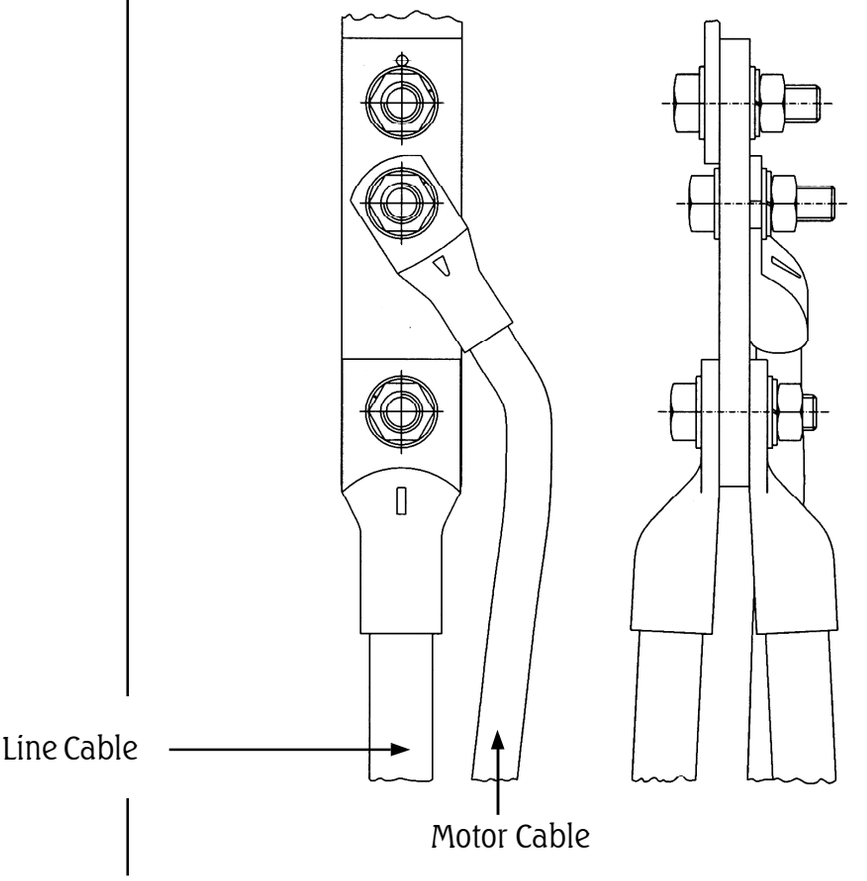
2) Due to the high currents and cable cross sections, it is also suggested to use copper bus bar for this type of connection.

3)When 2 poles motors are in full voltage it is necessary a minimum of 25% of load applied to its axle. When this condition can not be taken, a bypass contactor is necessary.

NOTE!

SSW-03 Plus is supplied with an extension bus bar to enable the connection of more cables to the SSW-03 Plus input bus bar.
Do not use this extension bus bar when SSW-03 Plus connection to line supply is made by means of bus bar.

The drawing below is orientative. Depending on the Soft-Starter type, the extension bus bar may have one, two or three holes.



3 INSTALLATION

ATTENTION!
The connection of the motor to the Soft-Starter must be realized carefully. Follow strictly the connection diagrams according to the winding types shown in figure 3.5 and item 6.4.1.

If reversal of motor direction of rotation is required, change the Soft-Starter connection to the line supply. Ensure that power is switched OFF while connections are changed.

Do not start motor with wrong P28 content:
OFF = standard connection
ON = within the motor delta connection

3.2 - ELECTRICAL INSTALLATION

3.2.1 - POWER/ GROUNDING CONNECTIONS

DANGER!
AC input disconnect: provide an AC input disconnecting switch to switch OFF input power to the Soft-Starter.
This device shall disconnect the Soft-Starter from the AC input supply when required (e.g. during maintenance services).

DANGER!
The AC input disconnect cannot be used as an emergency stop device.

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

DANGER!
The information below will be a guide to achieve a proper installation. Follow also all applicable local standards for electrical installations.

ATTENTION!
Provide at least 10 in (0.25m) spacing between low voltage wiring and the Soft-Starter. , line or load reactors, AC input power, and AC motor cables.

ATTENTION!
Control of overvoltage in the line that supply the Soft-Starter must be made using protective of surge with voltage of 550Vac (for models 220 - 440Vac) and 680Vac (for models 460 - 575Vac) connection phase to phase, and absortion energy capacity of 80 joules.

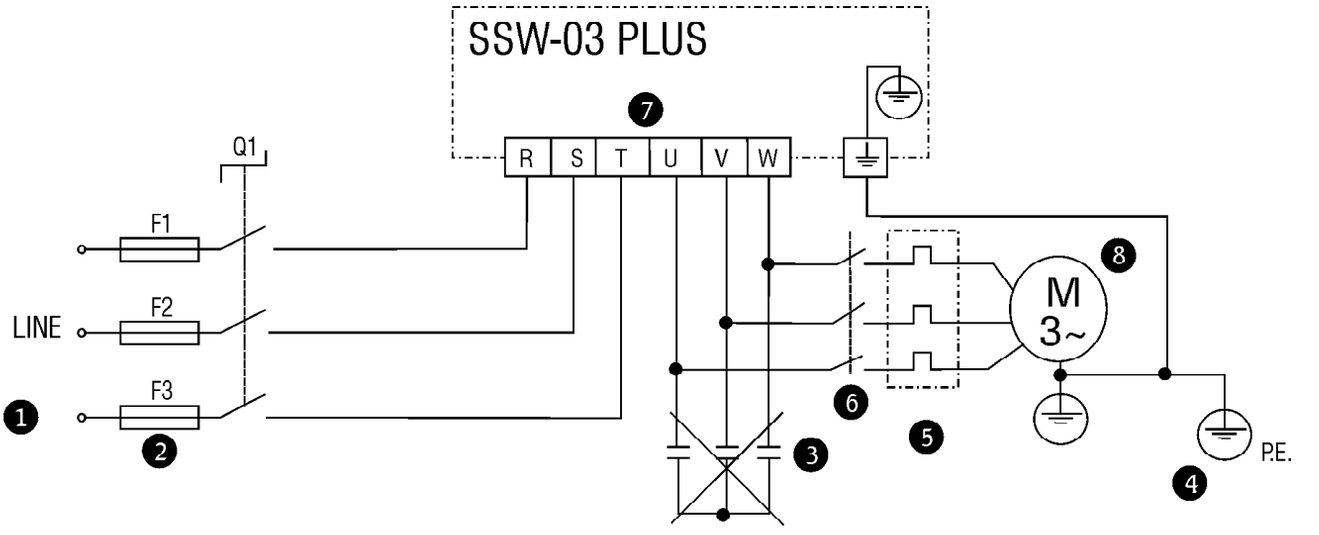


Figure 3.4 - Power and Grounding Connections for standard connection

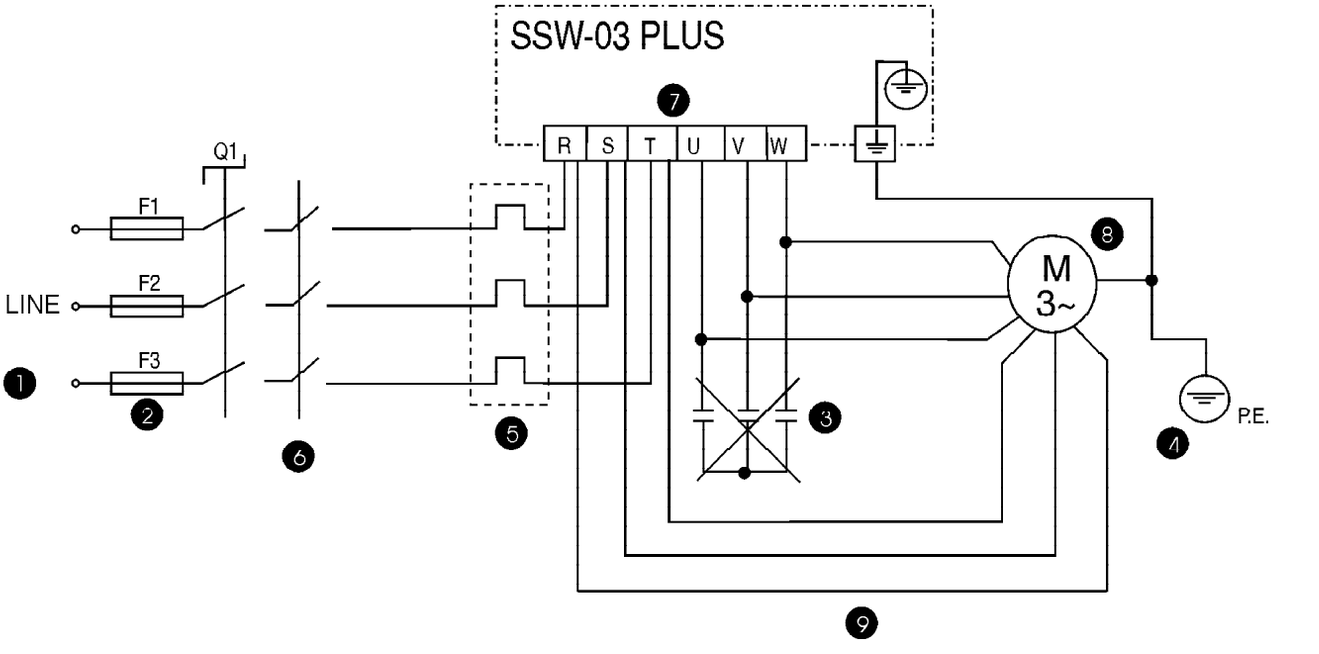


Figure 3.5 - Power and Grounding Connections for connection within the motor delta connection. See also item 6.4.1 in the manual

3 INSTALLATION

❶ The line voltage must be compatible with the rated voltage of the Soft-Starter.

❷ For installation use the cable cross sections and the fuses recommended in Table 3.1, 3.2, 3.3, 3.4. Maximum torque as indicated in table 3.5.

❸ Power factor correction capacitors must never be installed on the Soft-Starter output.

❹ The Soft-Starters must be grounded. For this purpose use a cable with a cross section as indicated in Tables 3.2, 3.3, 3.4. Connect it to a specific grounding bar or to the general grounding point (resistance ≤ 10 ohms).
Do not share the grounding wiring with other equipment which operate at high currents (for instance, high voltage motors, welding machines, etc.).
If several Soft-Starters are used together, see Figure 3.6.

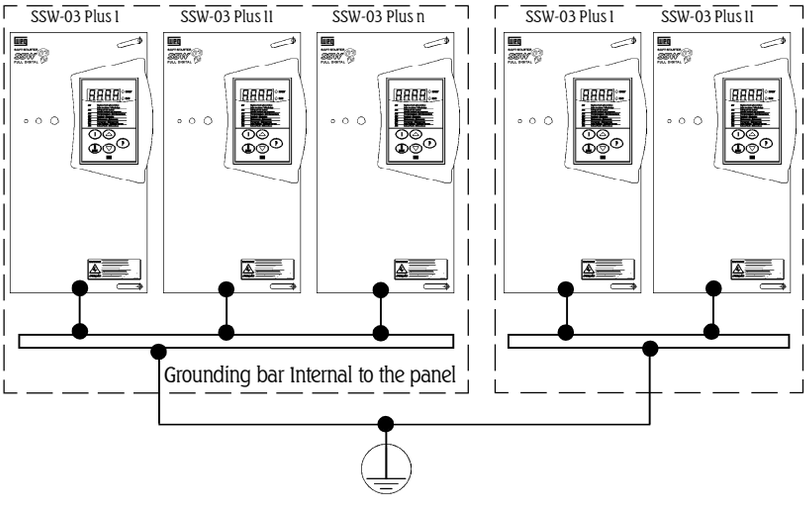


Figure 3.6 *- Grounding connection for more than one Soft-Starter*

Do not use the neutral conductor for grounding purpose.

❺ The Soft-Starter is fitted with electronic protection against motor overloads. This protection must be set according to the specific motor.
When several motors are connected to the same Soft-Starter, use individual overload relays for each motor.

❻ If a isolating switch or a contactor is inserted in the motor supply, do not operate them with running motor or when the Soft-Starter is enabled.

3 INSTALLATION

Table 3.1- Recommended fuses

Type SSW-03 Plus (A)	Standard Connection I_N (A)	Within the Motor Delta Connection I_N (A)	I^2t of the SCR (A^2s)
120	250	450	119.3k
170	315	500	256k
205	450	700	330k
255	500	700	370k
290	500	700	370k
340	700	700	370k
410	700	1250	1452k
475	900	1400	4250k
580	900	1600	4250k
670	900	1600	4250k
800	1400	2000	4250k
950	1600	2200	14000k
1100	1600	-	14000k
1400	2000	-	15125k

The input fuses must be of ultrarapid type (U.R.). I^2t must be smaller or equal to 75% of the SCR value indicated above (A^2s). These fuses protect the SCR against short-circuit. Instead of U.R. fuses you can also use normal fuses that protect the installation against short-circuit, but this type of fuse does not protect the SCR.

Table 3.2 – Recommended cables for Standard Connection (100% and 120%I_N)

Type SSW-03 Plus (A)	Standard Connection						Grounding Cables (mm^2)
	Rated Current 100%			Maximum Current 120%			
	Current 100% (A)	Cables (mm^2)	Bus mm x mm	Current 120% (A)	Bus (mm^2)	Bus mm x mm	
120	120	35	12 x 2	144	50	20 x 3	25
170	170	70	20 x 3	204	95	20 x 3	35
205	205	95	20 x 3	246	120	20 x 3	50
255	255	120	25 x 5	306	150	25 x 5	70
290	290	150	25 x 5	348	185	25 x 5	95
340	340	185	25 x 5	408	240	30 x 5	95
410	410	240	30 x 5	492	2 x120	40 x 5	120
475	475	300	40 x 5	570	2 x 150	40 x 5	150
580	580	2 x 150	40 x 5	696	2 x 185	40 x 10	150
670	670	2 x 185	40 x 10	804	2 x 240	40 x 10	185
800	800	2 x 240	40 x 10	960	2 x 300	50 x 10	240
950	950	2 x 300	50 x 10	1140	4 x 150	60 x 10	300
1100	1100	4 x 150	60 x 10	1320	4 x 185	80 x 10	2 x 150
1400	1400	4 x 185	80 x 10	1680	4 x 240	100 x 10	2 x 185

3 INSTALLATION

Copper cables with PVC 70°C (158°F) isolation, with ambient temperature of 40°C (104°F) installed in perforated conduits and not bunched. Non insulated or silver plated bus bars with rounded edges with 1 mm radius with ambient temperature of 40°C (104°F) and bus temperature of 80°C (175°F). For correct cable dimensioning, consider the installation conditions and the max. permitted voltage drop.

Table 3.3 – Recommended cables for connection within the motor delta connection (100%I_N)

Type SSW-03 Plus (A)	Connection within motor delta connection					Grounding Cables (mm^2)
	Rated Current 100% (A)	Line Cables (mm^2)	Line bus mm x mm	Motor Cables (mm^2)	Motor bus mm x mm	
120	208	95	20 x 3	35	12 x 2	25
170	294	150	25 x 5	70	20 x 3	35
205	355	185	25 x 5	95	20 x 3	50
255	441	300	30 x 5	120	25 x 5	70
290	502	2 x 120	40 x 5	150	25 x 5	95
340	588	2 x 150	40 x 10	185	25 x 5	95
410	709	2 x 185	40 x 10	240	30 x 5	120
475	822	2 x 240	40 x 10	300	40 x 5	150
580	1003	4 x 120	50 x 10	2 x 150	40 x 5	150
670	1159	4 x 150	60 x 10	2 x 185	40 x 10	185
800	1384	4 x 185	80 x 10	2 x 240	40 x 10	240
950	1644	4 x 240	100 x 10	2 x 300	50 x 10	300

Table 3.4 – Recommended cables for connection within the motor delta connection (120%I_N)

Type SSW-03 Plus (A)	Connection within the motor delta Connection					Grounding Cables (mm^2)
	Rated Current 120% (A)	Line cables (mm^2)	Line bus mm x mm	Motor Cables (mm^2)	Motor bus mm x mm	
120	249	120	20 x 3	50	20 x 3	25
170	353	185	25 x 5	95	20 x 3	35
205	426	300	30 x 5	120	20 x 3	50
255	529	2 x 120	40 x 5	150	25 x 5	70
290	602	2 x 150	40 x 10	185	25 x 5	95
340	706	2 x 185	40 x 10	240	30 x 5	95
410	851	2 x 300	40 x 10	2 x120	40 x 5	120
475	986	4 x 120	50 x 10	2 x 150	40 x 5	150
580	1204	4 x 150	80 x 10	2 x 185	40 x 10	150
670	1391	4 x 185	80 x 10	2 x 240	40 x 10	185
800	1661	4 x 240	100 x 10	2 x 300	50 x 10	240
950	1972	-	120 x 10	4 x 150	60 x 10	300

Copper cables with PVC 70°C (158°F) isolation, with ambient temperature of 40°C (104°F) installed in perforated conduits and not bunched.
Non insulated or silver plated bus bars with rounded edges with 1 mm radius with ambient temperature of 40°C (104°F) and bus temperature of 80°C (175°F).
For bypass connection use the same cables or bus bars that are used for motor connection.
For correct cable dimensioning, consider the installation conditions and the max. permitted voltage drop.

❼ Recommended torque on the power terminals

Table 3.5 - Maximum tightening torque for bolts of power part

Type SSW-03 Plus (A)	Standard Connection		Within the motor delta connection				Grounding	
	Without Delta Kit		With Delta Kit					
	Bolt R, S, T, U, V, W	Torque Nm (Lb.in)	Bolt R, S, T	Torque Nm (Lb.in)	Bolt U, V, W	Torque Nm (Lb.in)	Bolt	Torque Nm (Lb.in)
120	M6 (1/4")	8.3 (74.38)	M8 (5/16")	19 (166.25)	M6 (1/4")	8.3 (74.38)	M6 (1/4")	8.3 (74.38)
170/205	M8 (5/16")	19 (166.25)	M10 (3/8")	37 (328.12)	M8 (5/16")	19 (166.25)	M8 (5/16")	19 (166.25)
255... 340	M10 (3/8")	37 (328.12)	M12 (1/2")	61 (542.50)	M10 (3/8")	37 (328.12)	M10 (3/8")	37 (328.12)
410	M12 (1/2")	61 (542.50)	M12 (1/2")	61 (542.50)	M12 (1/2")	61 (542.50)	M12 (1/2")	61 (542.50)
475/580	M12 (1/2")	61 (542.50)	2 x M12 (1/2")	61 (542.50)	M12 (1/2")	61 (542.50)	M12 (1/2")	61 (542.50)
670	M12 (1/2")	61 (542.50)	4 x M12 (1/2")	61 (542.50)	M12 (1/2")	61 (542.50)	M12 (1/2")	61 (542.50)
800/950	2 x M10 (3/8")	37 (328.12)	4 x M12 (1/2")	61 (542.50)	2 x M10 (3/8")	37 (328.12)	2 x M10 (3/8")	37 (328.12)
1100/ 1400	4 x M10 (3/8")	37 (328.12)	-	-	-	-	-	-

The Delta Kit is supplied with the SSW-03 Plus.

3 INSTALLATION

The SSW-03 Plus is suitable for use on a circuit capable of delivering not more than X Arms (see below) symmetrical amperes, Y volts maximum, when protected by Ultra-fast Semiconductor Fuses.

Table 3.6 - Maximum current capacity of the power supply

Type SSW-03 Plus (A)	Standard Connection		Within the Motor Delta Connection	
	220-440V=Y X (kA)	460-575V=Y X (kA)	220-440V=Y X (kA)	460-575V=Y X (kA)
120	10	10	10	18
170	10	10	18	18
205	10	18	18	18
255	10	18	18	30
290	18	18	18	30
340	18	18	30	42
410	18	30	30	42
475	18	30	42	42
580	30	42	42	85
670	30	42	85	85
800	42	85	85	85
950	42	85	85	100
1100	85	85	85	100
1400	85	85	100	125

The SSW-03 Plus can be installed on power supplies with a higher fault level provided that adequate protection is provided by the fuses or circuit breaker.

❽ We do not recommend the use of motors that are operated in continuous duty with less than 50% of their rated current.

The rated motor current must not be smaller than 30% of the rated current of the Soft-Starter, in order that the overload protection works properly.

❾ Cables for the connection within the motor Delta connection, see table 3.3 and table 3.4.
Recommended application see item 9.9 and 9.10.

3.2.2 - Location of the power/grounding/ fans connection

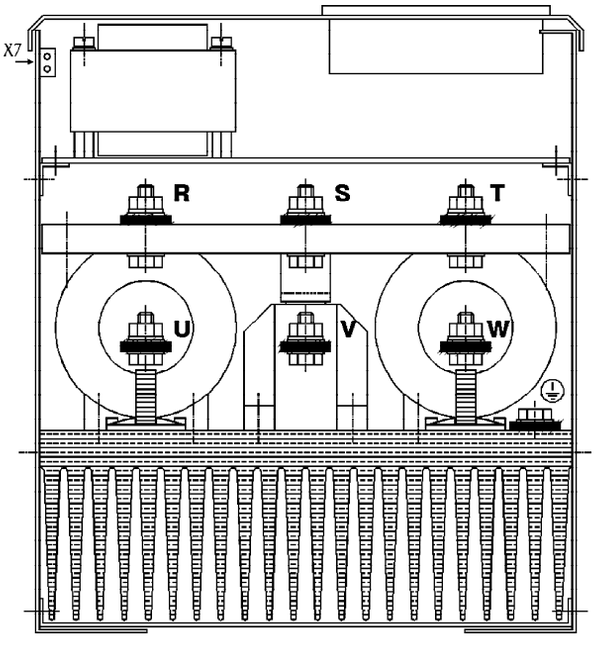


Figure 3.7 - *Location of the power/grounding connection*

3.2.3 - Signal and Control Connections

The signal (digital inputs/outputs output by relay) are performed through the following connectors of the Control Board CCS2.0X (see location in Figure 2.3, page 17).

X1 : Electronics supply (144mA for 110Vac; 78mA for 220Vac)
X2 : Digital and analog signals, output by relay
X7 : Connection to FAN.
XC2 : Connection to serial communication
XC6 : Connection to HMI-3P

3.2.3.1 - Description of the X2 Connector

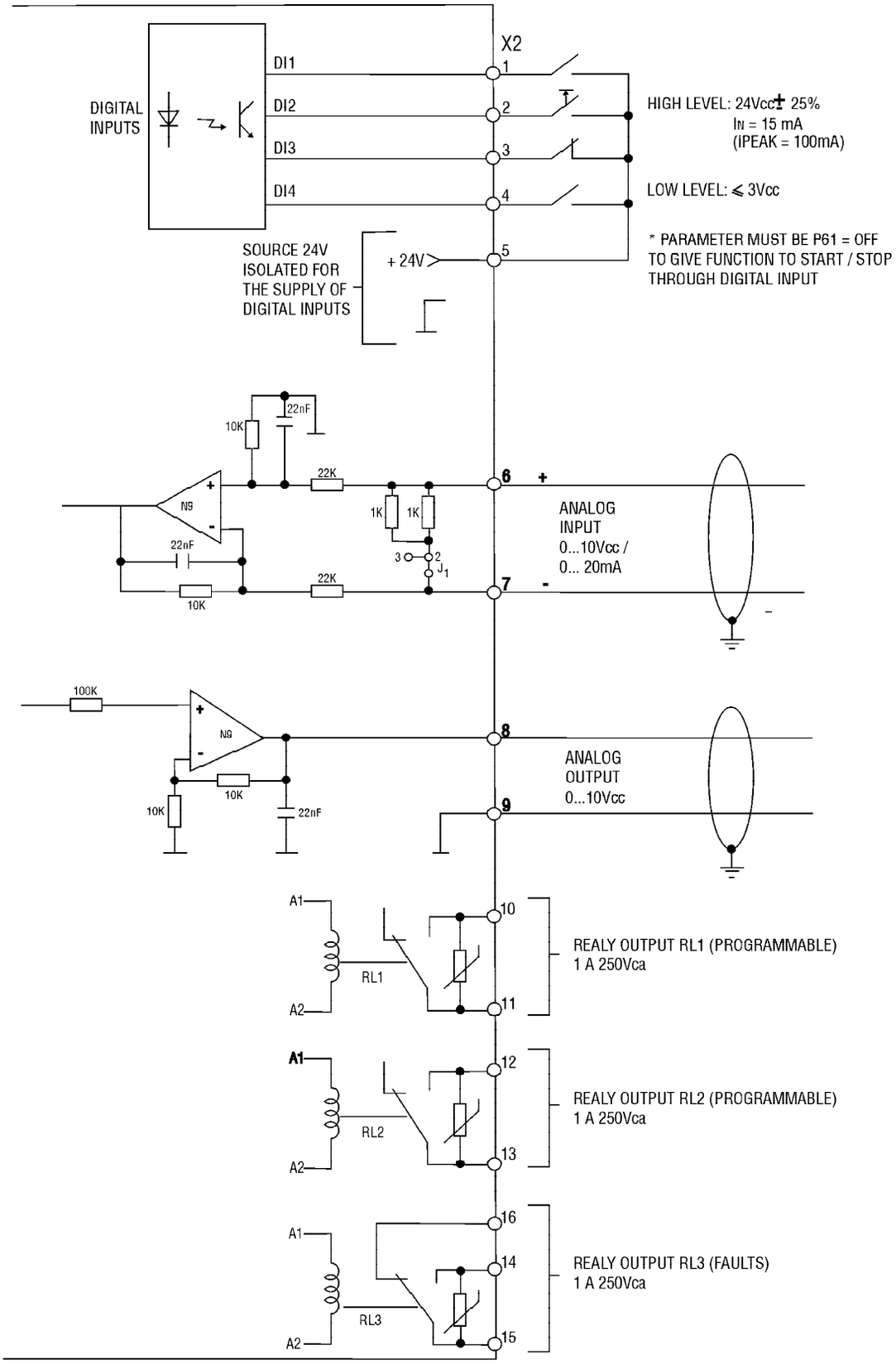


Figure 3.8 *- Description of the X2 (CCS3.00 or CCS3.01 connector)*

When installing the signal and control wiring, please note the following**:**

❶ Cable cross-section: 0.5...1.5mm^2;

❷ Relays, contactors, solenoid valves or breaking coils installed near to Soft-Starters can generate interferences in the control circuit. To eliminate this, you must install RC supressors connected in parallel with the coils of these device, when fed by alternate current and free wheel diodes when fed by direct current.

❸ When an extern HMI is used, the connection cable to the Soft-Starter should be passed through the slot at the bottom of the Soft-Starter.This cable must be laid separate from the other cables existing in the installation, maintaining a distance of 100mm (3.94in) each other.

❹ Max. recommended torque in the terminals X2 and X1: Maximum 0.5 Nm or 4.5lb.in.

❺ The control wiring (X2:1...9) must be laid separate from the power wiring.

3.2.4 - FAN CONNECTIONS

The fans connections must be done through X7:1 and X7:2 connector, according to the voltage defined by the Soft-Starter code:

Ex.: SSW-03. 205/220-440/ ⟵ - PL

Electronic / fan voltage:
1 = 110Vac
2 = 220Vac

SSW-03 Plus Type	Nominal current from the fans (110V)	Nominal current from the fans (220V)
120A, 170A, 205A	250mA	120mA
255A, 290A, 340A, 410A	480mA	240mA
475A, 580A	500mA	240mA
670A	750mA	360mA
800A, 950A	1400mA	700mA
1100A, 1400A	N.A.	840mA

Table 3.3 *- Fans consumption*

3.2.5 - Combination drive "A" Operation by HMI, Standard Connection

With the factory standard programming, you can operate the Soft-Starter with the minimum connection shown in Figure 3.9.
This operation mode is recommended for users who operate the Soft-Starter for the first time, as an initial training form.

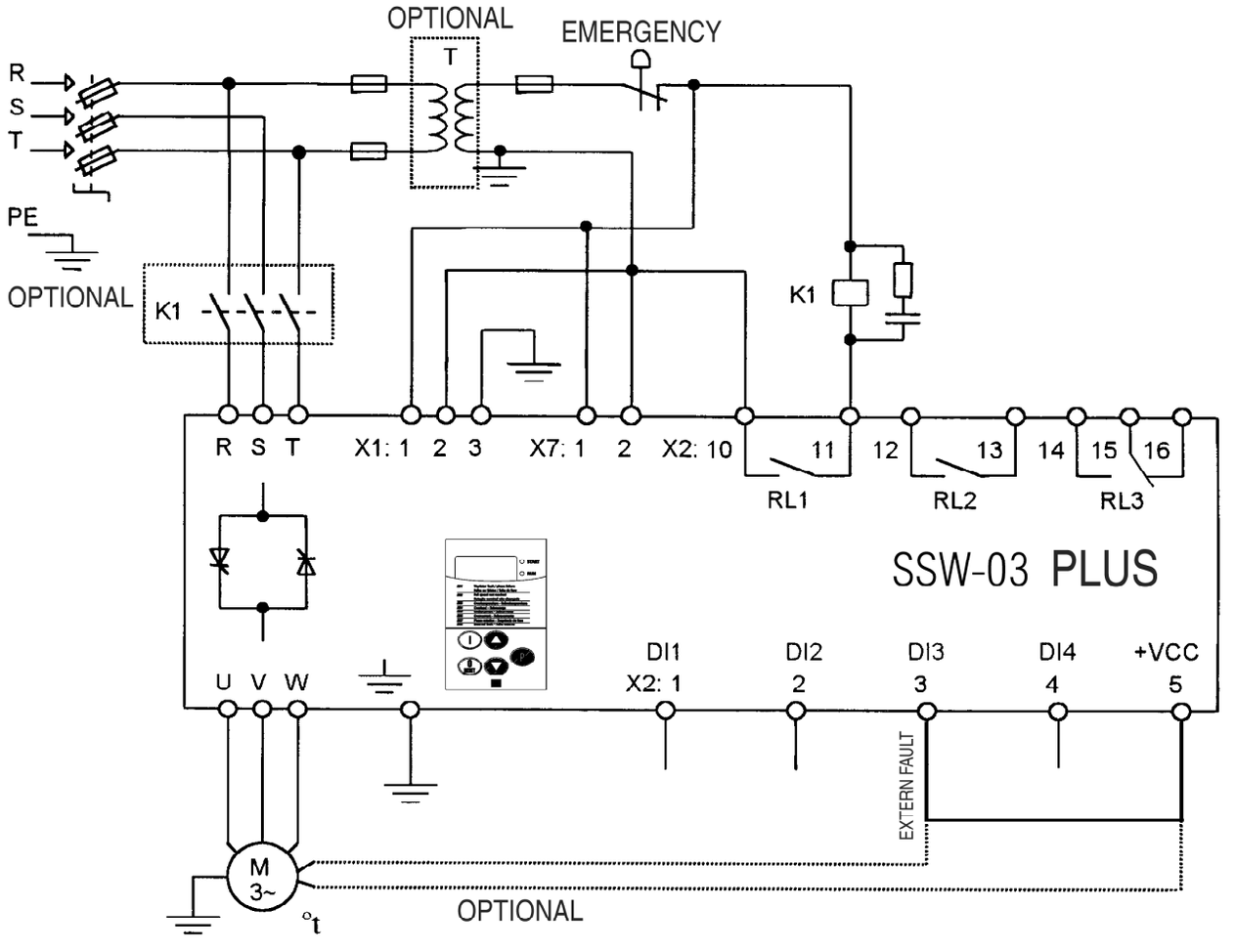


Figure 3.9 - Minimum connections for operation through HMI

Note: It's necessary to use normal fuses or breaker to protect the installation. Ultra-Rapid fuses are not necessary for the SSW-03 Plus operation, but they are recommended for SCR protection.
The transformer "T" is optional and must be utilized when the line voltage is different to the electronics and fan voltage.
The isolation contactor "K1" is optional, and is not necessary for the SSW-03 Plus operation. However due to protection and safety reasons it's recommended. In case

of maintenance the input fuses must be removed for a complete disconnection of the SSW-03 Plus from the line. For the integral motor protection it's recommended to install one or more thermostats in the motor. If the thermostat is not used, the external input error (DI3) from SSW-03 Plus must be connected to +Vdc.

NOTE!
Contactor "K1" is necessary to protect the motor in case there is a phase failure which is caused by damage in the SSW-03 Plus power circuit.

For Start-up according this operation mode, follow chapter 4.

3.2.6 - Combination Drive "B" Operation Through Terminals, Standard Connection

Shown in Figure 3.10 is an example of a typical combination drive circuit. For other application needs, we recommend the following:

☑ to analyse the application

☑ to study the SSW-03 Plus programming possibilities

☑ to define the electrical connection diagram

☑ to perform the electrical installation

☑ to start-up (programming the Soft-Starter correctly)

☑ to start-up the SSW-03 Plus in this operation mode, follow chapter 4.

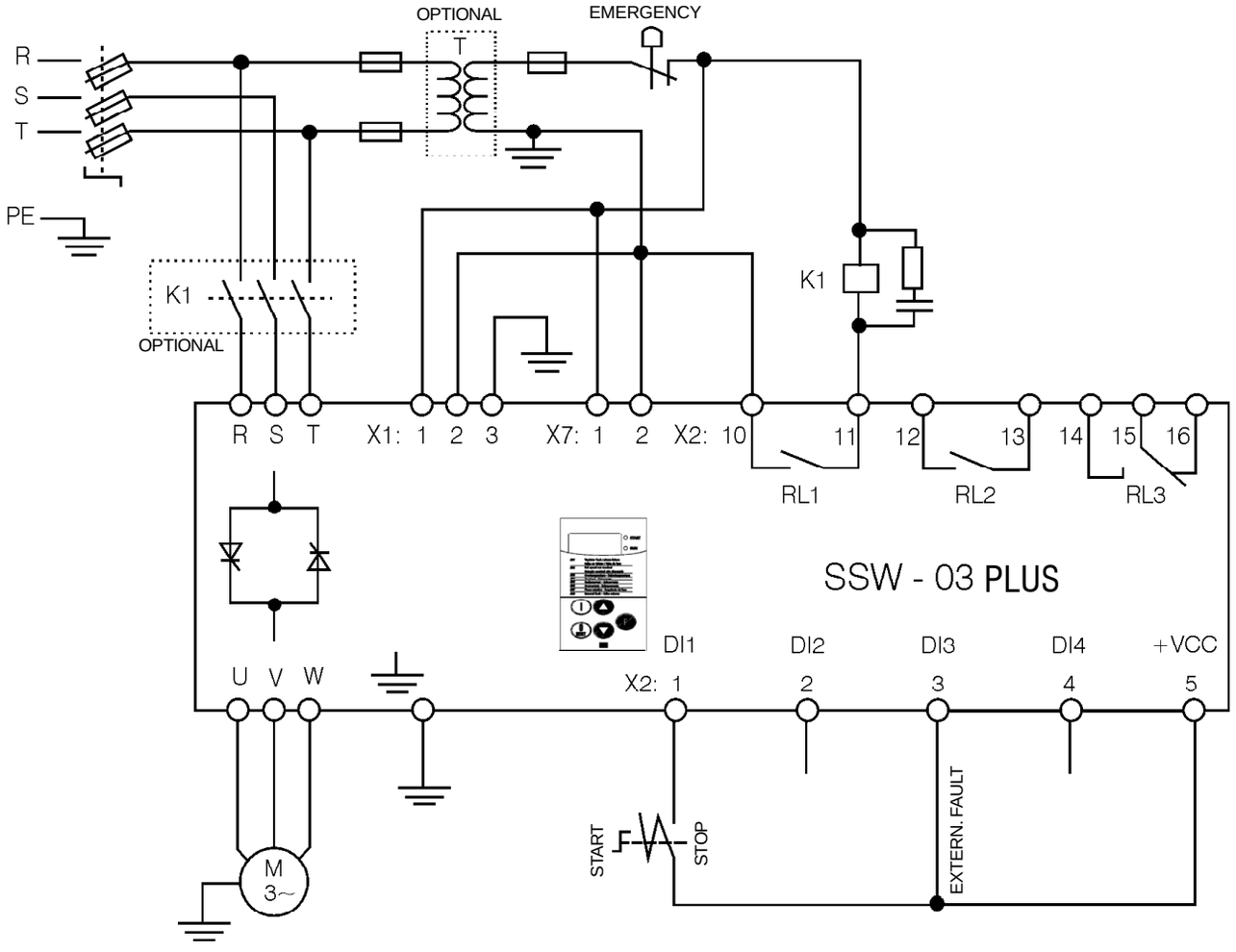


Figure 3.10 - Combination Drive "B" Operation through Terminals

Note: It's necessary to use normal fuses or breaker to protect the installation. Ultra-Rapid fuses are not necessary for the SSW-03 Plus operation, but they are recommended for SCR protection.
The transformer "T" is optional and must be utilized when the line voltage is different to the electronics and fan voltage.

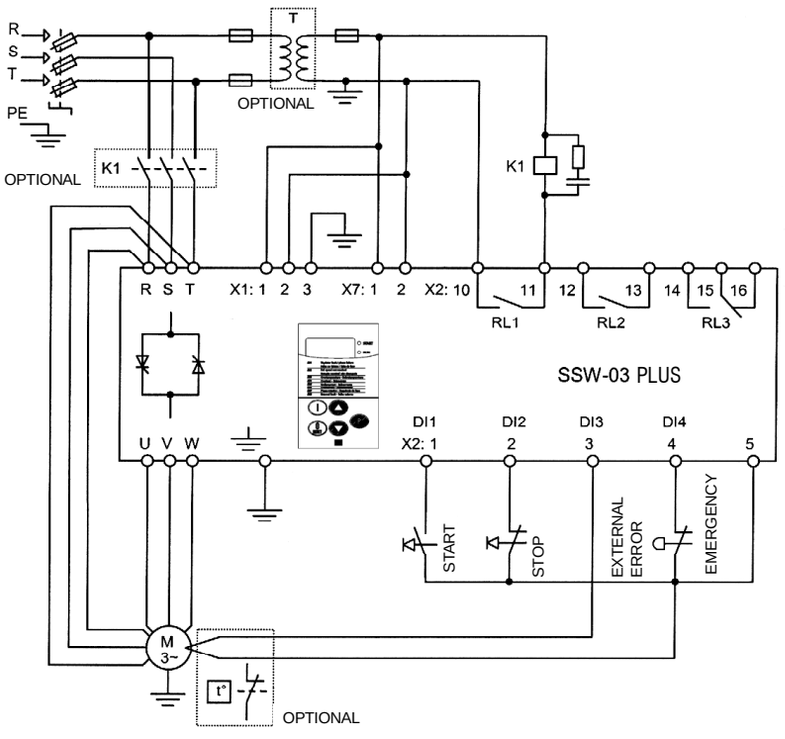
The isolation contactor "K1" is optional, and is not necessary for the SSW-03 Plus operation. However due to protection and safety reasons it is recommended. In case of maintenance the input fuses must be removed for a complete disconnection of the SSW-03 Plus from the line.
For the integral motor protection it is recommended to install one or more thermostats in the motor. If the thermostat is not used, the external input error (DI3) from SSW-03 Plus must be connected to +Vdc.

NOTE!
Contactor "K1" is necessary to protect the motor in case there is a phase failure, which is caused by damage in the SSW-03 Plus power circuit.

Programm P61 to OFF for operation through terminal.

3.2.7 - Combination Drive "C" - Operation Through Terminals, Connection within the Motor Delta Connection

With parameter P28=ON it is possible to use the SSW-03 Plus for connection within the motor delta connection. When the inside delta connection is used the SSW-03 Plus can be rated for 58% of motor nominal current.



Note: It's necessary to use normal fuses or breakers to protect the installation. Ultra-Rapid fuses are not necessary for the SSW-03 operation, but they are recommended for SCR protection.

The transformer "T" is optional and must be utilized when the line voltage is different than the electronics and fan voltage.

The isolation contactor "K1" is optional, and is not necessary for the SSW-03 Plus operation. However due to protection and safety reasons it's recommended. In case of maintenance the input fuses must be removed for a complete disconnection of the SSW-03 Plus from the line.

For the integral motor protection it's recommended to install one or more thermostats in the motor. If the thermostat is not used, the external input error (DI3) from SSW-03 Plus must be connected to +Vdc.

NOTE!

Contactor "K1" is necessary to protect the motor in case there is a phase failure which is caused by damage in the SSW-03 Plus power circuit with the application of the power isolation contactor. For motor connections, see Item 6.4.1.

3.3 - INSTALLATION OF OPTIONAL DEVICES

3.3.1 - HMI-3P ON THE PANEL DOOR

3.3.1.1 - Mechanical installation

When installed on the panel door, the following is recommended:

☑ temperature within the range of 0ºC to 55ºC (32°F to 131°F).

☑ environment free of corrosive vapour, gas or liquids.

☑ air free of dust or metallic particles.

☑ Avoid to exposing the key pad to direct sunlight, rain or moisture.

For mounting, see Figure 3.11.

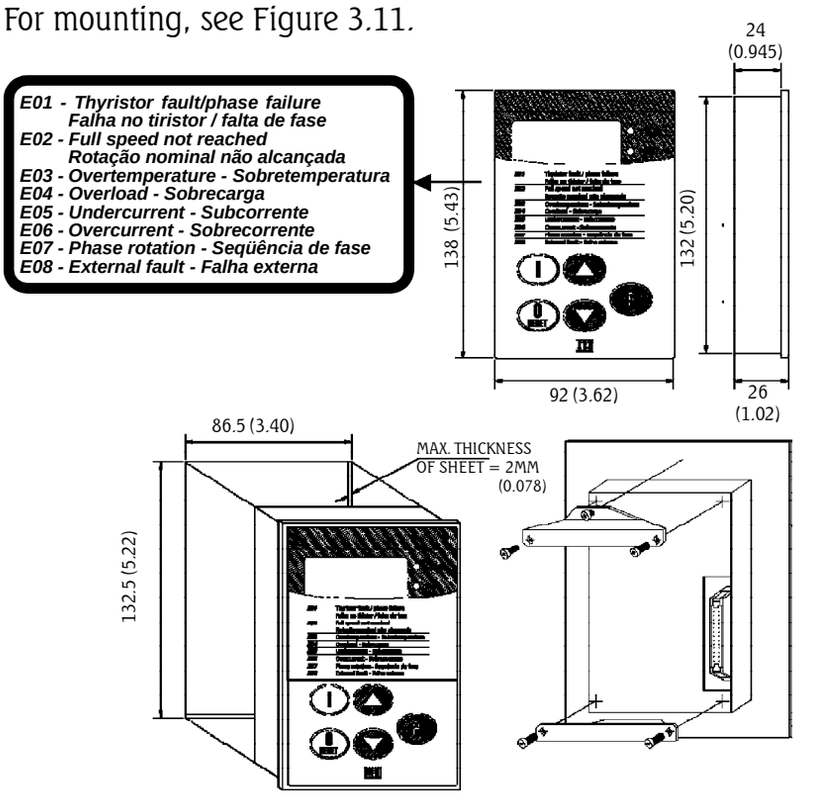


Figure 3.11 - Dimensions/Fastening of the HMI-3P. All dimensions in mm (inches)

3.3.1.2 - Electrical installation

The connection of the HMI-3P to the Soft-Starter is made through shielded flat cable connected to XC6 on the CCS3.0X control board. The shielding must be connected through a Faston type terminal near to XC6, as shown in Figure 3.12.

This cable must be laid separately from the other wirings at a minimum distance of 100mm (3.94in).

OPTIONS:

- HMI-3P + 1m (3.28ft) cable
- HMI-3P + 2m (6.56ft) cable
- HMI-3P + 3m (9.84ft) cable

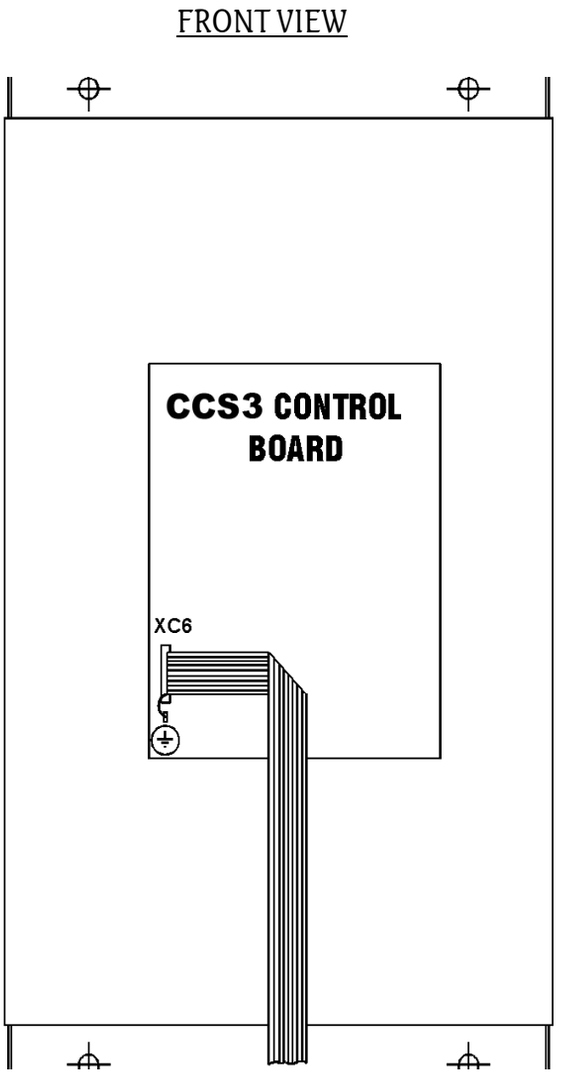


***Figure 3.12**- HMI-3P Cable Connection*

4 POWER-UP/COMMISSIONING

This Section deals with the following:

☑ How to check and prepare the Soft-Starter before up.

☑ How to up and check if the power-up has been succesful.

☑ How to operate the Soft-Starter according to the combination drives "A" and "B" after it has been installed. (See Electrical Installation).

The Soft-Starter shall be installed according to the Section 3 - Installation. If the driving design is different from the suggested combination drives "A" and "B", you must follow the procedures below:

4.1 - POWER-UP PREPARATIONS

DANGER!
Disconnect always the power system before making any connection

1) Check all connections
Check if all power, grounding and control connections are correct and well tightened.

2) Clean the inside of the Soft-Starter
Remove all material residues from inside of the Soft-Starter.

3) Check the motor
Check all motor connections and verify if its voltage, current and frequency meet the Soft-Starter ones. Check if the Soft-Starter has been connected correctly: standard connection or connection within the motor delta connection.

4) Mechanically decouple the load from the motor
If the motor cannot be decoupled, be sure that the direction of rotation (forward, reverse) cannot cause damage to the machine or person.

5) Close the Soft-Starter covers

4 POWER-UP/COMMISSIONING

4.2 - POWER-UP

After the Soft-Starter has been prepared it can now be powered-up:

1) Check the supply voltage:
Measure the line voltage and check if it is within the permitted range (rated voltage + 10% / -15%).

2) Power-up the input and switch on the control voltage:
Close the input circuit breaker.

3) Check if the power-up has been succesful:

The HMI-3P display will show:

Now the Soft-Starter will run some self-diagnosis routines and if there is no problem, the display will show:

Parameter Content
P72 (%I_N)

This means that the Soft-Starter is rdy=ready to be operated.

4) Follow the commissioning procedures
For combination drive "A" - Operation by HMI-3P - follow Item 4.3.2.
For combination drive "B" - Operation by terminals - follow Item 4.3.3.
For other configurations that require the change of several parameters (different standards), read first Chapter 6 - Detailed description of the parameters.

4.3 - COMMISSIONING

This Section describes the commissioning of the two characteristic combination drives describe above:

☑ Combination drive "A" - Operation through HMI-3P

☑ Combination drive "B" - Operation through Terminals

4 POWER-UP/COMMISSIONING

4.3.1 - Preparation

DANGER!
Even after disconnectiong the supply, high voltage can be present.
Wait at least 3 minutes after switching OFF the equipment to allow full discharge of the capacitors.

☑ The Soft-Starter must be installed and powered up as described in section 3 and 4.

☑ The user must have read Section 5 and 6 and be acquainted with the use of the HMI-3P and with the parameter organization.

☑ The user must also understand how to localize and to change the parameters.

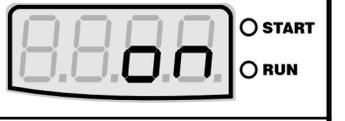
4.3.2 - Commissioning and operation via HMI-3P

Connections according to Figure 3.9.

ACTION	RESULT	INDICATION
	☑ Soft-Starter powered-up	
Press I	☑ Motor starts	
	☑ After starting time has been	
Press 0 RESET	☑ Switching Off by ramp provided P04 is set by parameter Ex: P04 = 20; P03 = 80	
	☑ Soft-Starter energized	

4.3.3. - Commissioning and Operation via Terminals

Connections according to figure 3.10.

ACTION	RESULT	INDICATION
Power-up the driving Start/Stop = open	☑ Soft-Starter realizes self-diagnosis. Soft-Starter ready to be programmed.	
Press P		
Press ▲	☑ It permits changing of parameters	
Press P		
Press ▲	☑ It enables to change the parameters	
Press P		
Press ▼	☑ To program operation via terminal	
Press P		
Press ▼	☑ To change the parameters, it is necessary to set P00 = ON	
Press P		
Press ▲	☑ Reading parameter of the current in percentage (%I_N)	
Press P	☑ Soft-Starter ready to be operated	

4 POWER-UP/COMMISSIONING

ACTION	RESULT	INDICATION
Close X2:1-5	☑ Motor starts	
	☑ After starting time has been	
Open X2:1-5	☑ Switch Off by ramp provided P04 is set by parameters. P04 = 20s; P03 = 80%	
	☑ Soft-Starter is powered up.	

NOTES:

1) Symbol of the LEDs Start/Run

- ● LED ON
- ◒ LED Flashing
- ○ LED OFF

2) If the direction of rotation of the motor is not correct, switch OFF the Soft-Starter and change two output cables of the Soft-Starter.

4.4 - SETTINGS DURING THE COMMISSIONING

Although the factory standard parameters are chosen in such a way to meet most application conditions, even so it may be necessary to make some parameters settings during the commissioning.

Follow the Parameter Quick Reference Table, checking the need to set each of the parameters.
Make the setting according to the specific application and record the last value in the corresponding column for the User's Setting.

These remarks can be important to clear up any questions.

Minimum Parameters to be set

P11 - Current Limitation:
Select the current limitation during the starting Standard: OFF (inactive)

P21 -Motor Current Setting:
Motor overload protection (Standard: OFF)

This setting is set OFF at factory. This means that it is disabled and there is no motor overload protection. For an efficient motor protection, set as described in Section 6.5.1 of this manual.

P25 - Thermal classes of the overload protection:
Selects the class of the overload protection suitable for the motor application (Factory Setting: 30)

According to the thermal class curves in Section 6.5.2. Class 30 takes the longest time to activate the motor overload protection.
To achieve a correct setting of this thermal class, proceed as follows:

1. Verify the motor data sheet the locked rotor time and the starting current (I_p/I_n) for DOL tarting. Select a thermal class that in this condition trips in a time shorter (Section 6.5.2 - Figure 6.10) than the indicated motor data.

2. Also check, if the selected thermal class, as described above, allows to start with reduced current. In this case, the actuation time, according to chart in Figure 6.10 - Item 6.5.2 - must be longer than the starting time of this motor with Soft-Starter.

P26 - Motor service factor:
Also applied for motor overload protection (Standard: 1.00), obtained from motor nameplate.

P28 - Selection of the Operation Mode:
It defines the connection type of the Soft-Starter to the motor (standard: OFF = standard connection). The Soft-Starter SSW-03 Plus can be connected in two ways to the motor: standard connection or connected within motor delta connection, as described in item 6.4.1 of this manual.

5 USE OF THE HMI

This Section describes the Human-Machine Interface (HMI-3P) and the programming mode of the Soft-Starter, providing the following information:

☑ General description of the HMI-3P

☑ Use of the HMI-3P

☑ SSW-03 Plus Parameter Organization

☑ Access to the parameters of the Soft-Starter

☑ Parameter changing (programming)

☑ Description of the Status and Signalling Indications

5.1 - DESCRIPTION OF THE HMI-3P INTERFACE

The HMI-3P consists in 4 digits, seven segment LED display, 2 signalling LEDs and 5 keys. Figure 5.1 describes the HMI-3P.

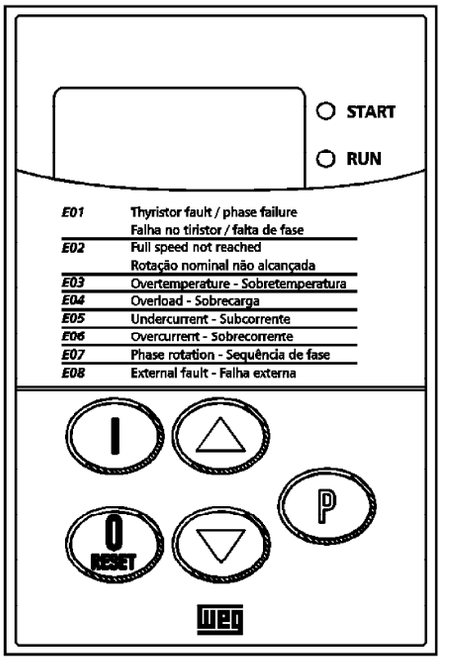


Figure 5.1 *- HMI-3P Description*

START Indicates that the Soft-Starter has received a start or stop command. (motor driven)

RUN Indicates the switch status; if at acceleration / deceleration ramp or at rated voltage.

Enables motor via ramp.

Disables the Soft-Starter via ramp (when programmed). Resets the Soft-Starter after an error has accured.

Changes display between the parameter number and its value.

Increments the number of the parameter or its value.

Decrements the number of the parameter or its value.

5 USE OF THE HMI

5.2 - USE OF THE HMI-3P

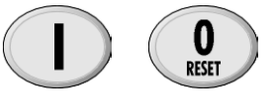
The HMI-3P is a simple interface wich permits the operation and the programming of the Soft-Starter.
It permits the following functions:

- ☑ Display of the Soft-Starter operation status, as well as the main variables
- ☑ Error display
- ☑ Display and changing of the adjustable parameters
- ☑ Soft-Starter operation through the keys START ("I") and STOP ("O")

5.2.1 - Use of the HMI-3P for Operation

All functions relating to the Soft-Starter operation (enabling (ON - "I") disabling (OFF "O"); increment/decrement (values/parameters) can be performed through the HMI-3P. This is made through standard factory programming of the Soft-Starter. These functions ON, OFF and Reset can also be executed individually by means of digital inputs. So it is necessary to program the parameters relating to these correspondent functions and inputs.
Find below the key description of the HMI-3P used for operation, when the Soft-Starter is Standard factory programmed:

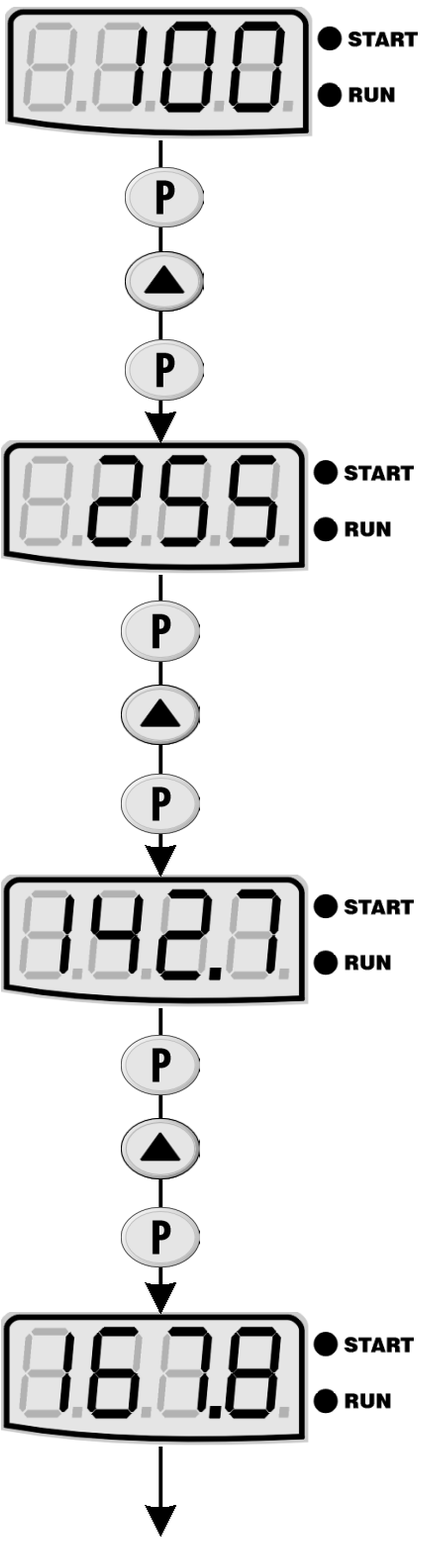
When programmed P61 = On
It functions as "I" (START), "O" (STOP) the motor



The motor accelerates and decelerates according to the set ramps.

5.2.2 - Signalling/ Indications of the HMI-3P (Display)

a) Monitoring Variables:

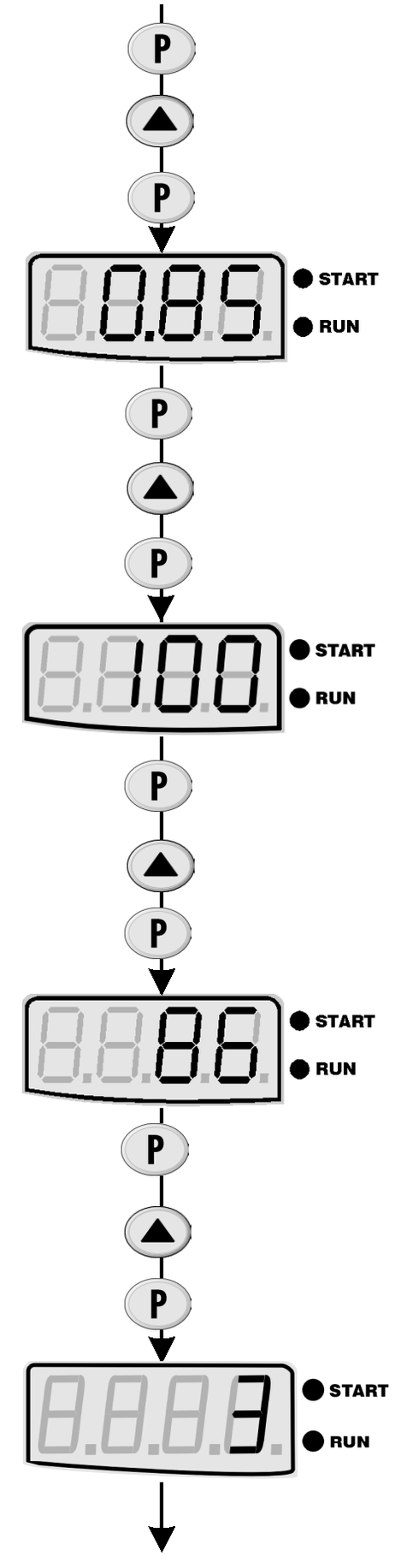


P72 - Value of the output current at percentage level of the switch

P73 - Value of the output current in Amperes

P74 - Value of the active power in kW

P75 - Value of the apparent power in kVA

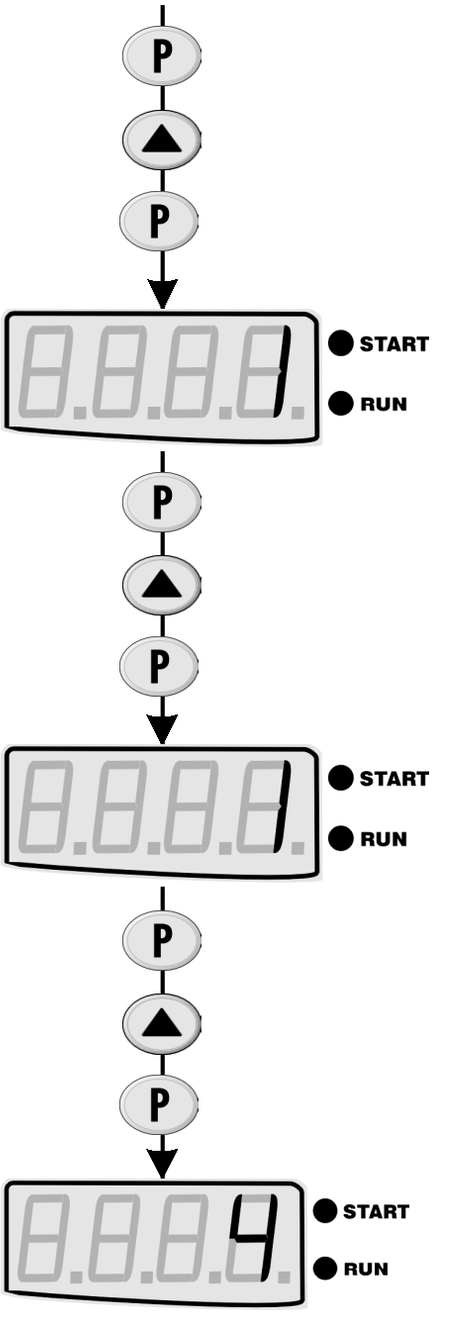


P76 - Load power factor value.

P77 - Value of the output voltage at percentage level.

P82 - Value of motor thermal protection status.

P96 - Last hardware error.



P97 - Second hardware error.

P98 - Third hardware error.

P99 - Fourth hardware error.

b) Flashing Display
Display flashes in the following conditions:

☑ Changing attempt of one non permitted parameter (see Item 5.3.1)

☑ Soft-Starter in fault condition (see Section: Maintenance)

5.3 - PARAMETER CHANGING

All information exchange between the Soft-Starter and the user is made through parameters. The parameter are shown on the display through the letter "**P**" followed by a number:

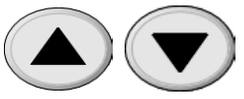
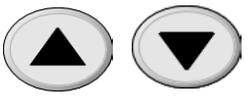
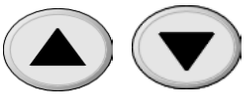
00 = Number of the parameter

Each parameter is related to a numeric value or a function.

The parameter values define the Soft-Starter programming or the value of a variable (for instance, current, voltage, power).

To program the Soft-Starter you must change the parameter(s) content(s).

5.3.1 - Selection/Changing Parameters

ACTION	DISPLAY	COMMENTS
Use the keys 		Localize the parameter P00
Press key		Numeric value associated with the parameter
Press key		Permit changing the parameters value. *3
Press key		
Use the keys 		Localize the desired parameter
Press key		Numeric value associated with the parameter
Use the keys 		Adjust the new desired value ***1**
Press Key		*1,*2

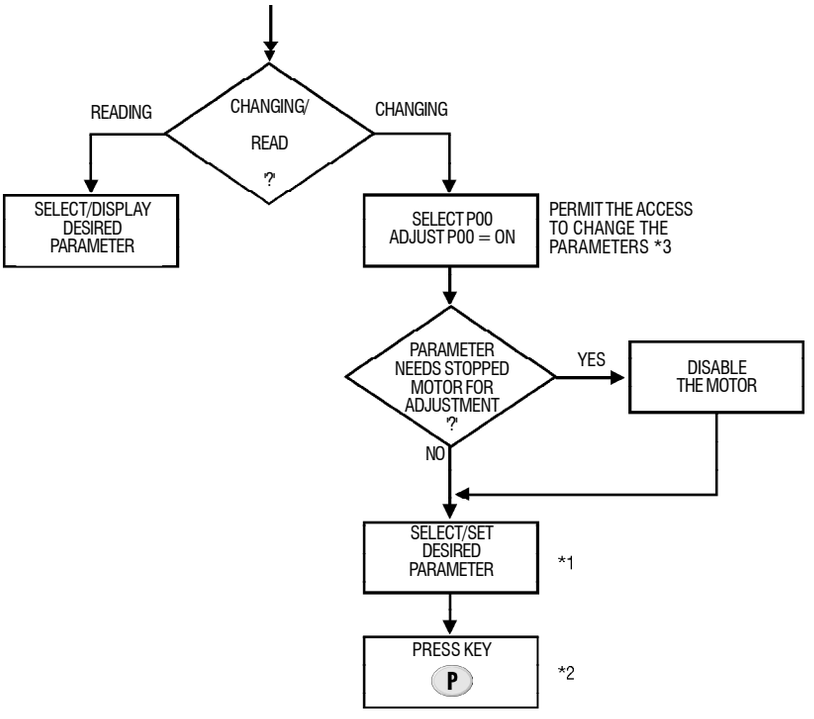


Figure 5.2 *- Flowchart for read/changing of parameters*

***1** The parameters which can be changed with a running motor, the Soft-Starter begins to use the new set value immediately, after pressing key P.
The parameter, which can be changed with stopped motor only, the motor must be disabled, now set the new parameters and press the key P.

NOTE!
If it is not possible to change a parameter with running motor, the display will indicate the parameter content by flashing.

***2** By pressing the key P after the adjustment, the last adjusted value will be stored automatically and this value will remain stored untill new changes are made.

***3** The disabling of the parameter changing access is made by setting P00 at "OFF" or de-energizing/energizing the Soft-Starter electronics.

6 DETAILED PARAMETER DESCRIPTION

This section describes in detail all the Soft-Starter parameters. In order to facilitate the description, the parameters were grouped by characteristics and functions

Read Parameters	Variables which can be seen on the display, but they can not be changed by the user.
Regulation Parameters	They are adjustable values and used according to the Soft-Starter function
Configuration Parameters	They define the Soft-Starter characteristics, the functions to be executed, as well as the input/output functions.
Motor Parameters	It defines the rated motor characteristics.

6.1- STANDARD PARAMETER SET AT FACTORY

The standard factory parameters are predefined values, with which the Soft-Starter is programmed at factory. The set of values is so selected to meet most applications, thus reducing the reprogramming during the start-up. If necessary, the user can change each parameter individually according to this application. At any time the user can return to the standard parameter set at factory, adopting the following procedures:

All set parameters will be lost (replaced by the factory standard)

1) Disabling the Soft-Starter

2) Setting P00 = ON

3) Setting P46 = ON.

4) Pressing Key **P**

5) The display indicates "EEP" in the time of the "default" values are loading.

6 DETAILED PARAMETER DESCRIPTION

6.2- READ PARAMETERS - P71...P77, P82, P96...P99

6.2.1 - P71 - Software Version

☑ It indicates the Software Version contained in the CPU (integrated circuit D1 CCS3.0X)

6.2.2 - P72 - Motor Current

☑ It indicates the output current of the Soft-Starter in percentage of the switch (I_N - %). (Accuracy of ±10%).

6.2.3 - P73 - Motor Current

☑ It indicates directly the Soft-Starter current in Ampere. (Accuracy of ±10%).

6.2.4 - P74 - Active Power

☑ It indicates the active power required by the load, values in kW. (Accuracy of ±10%).

NOTE!
OFF will be displayed when by-pass contactor or energy save is used.

6.2.5 - P75 - Apparent Power

☑ It indicates the apparent power required by the load, values in kVA. (Accuracy of ±10%).

6.2.6 - P76 - Load power factor

☑ It indicates the load power factor, without considering the harmonic currents generated by the load switching.

NOTE!
OFF will be displayed when by-pass contactor or energy save is used.

6.2.7 - P77 - Output voltage

☑ It indicates the Soft-Starter output voltage about the load, without carring the Back-EMF from the motor.

NOTE!
When the contactor by-pass is used for current or apparent power reading, the current transformer must be connected externally after the by-pass connection.

6.2.8 - P82 - Motor thermal protection status

☑ It indicates the status from motor thermal protection in percentage (0 ... 250).
Note: 250 is the value of the motor thermal protection tripping, and display indicates E04.

6.2.9 - Last errors

P96 - Last hardware error
P97 - Second hardware error
P98 - Third hardware error
P99 - Fourth hardware error

☑ They indicate the codes of the last, second, third and fourth error. The register indicates the last 4 Soft-Starter errors or faults.

☑ Register systematic:
EXX ⇨ P96 P97 ⇨ P98 ⇨ P99 ⇨ The former content of P99 is lost

6.3 - REGULATION PARAMETERS - P00... P15, P22...P42, P45, P47

6.3.1 - P00-Parameter access

☑ It releases the access to change the parameters.

P00	ACCESS
OFF	Reading of Parameter
ON	Changing of Parameter

6.3.2 - P01- Initial Voltage (% U_N)

☑ It adjusts the initial voltage value (%U_N) which will be applied to the motor according to Figure 6.1.

☑ This parameter must be set at the minimum value that starts the motor.

	min.	Range	max.	Factory Standard
P01 - Initial Voltage	25%U_N	shortest step 1%	90%U_N	30

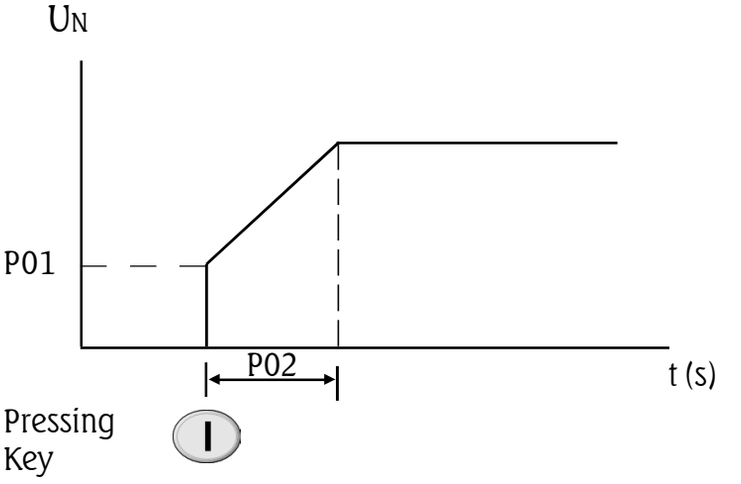


***Figure 6.1**- Acceleration Ramp*

6.3.3 - P02-Time of the Acceleration Ramp

☑ If defines the time of the voltage a ramp, as shown in figure 6.1, provided the Soft-Starter does not enter in current limitation (P11).

☑ When in current limitation, P02 acts as protection time against locked rotor.

	min.	Range	max.	Factory Standard
P02 - Time of the Acceleration Ramp	1s	shortest step 1s	240s	20

NOTE!
When motors are run without load or with small loads, the acceleration time will be shorter than the time programmed at P02, due to the back-emf generated by the motor.

6.3.4 - P03 - Voltage Fall step during Deceleration (%UN)

☑ Used in pump applications. See item 6.3.19, it set the voltage (%UN) that will be applied to the motor instantaneously when the Soft-Starter receives the command for deceleration by ramp.

NOTE!
In order to enable this function, P04 must be set by parameter at time according to Figure 6.2.

	min.	Range	max.	Factory Standard
P03 - Voltage fall step during deceleration	100%UN	shortest step 1%	40%UN	100

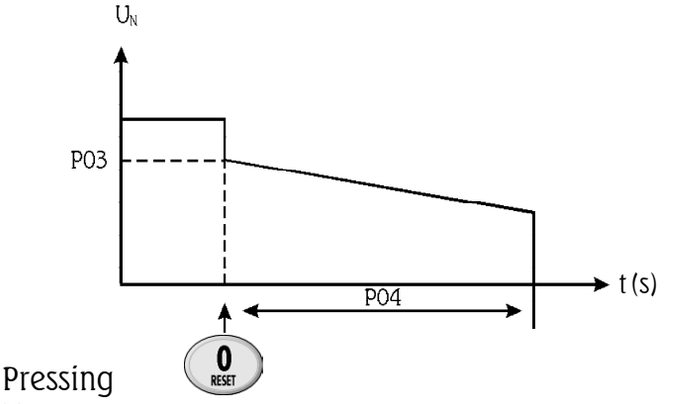


Figure 6.2 *- Deceleration Ramp*

6.3.5 - P04-Time of the deceleration ramp

☑ Used in pump applications. See item 6.3.19.It defines the time of the deceleration ramp that will be effected at the level set at P03 up to the thyristor locking voltage which is approx. 30% of the UN. As shown in Figure 6.2, this ramp is mainly beneficial for pump application.

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

	min.	Range	max.	Factory Standard
P04 - Time of the deceleration ramp	OFF, 2s	shortest step 1s	240s	OFF

6.3.6 - P11 - Current Limitation (%IN of the switch)

☑ It sets the max.current value that will be supplied to the motor (load) during the acceleration.

☑ The current limitation is used for loads with high or constant starting torque.

☑ The current limitation must be set at a level that permits the motor acceleration, otherwise the motor will not start.

NOTE!
1) If the full voltage is not reached at the end of the acceleration ramp time (P02), the error E02 will be displayed and the motor will be disabled.

2) The thermal thyristor protection, inclusive during the current limitation, is carried through thermostats of the Soft-Starter.

	min.	Range	max.	Factory Standard
P11 - Current limitation	OFF, 150%IN	shortest step 1%	500%IN	OFF

6 DETAILED PARAMETER DESCRIPTION

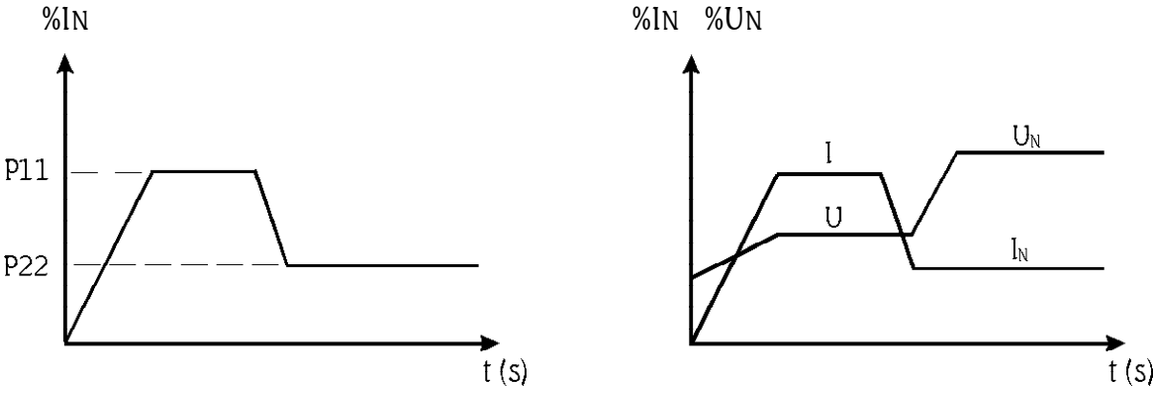


Figure 6.3 *- Current Limitation*

P11- Calculation example for setting of current limitation

☑ To limit the current at 2.5 x IN of the motor:
1) Standard Connection

IN of the switch = 170A
IN of the motor = 140A

ILIM=250% of the IN of the motor
2.5x 140A =350A

$$\frac{350A}{I_N \text{ of the switch}} = \frac{350A}{170A} = 2.05 \text{ x } I_N \text{ of the switch}$$

P11=205% of the IN of the switch =2.5x IN of the motor.

2) Within the motor delta connection

IN of the switch = 120A
IN of the motor = 140A

ILIM=250% of the motor IN
2,5 x 140A = 350A

$$\frac{350A}{I_N \text{ delta switch}} = \frac{350A}{207,8A} = 1,68 \text{ x } I_N \text{ of the switch}$$

P11 = 168% of IN of delta switch = 2,5 x IN of the motor.

NOTE!
This function (P11) does not active when the voltage pulse is enabled during the start (P41).

6.3.7- P12- Immediate overcurrent (%IN of the switch)

☑ It adjusts the instantaneous overcurrent level that the motor or Soft-Starter permits during a time preset at P13, after then the switch is switched Off, indicating E06, as shown in Figure 6.4.

NOTE!
This function is activated only at full voltage after the motor has started.

	min.	Range	max.	Factory Standard
P12 - Immediate Overcurrent	32%IN	shortest step 1%	200%IN	120

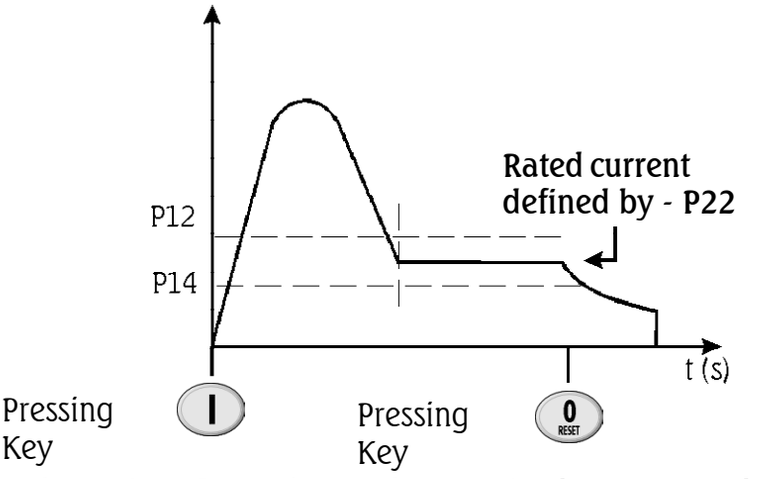


Figure 6.4 *- Protection against over/undercurrent at duty*

P12 -Calculation example for setting of immediate overcurrent.

☑ Maximum Current equal to 1.4 x IN of the motor
1) Standard Connection

IN of the switch =170A
IN of the motor =140A

1.4x 140A =196A

$$\frac{196A}{I_N \text{ of the switch}} = \frac{196A}{170A} = 1.15 \text{ x } I_N \text{ of the switch } 170 \text{ A}$$

P12 =115% of the IN of the switch =140% of the IN of the motor

2) Within the motor delta connection

I_N of the switch = 120A
I_N of the motor = 140A

1.4 x 140A = 196A

I_N of the switch within delta

120A x 1.73 = 207.8A

$$\frac{196A}{I_N \text{ delta switch}} = \frac{196A}{207.8A} = 0.94 \times I_N \text{ switch}$$

P12 = 94% of I_N of delta switch = 140% of the I_N motor.

6.3.8 - P14- Immediate undercurrent (%I_N of the switch)

☑ It set the minimum undercurrent that the Motor + load can operate without problems. This protection actuates when the current of load (Figure 6.4) goes to a value lower than set in P14; and for a time equal or higher than preset in P15, indicating error, E05.

NOTE!
This function is activated only at full voltage after the motor has started.

	min.	Range	max.	Factory Standard
P14 - Immediate undercurrent	20%I_N	shortest step 1%	190%I_N	70

P14- Calculation example for setting of immediate undercurrent (%I_N of the switch)

☑ Minimum Current equal to 70% of the I_N of the motor
1) Standard Connection

I_N of the switch = 170A
I_N of the motor = 140A

70% of the 140A= 0.7 x 140A = 98A

$$\frac{98A}{I_N \text{ of the switch}} = \frac{98A}{170A} = 0.57 \text{ x } I_N \text{ of the switch } 170A$$

P14 = 57% of the I_N of the switch = 70% of the I_N of the motor

2) Within the motor delta connection

I_N of the switch = 120A
I_N of the motor = 140A

70% of 140A = 0.7 x 140A = 98A

I_N of the switch within delta

120A x 1.73 = 207.8A

$$\frac{98A}{I_N \text{ delta switch}} = \frac{98A}{207.8A} = 0.47 \times I_N \text{ switch}$$

P14 = 47% of I_N of the switch = 70% of I_N of the motor

6.3.9 - P13 - Immediate Overcurrent Time(s)

☑ This parameter determines the maximum time that the load can operate with overcurrent, as set in P12.

	min.	Range	max.	Factory Standard
P13 - Immediate Overcurrent Time	OFF, 1s	shortest step 1s	20s	OFF

6.3.10 - P15 - Immediate undercurrent Time(s)

☑ Through this parameter is determined the maximum time that the load can operate with undercurrent, as set in P14. Typical application for this function is in pumping systems that benefit when they are dry operated.

	min.	Range	max.	Factory Standard
P15 - Immediate undercurrent Time	OFF, 1s	shortest step 1s	200s	OFF

6.3.11 - P22 - Rated current of the Soft-Starter (A)

☑ It is function is to adjust the Software to certain conditions of the hardware, being used as base of the following functions: starting current limitation (P11); immediate overcurrent (P12) at duty; undercurrent at duty (P14) and thermal overload protection of the motor.

	Possible Values	Factory Standard
P22 - Rated current of the Soft-Starter	120, 170, 205, 255, 290, 340, 410, 475, 580, 670, 800, 950, 1100, 1400A	According to the type

NOTE!

1) When a Soft-Starter is connected within the motor delta connection (P28=ON), the rated current of the Soft-Starter is set automatically to 1.73 x I_N, of the Soft-Starter.
2) Do not change this value, since the content of this parameter is specific for each software.

6.3.12 - P23 - Rated voltage of the Soft-Starter (V)

☑ The function is to calculate the power supplied to the load.

	Possible Values	Factory Standard
P23 - Rated voltage of the Soft-Starter	220, 230, 240, 380, 400, 415, 440, 460, 480, 525, 575V	380

6.3.13 - P31 - Phase rotation (ON = RST; OFF = any sequence)

☑ This function can be enabled or disabled, but when enabled its function is to protect the loads that can not be driven in both directions of rotation.

NOTE!

The phase sequence is only detected at the first time when the power part is activated after the electronic part has been energized. Thus a new phase sequence can only be detected when the electronic part is switched OFF or reset.

	Possible Values	Factory Standard
P31 - Phase rotation	OFF, ON	OFF

6.3.14 P33 - Voltage level of the JOG function

☑ This parameter realizes the acceleration ramp up to the set value of the JOG voltage during the time at which the digital Input (DI4) is closed. After opening, DI4 realizes the deceleration via ramp, provided this function has been enabled at P04.

NOTE!

1) The maximum activation time of the JOG function is determined by the time set at P02. After this time elapsed, the error E02 will be activated and the motor disabled.

2) Thus P55 = 4.

	min. Range max.	Factory Standard
P33 - JOG voltage level	shortest step 25% U_N ⟷ 1% ⟷ 50% U_N	25

6.3.15 - P34 - DC braking time (s)

☑ This parameter sets the DC braking time, provided P52=3 and P28=OFF. This function is only possible with the aid of a contactor that must be connected according to Item 9.6 - Typic DC braking connection diagram.

☑ This function must be used when reduction of the deceleration time imposed by the load to the system is desired.

NOTE!

1) Wherever these functions are used, you must consider a possible thermal overload in the motor windings.
The thermal overload protection does not operate during DC-braking.
2) There is no DC-braking when Soft-Starter is connected within the motor delta connection.

	min. Range max.	Factory Standard
P34 - DC braking time	Shortest step OFF, 1s ⟷ 1s ⟷ 10s	OFF

6.3.16 - P35 - DC-Braking voltage level (%U_N)

☑ This parameter sets the AC line voltage, that is converted directly into DC voltage and applied on the motor terminals during the braking time.

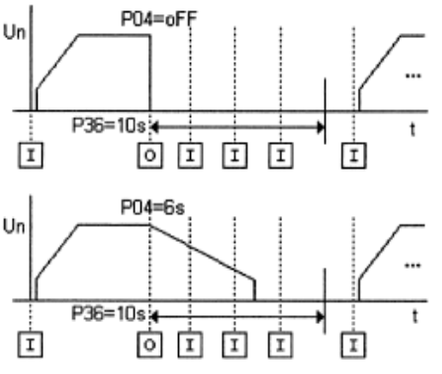
	min.	Range	max.	Factory Standard
P35 - DC braking voltage level (%U_N)	30%U_N	shortest step 1%	50%U_N	30

6.3.17 -P36 - Time interval between starts

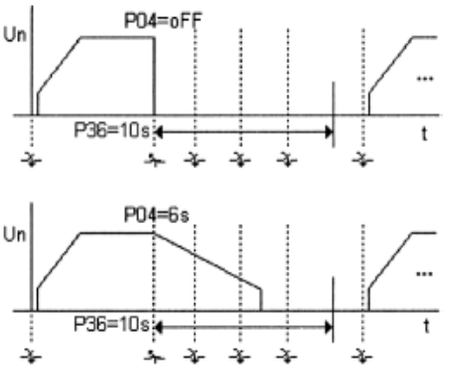
☑ This protection acts limiting the time interval between starts to avoid excessive starting and stopping conform time adjusted in parameter P36.

	min.	Range	max.	Factory Standard
P36 - Time interval between starts	OFF, 1s	Shortest step 1s	999s	2s

Operation by HMI (I/O)

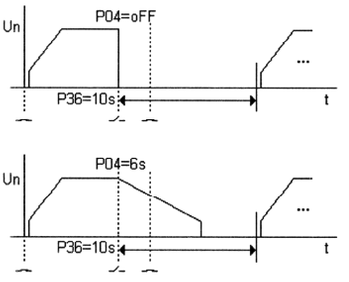


Operation by three wire digital input (DI1 and DI2)



Attention:
The SSW controller will not accept a new Start command during the time, adjusted in P36, elapses after Stop. Identically to serial interface communication.

Operation by two wire digital input (DI1)



Attention:
The SSW controller will not accept a new Start command during the time, adjusted in P36, elapses after Stop. Identically to serial interface communication.

NOTE!

1) Use this function only if you need to avoid excessive starting and stopping.
2) The time counter start after Stop command, with or without soft stop.
3) The time adjusted in P36 must be greater than the time adjusted in P04 to this function wok properly.
4) This function doesn't have action at Jog function.
5) During the reversal of the motor direction, the new start of the motor only will be realized after time, adjusted in P36, elapses.

6.3.18 -P41 - Voltage pulse time at the start (Kick Start)

☑ The voltage pulse at the start, when enabled, defines the time during which this voltage pulse (P42) will be applied to the motor, so that the motor succeeds to accelerate the initial moment of inertia of the load coupled to its shaft, as shown in Figure 6.5.

NOTE!
Use this function only for specific applications, where break away torque is needed.

	min.	Range	max.	Factory Standard
P41 - Voltage pulse at the start (Kick Start)	OFF, 0.2s	shortest step 0.1s	2s	OFF

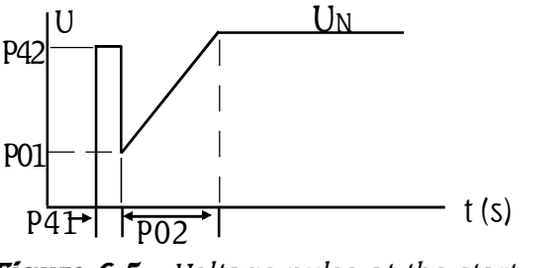


Figure 6.5 *- Voltage pulse at the start*

6.3.19 -P42 - Voltage pulse level at the start (Kick Start)

☑ This function determines the voltage level applied to the motor, so it is able to accelerate the inertia process of the load, as shown in Figure 6.5.

NOTE!
This function, when enabled, does not permit the activation of the current limitation during the start.

	min. Range max.	Factory Standard
P42 - Voltage pulse level at the start	70%UN ← shortest step 1% → 90%UN	70

6.3.20 - P45 - Pump Control

☑ Weg has developed for a special algorithm for application with centrifugal pumps (Quadratic Torque). This special algorithm is used to minimize pressure overshoots in the hydraulic pipeline, that can cause ruptures or excessive wear.

NOTE!
Before the first start of the Pump, disable the Pump Control function. P45 must be set at OFF.
Set the following parameters:

P01 = 30 (Initial Voltage)
P02 = 15 (Acceleration Ramp Time)
P03 = 80 (Voltage Fall Step during Deceleration)
P04 = 15 (Deceleration Ramp Time)
P11 = OFF (Current Limitation)

After setting the values above start and stop the Pump. Then check the correct direction of rotation, pump flow and the Current of the motor.

After the above step you can enable the Pump Control (P45=ON).

☑ When P45 set at "On" and key "P" is pressed, the display indicates "PuP" and the following parameters will be set automatically:

P02 = 15 s (acceleration time)
P03 = 80% UN (voltage step during deceleration)
P04 = 15 s (deceleration time)
P11 = OFF (Current Limit)
P14 = 70% IN (switch undercurrent)
P15 = 5s (Undercurrent Time)
P43 = OFF (By-pass relay)

The other parameters continue with their previous values.

NOTE!
Although the values that are set automatically meet most applications, they can be improved to meet the requirements of your application.
Please find below a procedure to improve the performance of the control of pumps.
End setting of the pump control function:

NOTE!
This setting must be used only to improve the performance of the pump control and when the pump is already installed and able to operate at full-load.

1. Set P45 (Pump control) at "On".

2. Set P14 (undercurrent) or set P15 (Undercurrent Time) at "OFF" until the set has finished. After then, program it again.

3. Check the correct direction of rotation of the motor, as indicated ON the pump frame.

4. Set P01 (initial voltage - % UN) to the level so the motor starts to run without vibration.

5. Set P02 (Acceleration Time [s]) to the starting time required by the load. With the manometer in the pipeline, check the pressure increase that must be continuous until the max. required level is reached without overshoots.
If overshoots occur, increase the acceleration time to reduce this pressure overshoots at maximum.

6. P03 (Voltage Fall Step - %UN) use this function to cause an immediate pressure drop or a more linear pressure drop during the motor deceleration.

7. P04 (deceleration time) during the motor deceleration check with manometer the pressure drop that must be continuous until the minimum level is reached without the presence of hydraulic ram when the non-return valve is closed. If this occurs, increase the deceleration time until the oscillations are reduced at maximum.

6 DETAILED PARAMETER DESCRIPTION

NOTE!
If no manometer is installed in the pipelines, the hydraulics ram can be observed through the pressure relief valves.

NOTE!
Excessive acceleration or deceleration times can cause motor overheating. Program them for your application as short as possible.

	Possible Values	Factory Standard
P45 - Pump Control	OFF, ON	OFF

6.3.21 P47 - Auto-Reset Time (s)

☑ When an error occurs, except E01, E02 and E07 or E2x, the Soft-Starter can realize an automatic reset after the programmed time at P47 has been elapsed.
If P47=OFF, the Auto-Reset will not occur.
After the Auto-Reset time has been elapsed and the same error occurs three consecutive times (*), the Auto-Reset Function will be disabled. Thus, if an error occurs four consecutive times, this error remains on the display (and the Soft-Starter will be disable).

(*) an error will be considered consecutive, if it occurs within 60 seconds after has been executed the last Auto-Reset.

	min. Range max.	Factory Standard
P47 - Auto-Reset Time	OFF, 10s ⟷ (shortest step 1s) 600s	OFF

6.4 - CONFIGURATION PARAMETERS - P28, P43, P44, P46, P50...P57, P61...P64

6.4.1 - P28 - Operation Mode

SSW-03 Plus permits two modes of operation: standard connection or connection within the motor delta connection.

P28=OFF - Standard connection uses the Soft-Starter in the normal star or delta line connection.

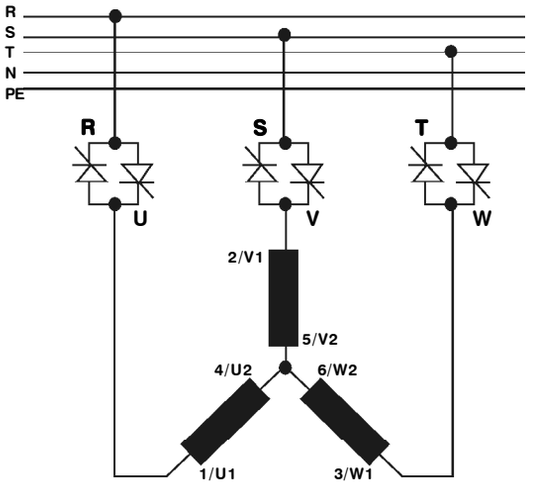
P28=ON - Motor inside delta connection uses the Soft-Starter connected by the six motor leads in the motor phases.

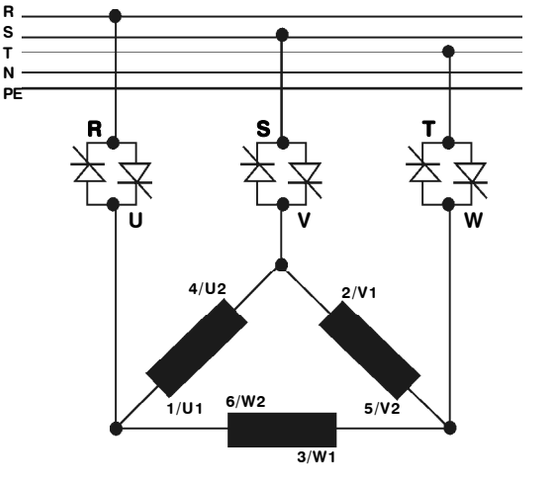
For the delta inside connection the Soft-Starter SSW-03 is installed separately in each winding of the motor through 6 cables. In this type of connection the circulating current of the Soft-Starter is only the 58% from the nominal current of the motor. This characteristic changes the relation between the motor nominal current and the nominal current of the Soft-Starter. To know, in this connection, the Soft-Starter can be specified as:
- 1.50 times the nominal current of the motor, during the start;
- 1.73 times the nominal current of the motor, in full voltage.

During the start the relation is lesser because had the common characteristics to this type of connection (inside of the Delta) the Thyristor of the Soft-Starter needs to lead the same current in a lesser cycle time, raising with this the losses in the Thyristor during the start.

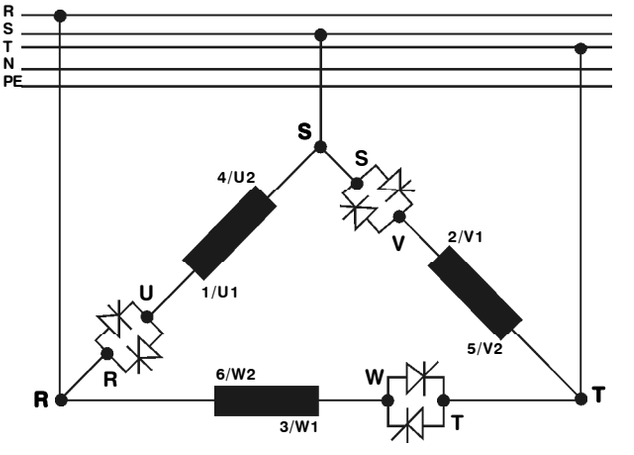
The standard connection requires less output wiring. The connection within the motor delta connection requires twice the standard connection, but for short distances, it is a cheaper option for Soft-Starter + motor + wiring.

Standard connection with three cables: P28=OFF, Soft-Starter line current equal to motor current.

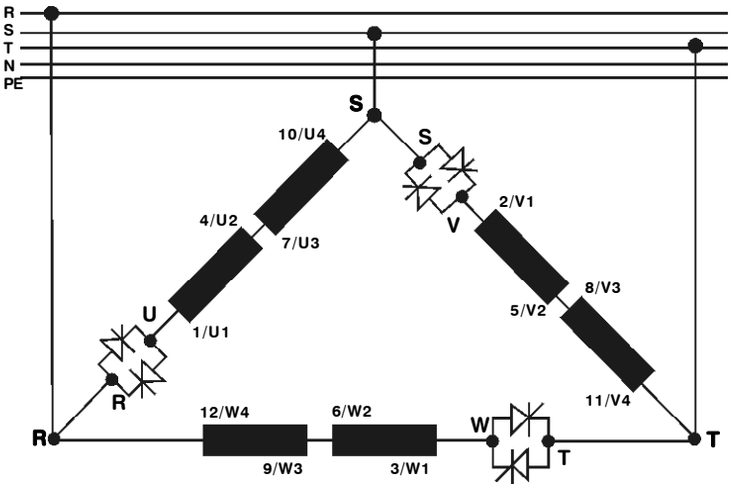




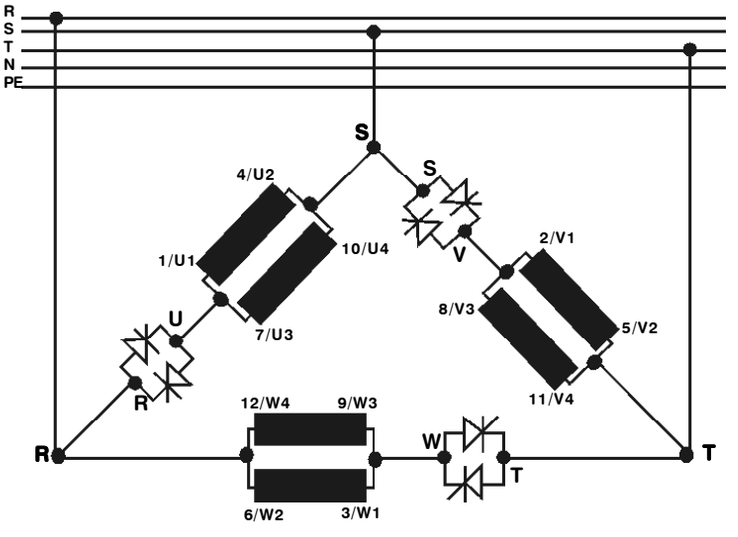
Connection within the Motor Delta Connection with six cables: P28=ON, Soft-Starter line current approximately 58% of the motor current.



Within the motor delta connection with motor double delta serial connected.



Within the motor delta connection with motor double delta parallel connected.



ATTENTION!

To perform the connection within the motor delta connection, your motor must have the correct delta connection voltage.

NOTE!

1)When the connection within the motor delta connection is used, as shown in Item 9.9, the connection cables of the Soft-Starter to the line supply, or the line supply isolation contactor must be able to carry the motor rated current, and the motor connection cables to the Soft-Starter, and/or the bypass contactor must be able to carry 58% of the motor rated current.
2) Due to the high currents and cable cross sections, it is also suggested to use copper bus bar for this type of connection to connect the Soft-Starter to the line supply.
3) For 2 pole motors must have a minimum 25% load applied to the axle when in full voltage. A ByPass contactor is necessary when that condition are not possible.

6 DETAILED PARAMETER DESCRIPTION

ATTENTION!

The connection of the motor to the Soft-Starter must be made carefully. Follow strictly the connection diagrams according to the winding types shown in Figure 3.5 and item 6.4.1.

If reversal of motor direction of rotation is required, change the Soft-Starter connection to the network only.
Ensure that the electronics is switched OFF while connections are changed each other.

Do not start motor with wrong P28 content:
OFF = standard connection
on = within the motor delta connection

	Possible values	Factory Setting
P28 - Operation Mode Selection	OFF, ON	OFF

6.4.2 - P43 - By-Pass relay

☑ This function, when enabled, permits activates full voltage indication by means of RL1 or RL2 (P51 or P52) in order to energise a by-pass contactor.

☑ The main function of the Soft-Starter By-Pass is to eliminate the losses in the form of heat generated by the Soft-Starter.

NOTE!

1) This function must always be programmed when a by-pass contactor is used.

2) To keep the protections relating to motor current reading, use external current transformers or the MAC-0x. See section 10.

3) When P43 is set to "On", the parameters P74 and P76 become inactive "OFF".

	Possible Values	Factory Standard
P43 - By-Pass relay	OFF, ON	OFF

6.4.3 - P44 - Energy Save

☑ This function can be enabled or disabled. When enabled, its function is to reduce the losses in the motor air gap, when motor runs without load or only drives a partial load.

NOTE!

1) The total energy save depends on the load which is driven by the motor.

2) This function generates undesired harmonic currents in the network due to the conduction angle for the voltage reduction.

3) When P44=ON, the parameters P74 and P76 are disabled "OFF".

4) Not possible to enable with by-pass (P43 = ON).

5)Run led is flashing when energy save is enabled.

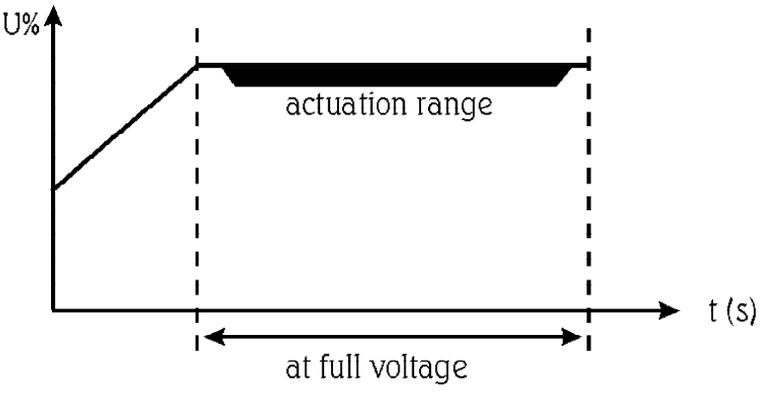


Figure 6.6 *- Energy save*

	Possible Values	Factory Standard
P44 - Energy Save	OFF, ON	OFF

6.4.4 - P46 - Default values (it loads factory parameters)

☑ When this function is enabled, it resets the parameters to the factory default values, excepting parameter "P22", "P23" and "P28".

	Possibles Values	Factory Standard
P46 - default values	OFF, ON	OFF

6.4.5 -P50 - Function of the Relay RL3

☑ It enables the Relay RL3 to operate according to the parameters set below:

1- The N.O. contact from RL3 is closed when the SSW-03 Plus does not have a fault condition.

2- The N.O. contact from RL3 is closed when the SSW-03 Plus have a fault condition.

	Possible Values	Factory Standard
P50 - Programming of the Relay RL3	1, 2	1

6.4.6 - P51 - Function of the relay RL1

☑ It enables the Relay RL1 to operate according to the parameters set below:

1 - Function "Operation", the relay is switched ON instantaneously with the order Switch ON of the Soft-Starter, switching Off only when the Soft-Starter receives an order of general switching Off, or by ramp when the voltage reaches 30% of the rated voltage (30% U_N), as shown in Figure 6.7.

2 - Full voltage Function, the relay is only switched On after Soft-Starter has reached 100% of U_N, and switched Off when the Soft-Starter receives a command for general switching Off, or by ramp, as shown in Figure 6.7.

NOTE!
The function of full voltage is used to activate the by-pass contactor, the parameter P43 must be set at "On".

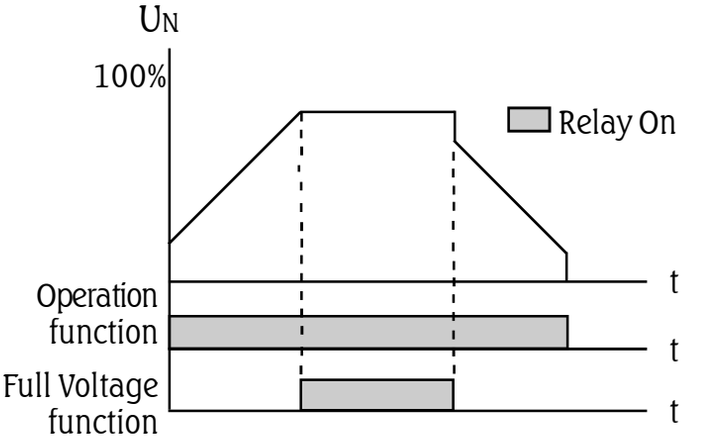


Figure 6.7 *- Functioning of the relays RL1 and RL2*

3 - Function direction of rotation. The relay is ON when digital input (DI3) is closed, and OFF when digital input is open (DI3). The relay controls a contactor that must be connected at the SSW-03 Plus output, which reverse the direction of rotation by inverting two motor phases - See Item 9.7 - Typical Application with Reversal.

NOTE!

1) For this function, the parameter P54 must be programmed at 4 and P28 = OFF.

2) Direction of rotation cannot be performed when Soft-Starter is connected within the motor delta connection (P28=ON).

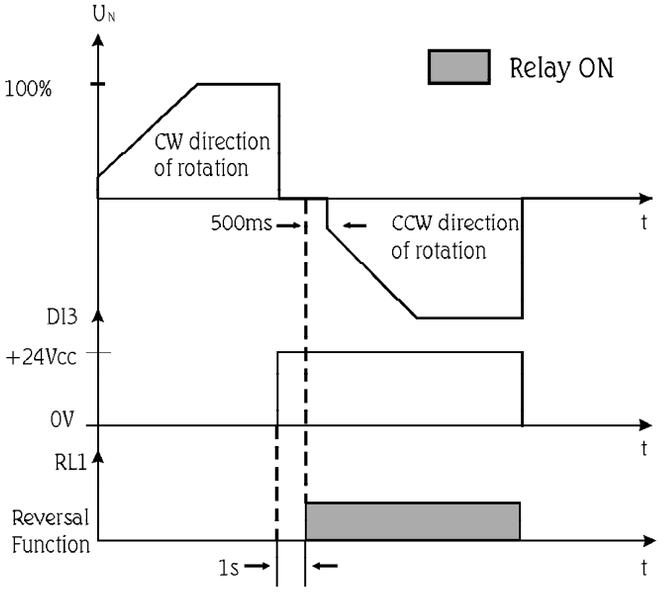


***Figure 6.8** - Functioning of the reversal relay RL1*

	Possible Values	Factory Standard
P51 - Function of the relay RL1	1, 2, 3	1

6.4.7 - P52 - Function of the relay RL2

☑ It enables the Relay RL2 to operate according to the parameters set bellow:

1-2 - Enables the Relay RL2 to operate according to the parameters described in Item 6.4.6.

3 - Function DC braking. The relay is ON when the Soft-Starter receives an OFF command. For this function an additional contactor must be used. See Item 9.6 - Typical diagram for DC braking.

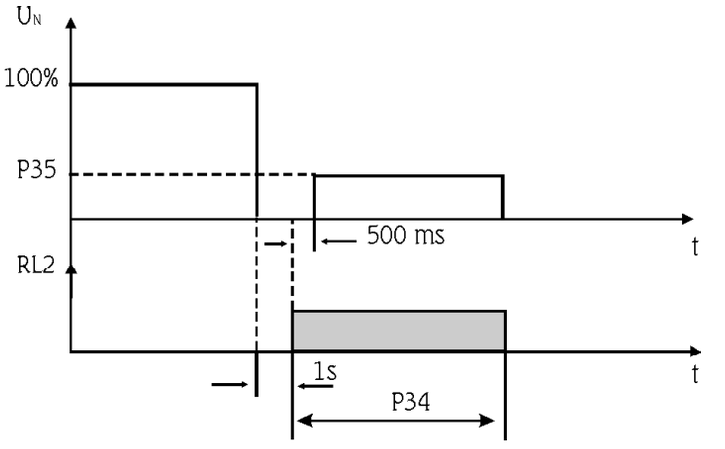


***Figure 6.9** - Operating mode of the RL2 for the DC braking*

NOTE!

1) Before starting programming, make all needed external connections.

2) DC-Braking cannot be performed when the Soft-Starter is connected within the motor delta connection (P28=ON).

	Possible Values	Factory Standard
P52 - Function of the relay RL2	1, 2, 3	2

6.4.8 - P53 - Programming of the Digital Input 2

☑ Enable the digital input 2 (terminal X2:2) to operate according to described codes:
OFF = without function

1 - Error Reset = it reset an error status every time the DI2 input is at +24Vdc (X2:5).

2 - External Error = can be used as additional load protection. It acts when the input is open.
Ex.: thermal protection for the motor by means of dry contact (without voltage) of a protection relay (thermostat).

3 - General Enabling = X2:2 must be connected to +24Vdc (X2:5) for the Soft-Starter to operate. If it is not connected, the SCRs firing pulses are disabled.

4 - Three Wire Control = allows control of the Soft-Starter through digital inputs: DI1 (X2:1) start input and DI2 (X2:2) stop input. According to item 9.3.

	Possible Values	Factory Standard
P53 - Programming of the Digital Input 2 (DI2)	OFF, 1, 2, 3, 4	1

6.4.9 - P54 - Programming of the digital input 3

☑ This parameter enables the digital input 3 (terminal X2:3) to operate according to the describe codes:

OFF = without function

1 - "Error Reset" (As described in item 6.4.8).

2 - "Extern Error" (As described in Item 6.4.8).

3 - "General Enabling" (As described in Item 6.4.8).

4 - "Direction of rotation". It enables the digital Input 3 (DI3), when connected to +24Vdc (X2:5), it drives the relay RL1 (as described in item 6.4.6) and realizes the reversal of the motor direction of rotation with the Soft-Starter. See Item 9.7 - Typic Application with Reversal.

NOTE!
For the function direction of rotation, parameter P51 must be set to "3".

	Possible Values	Factory Standard
P54 - Programming of the Digital Input 3 (DI3)	OFF, 1, 2, 3, 4	2

6.4.10 - P55 - Programming of the digital input 4

☑ This parameter enables the digital input 4 (terminal X2:4) to operate according to the described codes:
OFF = Without Programming

1 - "Error Reset" (As described in Item 6.4.8).

2 - "Extern Error" (As described in Item 6.4.8).

3 - "General Enabling" (As described in Item 6.4.8).

4 - "JOG Function". It enables the Digital Input 4 (DI4), when connected to+24Vdc (X2:5), and enables the SSW-03 Plus to apply the JOG voltage (P33) to the motor (as described in Item 6.3.14.

	Possible Values	Factory Standard
P55 - Programming of the Digital Input 4 (DI4)	OFF, 1, 2, 3, 4	OFF

6.4.11 - P56 - Programming of the analog output

☑ This parameter enables the analog 8 bits output (X2:8 and X2:9) (Voltage 0...10Vdc - gain adjustable at P57) and indicates the following magnitudes:
OFF = Without Programming

1 - "Current": proportional to the current that flows through the switch.

2 - "Voltage" proportional to the SSW-03 Plus output voltage.

3 - "Power Factor": porportional to the power factor of the load without considering the harmonic currents.

4 - "Thermal motor protection": proportional to the thermal state of the motor.

	Possible Values	Factory Standard
P56 - Programming of the Analog output (8 bits)	OFF, 1, 2, 3, 4	OFF

6.4.12 - P57 - Scaling of the Analog Output

☑ This parameter sets the scaling of the analog output (X2:8 and X2:9) that is defined by the parameter P56.

NOTE!
With gain 1.00 we will have the following conditions:

P56 = 1 Output: 10 Vdc, when 500% of the I_N of the Soft-Starter.

P56 = 2 Output: 10 Vdc when 100% of the U_N of the Soft-Starter output.

P56 = 3 Output: 10 Vdc when the load power factor is equal to 1.00.

P56 = 4 Output: 10 Vdc when the state of the thermal protection of the motor (P82) is equal to 250%.

	min.	Range	max.	Factory Standard
P57 - Analog Output (8 bits) Gain	0.00	shortest step 0.01	9.99	1.00

6.4.13 - P61 - Control enabling

Table 6.1 - *Command that depend on the P61 adjust*

Comands	P61 = OFF	P61 = ON		Description
	Digital Input	HMI	Serial	
I/O	X	X	X	Digital Input or HMI/Serial
JOG Function	X		X	Digital input 4 (DI4) or Serial
Direction of rotation	X		X	Digital input 3 (DI3) or Serial
General Enabling	X		X	Digital inputs 2, 3, 4 or serial

• I/O (Start/Stop): When P61 = OFF, it enables via digital inputs (DI1 or DI1 and DI2) the motor start/stop.
When P61 = ON, it enables the motor start/stop via HMI-3P and serial.
When P61 = ON, the digital input "DI1" is without function.

NOTE!
To make the selection through HMI-3P/serial or digital input, the motor must be locked, inclusive when the change is HMI-3P/serial to digital input (DI1), it must be open. If the digital input (DI1) is closed, the parametrization cannot be processed and the display flashes.

• JOG Function: This function can be programmed at the Digital Input (DI4) if P61=OFF; or P61=ON it operates via serial input.

• Function of the change of the Direction of Rotation:
This function can be programmed at the Digital Input (DI3) if P61=OFF, or P61=ON it operates via serial.

• General Enabling: This function can be used as "Emergency Stop" and it can be programmed for any of the following Digital Inputs DI2, DI3 or DI4

and also via serial (provided P61=ON). If more than one Digital Input is programmed for this function, the first that opens will be the emergency stop. If the command is also enabled for serial operation (P61=ON), all Digital Inputs programmed to General Enabling must be closed.

Table 6.2 - *Controls that do not depend on the setting of P61*

Commands	Digital Input	HMI	Serial	Description
Extern Error	X			Only at the Digital Input 2, 3 or 4.
Error Reset	X	X	X	avaliable at any.

- External Error: It can be programmed for any Digital Input DI2, DI3 or DI4. If there is no external error, there is also no actuation. If more than one digital Input has been programmed for "External Error", any input will actuate, when disconnected from +24Vdc (X2:5).
- Error Reset: The Error Reset is accepted via HMI-3P, serial and Digital Inputs DI2, DI3 or DI4, when so programmed. If more than one Digital Input if programmed, any one can reset the error status, requiring only the receipt of a +24Vdc (X2:5) pulse.

	Possible Values	Factory Standard
P61 - Command Enabling	OFF, ON	ON

6.4.14 - P62 - Address of the Soft-Starter at the communication network

☑ This parameter defines the address of Soft-Starter on the communication network. This is for use with the superdrive software.

	min.	Range	max.	Factory Standard
P62 - Address of the Soft-Starter on the Communication Network	1	shortest step 1	30	1

6.4.15 - P63 - Watch Dog Time of the Serial Communication

☑ This parameter can enable or disable the serial communication watch dog, as well as set the watch dog time. This protection (E29 Error) acts when the serial communication between the master and the Soft-Starter is interrupted, causing the action as set in parameter P64.

NOTE!
Enable this function only if there is **cyclic** serial communication with a Master.
Set the watch dog time according to the time between telegrams sent by the Master.

	min.	Range	max.	Factory Standard
P63 - Watch Dog Time of the Serial Communication	OFF, 1	shortest step 1s	5s	OFF

6.4.16 - P64 - Action After Watch Dog Time is Elapsed

☑ This parameter sets the action to be adopted after the watch dog time is elapsed.

NOTE!
P63 must be set different from OFF.

Values of P64:
1- Indicates only E29 error on the HMI of the Soft-Starter.
2 - Indicates E29 error and disables the Soft-Starter by ramp, if P04 is programmed different from OFF. If P04=OFF, the motor is stopped by inertia.
3 - Indicates E29 error and causes general disabling of the Soft-Starter. Its acts as Emergency. The motor is stopped by inertia.

	Posibles Values	Factory Standard
P64 - Action After Watch Dog Time is Elapsed	1, 2, 3	1

6.5 - MOTOR PARAMETERS: P21, P25, P26, P27

6.5.1 - P21 - Motor Current Setting (% IN of the switch)

- ☑ Sets the motor current value percentually relating to rated switch current.
- ☑ Monitors the overload condition according to the thermal class curve selected at P25, and protects the motor against overloads applied on the shaft.
  When the overload time is exceeded as defined by the thermal class protection, the motor is OFF and the HMI-3P display will show error E04.
- ☑ Parameter P21, P25, P26 and P27 are part of the thermal protection.
- ☑ To disable the thermal protection, set P21=OFF.

Ex: How to set P21:
1) Standard Connection
I_N of the switch = 170A
I_N of the motor = 140A

$$\frac{I_N \text{ of the motor}}{I_N \text{ of the switch}} = \frac{140A}{170A} = 0.823$$

P21 = 82.3%

2) Within motor delta connection
I_N of the switch = 120A
I_N of the motor = 140A

I_N of the delta switch = 120A x 1.73 = 207.8A

$$\frac{I_N \text{ of the motor}}{I_N \text{ of the delta switch}} = \frac{140A}{207.8A} = 0.673 \text{ x } I_N \text{ of the switch}$$

P21 = 67.3% of I_N of delta switch

NOTE!
The error E04, motor overload, remains in the memory, even if the CPU is reset, and when the CPU is switched Off, the last value is stored. The value is only decremented with the switch On and the motor Off.

	min.	Range	max.	Factory Standard
P21 - Adjust of the motor current	OFF, 30.0%In	shortest step 1%	200.0%In	OFF

6.5.2 - P25 - Thermal Class of the Motor Protection

P25	Action
5	Class 5
10	Class 10
15	Class 15
20	Class 20
25	Class 25
30	Class 30

Table 6.3 *- Thermal Classes*

- ☑ The Soft-Starter SSW-03 Plus is fitted with a Thermal Protection. This protection is very efficient for the motor protection. All Soft-Starter SSW-03 Plus models are fitted with this protection and always it is activated, error E04 is displayed and the motor is switched off.
- ☑ This thermal protection has curves that simulate the motor heating and cooling. The calculation is performed through a sophisticated software that estimates the motor temperature by means of the current that is supplied to the motor.
- ☑ The actuation curves of the motor Thermal Protection are according to IEC 60947-4-2 standard.
- ☑ The motor heating and cooling curves are based on long experience of the company with its motors. These curves adopt a standard three-phase motor with IP55 degree of protection. These curves also consider if the motor is cooled during operation or not.

☑ The cooling time of the thermal image depends on the motor power, i. e., for each power, a different cooling time is considered. If a different cooling time is required, this setting can be made at P27.

☑ The estimated value for the motor temperature is saved in non-volatile memory always the control board is switched off. Thus, always the control board is switched on, the last saved value will be returned.

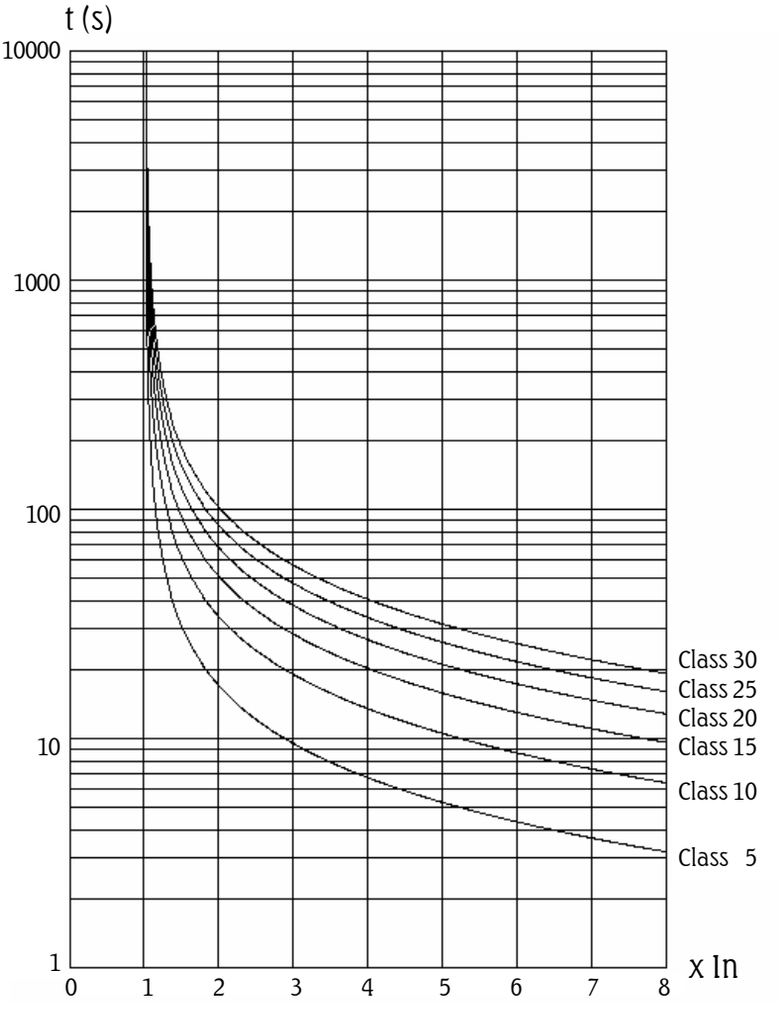


Figure 6.10 - *Thermal Classes for Cold Motor Protection*

☑ If a Service Factor different from 1.00 is used, the nominal current for the chart (figure 6.10) has to be corrected by the S.F. For example: a motor of In=100A and S.F.=1.15 has 1 x In=115A.

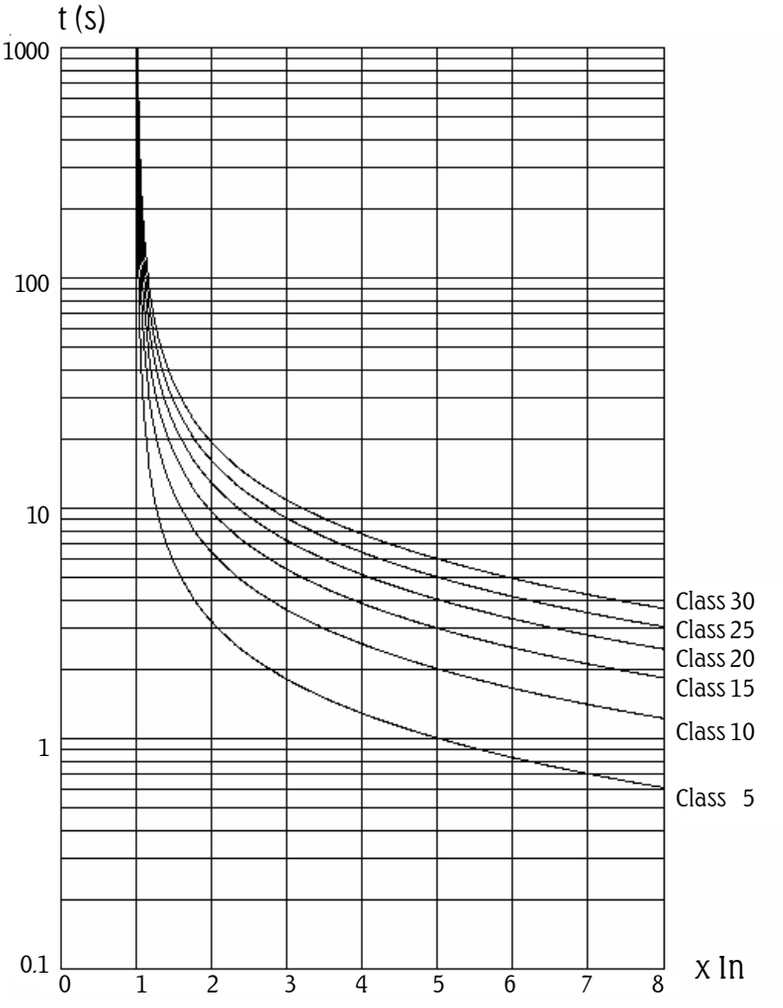


Figure 6.11 *- Thermal Classes for Hot Motor Protection*

☑ To determine the actuation times for applications inbetween no load and full load condition a multiplication factor dependent on the percentage of the motor current has to be applied.

Current %In	Factor
0%	1
20%	0.84
40%	0.68
60%	0.51
80%	0.35
100%	0.19

Table 6.4 *- Multiplication factor for the corrected Thermal Class times*

☑ EXAMPLE:

Correction of the actuation time:

A motor operating at 80% In is switched off and switched on immediately.
The starting duty is 3xIn @ 25s. The selected Thermal Class is Class 20 with 39s @ 3xIn.
The correction factor for 80% In in the table 6.4 is 0.35.
The corrected actuation time is: 0.35 x 39s = 13.7s, the actuation time is reduced from 39s at cold condition to 13.7s. This means that a immediate start is not possible before the thermal image of the motor has been cooled down.

NOTE!

For programming correctly the Thermal Class that should protect the motor against overheating, you must consider the allowed hot locked rotor time. This data is available in the catalog of the motor manufacturer.

☑ EXAMPLE:

Suggestions on how to program the Thermal Class correctly:

Motor data:
Power: 100hp
Voltage: 380V
Rated current (In): 140A
Service factor (S. F.): 1.00
Ip/In: 6.6
Locked rotor time: 12s at hot (Standard catalog information)
Speed: 1780rpm

Data about the motor + load Starting:
Starting by Voltage Ramp, average starting current:
3 x the rated motor current during 25s (3 x In @ 25s).

1) In the cold chart Figure 6.10, we can find the minimum required Thermal Class that allows motor start with reduced voltage:
For 3 x In @ 25s, we select the next higher class: 15

2) In the hot chart Figure 6.11, we can find the maximum Thermal Class that the motor will withstand due to the hot locked rotor time:
For 6.6 x In @ 12s, we select the next lower Class: 30

Now it is known that Thermal Class 15 allows cold start and Thermal Class 30 is the upper limit. Thus you must select a Thermal Class between these two Thermal Classes by considering the number of starts per hour and the time interval between motor On-Off procedures.

With a smaller Class selected, the motor protection will increase but, less starts per hour are allowed and longer time intervals between motor On-Off procedures are required.

On the other hand with a higher Class selected, the motor might be operated closer to the limit, thus more starts per hour are allowed and shorter time intervals between motor On-Off procedures can be used.

If you are not sure which Thermal Class should be adopted between these two limits, adopt the lowest Thermal Class firstly, and only during practical tests at full load operation select the Class that is more suitable to your requirements, without exceeding the upper limit.

NOTE!
If several Thermal Classes can be applied, program one that is most suitable for your application, protecting your motor according to your duty requirements.

NOTE!
If the motor is equipped with a temperature sensor (PTC or Thermostat) which is used for thermal protection, the thermal class of the SSW-03 Plus can be disabled by setting P21= Off.

6.5.3 - P26 - Motor Service Factor

☑ It sets the Motor Service Factor (SF) according to the motor nameplate data.
That value defines the load that the motor can drive.

	min.	Range	max.	Factory Standard
P26 - Motor Service Factor	0.80	shortest step 0.01	1.50	1.00

6.5.4 - P27 - Auto-reset of the Thermal motor image

☑ It sets the time for the auto-reset of the thermal motor image. The thermal decrement of the thermal motor image simulates the motor cooling time with load and without load, ON and OFF. The algorithm that realizes this simulation is base on tests applied on WEG motors IP55 standard according to your power programmed in the Soft-Starter parameters.
In application, where several starts per hour are required, you can use the auto-reset of the thermal image.

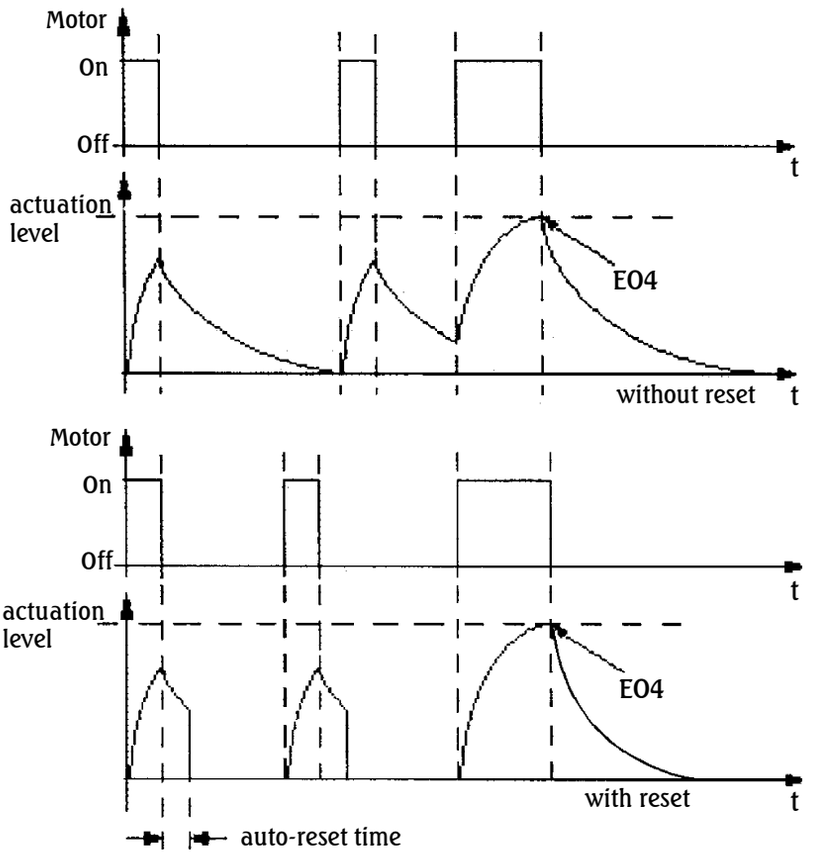


Figure 6.12- *Auto-reset of the thermal memory*

NOTE!
Please note that every time you use this function you can reduce the winding life of your motor.

	min.	Range	max.	Factory Standard
P27 - Auto-reset of the thermal memory	OFF, 1	shortest step 1s	600s	OFF

7 MAINTENANCE

7.1 - ERROR AND POSSIBLE CAUSES

☑ The Soft-Starter can indicate an error of incorret programming (E24), serial errors (E2X) and Hardware errors (E0X).

7.1.1 - PROGRAMMING ERROR (E24)

☑ The error of incorrect programming (E24) does not permit that the value, changed incorrectly, be accepted. This error occurs when any parameter is changed with the motor OFF and under the following incompatibility conditions between the parameters.

- P11 (Current Limitation) with P41 (kick Start).
- P28 (Within Delta) with P34 (DC-Braking).
- P28 (Within Delta) with P52=3 (DC-Braking).
- P28 (Within Delta) with P51=3 (Direction of Rotation).
- P28 (Within Delta) with P54=4 (Direction of Rotation).
- P34 (DC-Braking) with P28=ON (Within Delta).
- P41 (Kick Start) with P11 (Current Limitation).
- P41 (Kick Start) with P55=4 (JOG Function).
- P43 (By-Pass) with P44=ON (Energy-Save).
- P44 (Energy-Save) with P43=ON (By-Pass).
- P51=3 (Direction of Rotation) with P28=ON (Within Delta).
- P52=3 (DC Braking) with P28=ON (Within Delta).
- P54=4 (Direction of Rotation) with P28=ON (Within Delta).
- P55=4 (JOG Function) with P41 (Kick Start).
- P61 (HMI/DI) with DI1=ON (Digital Input).
- P61 (HMI/DI) with DI2=ON (JOG).

To abandon this error condition, press keys P, I, O.

7.1.2 - SERIAL

☑ Serial communication errors (E2X) do not permit the changing of the value or that the incorrectly transmitted value be accepted.
For further info, see please Serial Communication Manual - SSW-03.
To abandon this error condition, press keys P, I, O.

7.1.3 - HARDWARE ERRORS (E0X)

☑ Hardware errors (E0X) disable the Soft-Starter.
To abandon this error condition, switch OFF the equipment and switch it again ON, or press RESET key. Before doing this, you must eliminate the source of the error.

NOTE!
Long connection cables between the Soft-Starter and the motor (longer than 150m (492ft)) or shielded cables can show a high reactance. This may cause error "E01".

Solution:
Connect a three-phase reactance in series with the motor supply line. In this case, contact the manufacturer.

Note: Actuation form of the errors:
All errors E01...E08 switch Off the relay RL3 and disable the thyristor firing and indicate the error on the display.

Table 7.1- *Hardware errors*

ERROR	RESET	POSSIBLE CAUSE
E01	☑ Switch OFF/ON the electronics ☑ Or through key 0 RESET ☑ Or through digital input for reset ☑ Or through serial	☑ Phase-fault in the three-phase network ☑ Short-circuit or fault in the thyristor ☑ Motor is not connected ☑ Supply frequency with oscillation higher than 10%. ☑ Type of motor connection is wrong
E02		☑ The time of the ramp acceleration is shorter than the actual acceleration time since the function of the current limitation is activated.
E03		☑ Ambient temperature higher than 40ºC (104ºF) and current too high. ☑ Starting time with current limitation higher than specified by switch. ☑ Too many of successive starts. ☑ Fan is locked or defective
E04		☑ Set of P21, P25 and P26 too low relating to the used motor ☑ Load on the motor shaft too high ☑ Too many of successive starts
E05		☑ Pump is dry operating ☑ Load decoupled from the motor shaft
E06		☑ Short-circuit between phases ☑ Motor shaft is locked
E07		☑ Network phase sequence inverted at the input
E08		☑ Terminal board X2.3 and X2.5 is open (not connected to +24Vdc)

Table 7.2 *- Hardware errors and possible solutions*

PROBLEM	POINT TO BE CHECKED	CORRECTIVE ACTION
Motor does not run	☑ Wiring not correct	1. Check all power and control connections. For instance, check the digital input of extern error that must be connected to +24V.
	☑ Wrong programming	1. Check if the parameters are correct programmed for the application.
	☑ Error	1. Check if the Soft-Starter is not disabled due to a detected error condition (see table above).
Motor speed changes (oscillates)	☑ Loose connections	1. Disable the Soft-Starter, switch OFF the suplly voltage and tighten all connections. 2. Check if all intern Soft-Starter connections are tightened.
Motor speed too high or too low	☑ Motor nameplate data	1. Check if the motor is used according to its application
Display OFF	☑ HMI connections	1. Check the HMI connections to the Soft-Starter (control board CCS3.0X)
	☑ Check the supply voltage X1.1 and X1.2	1. The rated values must meet the following requirements: For 220-230Vac - Min.: 187Vac - Max. 253Vac; For 110-120Vac - Min.: 93.5Vac - Max. 132Vac
Jerk during deceleration	☑ Soft-Starter programming	1. Decrease the deceleration time setting on the parameter P04.

Table 7.3 - *Periodical Inspections after the commissioning*

COMPONENT	PROBLEM	CORRECTIVE ACTION
Terminals, connectors	Loose screws	Tighten them (2).
	Loose connectors	
Fans ([1])/ cooling System	Fans are dirt	Clean them.(2)
	Abnormal acoustic noise	Replace the fan.
	Abnormal vibration	
	Dust in the air filter	Clean or replace it.(3)
Printed circuit boards	Dust, oil, moisture accumulation, etc.	Clean them.(2)
	Smell	Replace them.
Power Module/ Power Connections	Dust, oil, moisture accumulation, etc.	Clean them.(2)
	Connection screws are loose	Tighten them (2).
Power Resistors	Discoloration	Replace them.
	Smell	

Note:

(1) We recommend to replace the fans after each 40,000 hours of operation.

(2) Every 6 months.

(3) Twice per month.

7.2 - PREVENTIVE MAINTENANCE

DANGER!
Disconnect always the supply voltage before attempting to service any electric component of the Soft-Starter.

Even after switching OFF the Soft-Starter, during a certain time high voltages may be present. Thus wait 3 minutes to allow a complete discharge of the power capacitors.
Always connect the equipment frame to the grounding (P.E) at the suitable point.

ATTENTION!
The electronic boards are fitted with components sensitive to electrostatic discharges.
Never touch the components or connectors directly. If this is necessary, touch before on the metallic frame or use a suitable grounding bracelet.

Never apply a high voltage test on the Soft-Starter!
If this is necessary, contact the manufacturer.

In order to avoid operation problems caused by unfriendly ambient conditions, such as high temperature, moisture, dirt, vibration or aging of the components, make periodical inspections on the Soft-Starter and installations.

7.2.1 - CLEANING INSTRUCTIONS

When it is necessary to clean the Soft-Starter folow these guidelines:

a) Cooling system:
- Switch OFF Soft-Starter power supply.
- Remove all the dust located on the ventilation openings of the enclosure using a plastic brush or flannel.
- Remove all the dust accumulated on the heatsink fins and fans using compressed air.

b)Printed circuit boards (PCBs):
- Switch OFF Soft-Starter power supply.
- Remove all the dust or moisture accumulated on the board using a anti-static brush and/or a compressed air ion gun (ex: charger buster ion gun (non-nuclear) Ref. A6030-6 from DESCO). If necessary remove PCBs from the Soft-Starter.

7.3 - CHANGING SUPPLY FUSE

1. Disconnect power supply of the Soft-Starter.

DANGER!
Disconnect always the supply voltage before attempting to service any electric component of the Soft-Starter.
Even after switching OFF the Soft-Starter, during a certain time high voltages may be present. Thus wait 3 minutes to allow a complete discharge of the power capacitors.

2. Open the enclosure of the Soft-Starter.

3. Find the fuse on the board CCS3 and replace it by the type specified in the spare parts list.

4. Close the Soft-Starter.

7.4 - SPARE PART LIST

Name	Item Nº	Specification	Types (Amper) 220...440 Vac												
			120	170	205	255	290	340	410	475	580	670	800	900	1100	1400
			Units per Soft-Starter													
Thyristor Module	0303.8238	Thyristor Module 160A 1200V	3													
	0303.8262	Thyristor Module 230A 1200V		3												
	0303.8980	Thyristor Module 250A 1200V			3											
Disc Thyristor	0303.9463	Disc thyristor 720A 1200V				6	6	6								
	0303.9455	Disc thyristor 990A 1200V							6							
	0303.9447	Disc thyristor 1650A 1200V								6	6	6	6			
	0303.7142	Disc thyristor 1800A 1200V												6	6	
	0303.7207	Disc thyristor 2400A 1200V														6
RC Snuber	0301.1631	Wire Resistor 25R 50W 10%				3	3	3	3	3	3	3	3	3	3	3
	0302.4490	Polyprop. capacitor 0,47uf 850V				3	3	3	3	3	3	3	3	3	3	3
Fans*	0400.1494	Fan 120x120mm 220Vac				3	3	3	3							
	0400.2547	Fan 150x172mm 220Vac	1	1	1					2	2	3				
	0400.2571	Fan 120x120mm 110Vac				3	3	3	3							
	0400.2555	Fan 150x172mm 110Vac	1	1	1					2	2	3				
	0400.3519	Fan 225x225mm 110Vac											2	2		
	0400.3500	Fan 225x225mm 220Vac											2	2		
	0400.3403	Fan 280x280mm 220Vac													2	2
Source Fuse	0305.5620	Glass fuse 0,5A 250V	1	1	1	1	1	1	1	1	1	1	1	1	1	1
HMI-3P	12052	Humam/Machine Interface HMI-3P	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CCS3.00	4160.1784	Board Control	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RCS1.00	4160.0357	RC Snuber Board		3	3											
RCS2.00	4160.0829	RC Snuber Board	3													
Currernt Transform.	0307.2606	CT 1500/5A 2,5VA 2,5%	2	2	2	2	2	2								
	0307.2614	CT 3000/5A 2,5VA 2,5%							2	2	2					
	0307.2789	CT 4000/5A 2,5VA 2,5%										2	2			
	0307.2843	CT 5000/5A 2,5VA 2,5%												2		
	0307.0840	CT 7000/5A 2,5%VA 2,5%													2	2
FIS 1.00	4160.1230	Filter Board	1													
FIS 1.01	4160.1242	Filter Board				1	1	1	1	1	1	1	1	1	1	1
FIS 1.02	4160.1256	Filter Board		1	1											

* Note: a) The 110Vac fan is used in the SSW-03.XX/YYY-YYY/1 - PL
b) The 220Vac fan is used in the SSW-03.XX/YYY-YYY/2 - PL

7 MAINTENANCE

Name	Item Nº	Specification	Types (Amper) 460...575 Vac													
			120	170	205	255	290	340	410	475	580	670	800	900	1100	1400
			Units per Soft-Starter													
Thyristor Module	0303.9617	Thyristor Module 160A 1600V	3													
	0303.9552	Thyristor Module 230A 1600V		3												
	0303.9560	Thyristor Module 250A 1600V			3											
Disc Thyristor	0303.9579	Disc thyristor 720A 1600V				6	6	6								
	0303.9587	Disc thyristor 990A 1600V							6							
	0303.9595	Disc thyristor 1650A 1600V								6	6	6	6			
	0303.7150	Disc thyristor 1800A 1600V												6	6	
	0303.7215	Disc thyristor 2400A 1600V														6
RC Snuber	0301.1631	Wire Resistor 25R 50W 10%				3	3	3	3	3	3	3	3	3	3	3
	0302.4490	Polyprop. capacitor 0,47uf 850V				3	3	3	3	3	3	3	3	3	3	3
Fans*	0400.1494	Fan 120x120mm 220Vac				3	3	3	3							
	0400.2547	Fan 150x172mm 220Vac	1	1	1					2	2	3				
	0400.2571	Fan 120x120mm 110Vac				3	3	3	3							
	0400.2555	Fan 150x172mm 110Vac	1	1	1					2	2	3				
	0400.3519	Fan 225x225mm 110Vac											2	2		
	0400.3500	Fan 225x225mm 220Vac											2	2		
	0400.3403	Fan 280x280mm 220Vac													2	2
Source Fuse	0305.5620	Glass fuse 0,5A 250V	1	1	1	1	1	1	1	1	1	1	1	1	1	1
HMI-3P	12052	Humam/Machine Interface HMI-3P	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CCS3.01	4160.1785	Board Control	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RCS1.01	4160.0527	RC Snuber Board		3	3											
RCS2.01	4160.0837	RC Snuber Board	3													
Currernt Transform.	0307.2606	CT 1500/5A 2,5VA 2,5%	2	2	2	2	2	2								
	0307.2614	CT 3000/5A 2,5VA 2,5%							2	2	2					
	0307.2789	CT 4000/5A 2,5VA 2,5%										2	2			
	0307.2843	CT 5000/5A 2,5VA 2,5%												2		
	0307.0840	CT 7000/5A 2,5%VA 2,5%													2	2
FIS 1.04	4160.1299	Filter Board	1													
FIS 1.05	4160.1302	Filter Board				1	1	1	1	1	1	1	1	1	1	1
FIS 1.03	4160.1280	Filter Board		1	1											

* Note: a) The 110Vac fan is used in the SSW-03.XX/YYY-YYY/1 - PL
b) The 220Vac fan is used in the SSW-03.XX/YYY-YYY/2 - PL

8 TECHNICAL CHARACTERISTICS

8.1 - POWER DATA

- ☑ Line Voltage:
  - ⇨ voltage : + 10%, -15% (with motor power loss)
  - ⇨ frequency : 50/60Hz ± 10%
  - ⇨ Start Duty: 3 x I_N for 30 sec, 10 starts per hour (Standard Connection) -
    3 x I_N for 25 sec, 10 starts per hour (Delta Inside Connection)
- ☑ Overvoltage category III (EN61010/UL508).
- ☑ Transient voltages according to overvoltage category III.

8.2 - POWER / CURRENT TABLE

8.2.1 Table of Power and Currents for Three Cable Standard Connection (Ambient Temperature of 40°C (104°F)).

Type SSW-03 Plus	40ºC			Rated Dissipaded Power	40ºC							
	Rated Current 3xI_N @ 30s	Rated Current 4.5xI_N @ 30s	Maximum Current at. Cont. Duty		220V		380V		440V		575V	
	A	A	A	W	HP	kW	HP	kW	HP	kW	HP	kW
120	120	80	144	475	50	37	75	56	100	75	125	93
170	170	113	204	655	75	56	125	93	125	93	150	112
205	205	137	246	781	85	63	150	112	175	130	220	164
255	255	170	306	986	100	75	175	130	200	149	250	186
290	290	193	348	1112	125	93	200	149	250	186	300	224
340	340	227	408	1292	140	104	250	186	280	209	350	261
410	410	273	492	1544	175	130	300	224	350	261	450	336
475	475	317	570	1780	200	149	340	254	400	298	500	373
580	580	387	696	2157	250	186	400	298	500	373	628	468
670	670	447	804	2508	270	201	450	336	550	410	750	559
800	800	533	960	3051	300	224	550	410	700	522	850	634
950	950	633	1140	3591	400	298	750	559	800	597	1150	858
1100	1100	733	1320	4225	450	336	800	597	900	671	1200	895
1400	1400	933	1680	5305	600	447	1000	746	1200	895	1500	1119

8.2.2 Table of Power and Currents for Three Cable Standard Connection (Ambient Temperature of 55°C (131°F))

Type SSW-03 Plus	55ºC			Rated Dissipaded Power	55ºC							
	Rated Current 3xI_N @ 30s	Rated Current 4.5xI_N @ 30s	Maximum Current at. Cont. Duty		220V		380V		440V		575V	
	A	A	A	W	HP	kW	HP	kW	HP	kW	HP	kW
120	100	67	120	403	40	30	75	56	75	56	100	75
170	145	97	174	565	50	37	100	75	100	75	150	112
205	170	113	204	655	75	56	125	93	125	93	175	130
255	255	170	306	986	100	75	175	130	200	149	250	186
290	290	193	348	1112	125	93	200	149	250	186	300	224
340	290	193	348	1112	125	93	200	149	250	186	300	224
410	380	253	456	1436	150	112	270	201	300	224	400	298
475	475	317	570	1780	200	149	350	261	400	298	500	373
580	500	333	600	1869	200	149	370	276	430	321	550	410
670	550	367	660	2076	225	168	400	298	450	336	600	447
800	620	413	744	2403	250	186	450	336	500	373	700	522
950	800	533	960	3051	300	224	600	447	700	522	850	634
1100	850	567	1020	3325	375	280	650	485	750	559	950	708
1400	1080	720	1296	4153	450	336	800	597	900	671	1200	895

NOTE!
The maximum, powers indicated in the table above are based on 3 x I_N @ 30s and 10 starts per hour. They are also based on WEG IV pole standard Motors.

8.2.3 Table of Powers and Currents for 6 Cable Connection Within Motor Delta Connection (Ambient Temperature 40°C (104°F))

Type SSW-03 Plus	40ºC			Rated Dissipaded Power	40ºC							
	Rated Current 3xIN @ 30s	Rated Current 4.5xIN @ 30s	Maximum Current at. Cont. Duty		220V		380V		440V		575V	
	A	A	A	W	HP	kW	HP	kW	HP	kW	HP	kW
120	208	138	249	475	75	56	150	112	175	130	225	168
170	294	196	353	655	125	93	200	149	250	186	300	224
205	355	236	426	781	150	112	250	186	300	224	400	298
255	441	294	529	986	175	130	300	224	350	261	450	336
290	502	334	602	1112	200	149	350	261	400	298	550	410
340	588	392	706	1292	250	186	400	298	500	373	650	485
410	709	473	851	1544	300	224	500	373	600	447	750	559
475	822	548	986	1780	350	261	600	447	700	522	900	671
580	1003	669	1204	2157	400	298	700	522	850	634	1100	820
670	1159	773	1391	2508	450	336	850	634	950	708	1250	932
800	1384	923	1661	3051	550	410	1000	746	1150	858	1500	1119
950	1644	1096	1972	3591	650	485	1200	895	1400	1044	1800	1342
1100	1903	1269	2284	4225	800	597	1350	1007	1600	1193	2100	1566
1400	2422	1615	2906	5305	1000	746	1750	1305	2050	1529	2650	1976

8.2.4 Table of Powers and Currents for 6 Cable Connection Within Motor Delta Connection (Ambient Temperature 55°C (131°F))

Type SSW-03 Plus	55ºC			Rated Dissipaded Power	55ºC							
	Rated Current 3xIN @ 30s	Rated Current 4.5xIN @ 30s	Maximum Current at. Cont. Duty		220V		380V		440V		575V	
	A	A	A	W	HP	kW	HP	kW	HP	kW	HP	kW
120	173	115	208	403	75	56	125	93	150	112	175	130
170	251	167	301	565	100	75	175	130	200	149	270	201
205	294	196	353	655	125	93	200	149	250	186	300	224
255	441	294	529	986	175	130	300	224	350	261	450	336
290	502	334	602	1112	200	149	350	261	400	298	550	410
340	502	334	602	1112	200	149	350	261	400	298	550	410
410	657	438	789	1436	250	186	450	336	550	410	700	522
475	822	548	986	1780	330	246	600	447	650	485	900	671
580	865	577	1038	1869	350	261	630	470	700	522	950	708
670	952	634	1142	2076	400	298	700	522	800	597	1050	783
800	1073	715	1287	2403	450	336	750	559	900	671	1150	858
950	1384	923	1661	3051	550	410	1000	746	1150	858	1500	1119
1100	1471	980	1765	3325	600	447	1050	783	1250	932	1600	1193
1400	1868	1246	2242	4153	750	559	1350	1007	1550	1156	2050	1529

NOTE!

The max. powers indicated in the Table above are based on 3xIN @ 25s and 10 starts per hour. They are also based on WEG IV pole standard motors.

The max. continuous duty current indicated above can only be applied for continuous duty with only 1 start per hour, not allowing the 10 starts per hour mentioned above.

8 TECHNICAL CHARACTERISTICS

8.3 - MECHANICAL DATA

☑ See figure

☑ Finish: - Electrostatic Epoxy Powder Paint
- Colour: Cover - light-gray - RAL 7032
Cabinet - dark-gray - RAL 7022

8.4 - ELECTRONICS DATA

☑ Permited mains oscillations:
⇨ Voltage: 110/120V or 220/230V ± 10%
⇨ Frequency: 50/60Hz ± 10%

8.5 - ELECTRONICS DATA / GENERAL

Control	Method	☑ Voltage variation under load
Inputs	Analog	☑ 01 differential input: 0...10Vdc, 0...20mA or 4...20mA, non isolated ☑ Resolution: 10 bits ☑ Programmable functions
	Digital	☑ 04 Galvanically isolated input (optocoupled), 24Vdc ☑ Programmable functions
Outputs	Analog	☑ 01, non isolated, resolution 8 bits - 0...10V ☑ Programmable functions
	Relay	☑ 02 relays, NO contact, 250V/1A ☑ Programmable functions ☑ 01 relay, NO, NC contact - 250V/1A specific for faults.
Safety	Protections	☑ Under/Overcurrent at the output of the Soft-Starter ☑ Phase fault for the supply ☑ Motor phase fault (motor non connected) ☑ Mains frequency with ± 10% oscillation ☑ Tyristor fault ☑ Inverted phase sequence (programmable) ☑ Overtemperature at the power stage ☑ Overload at the output (I^2t). ☑ Extern fault ☑ CPU Error ☑ Programming error ☑ Error the serial interface
Communication	Serial Interface	☑ RS 232

8 TECHNICAL CHARACTERISTICS

Human Machine Interface	HMI-3P (Destachable)	☑ 05 keys: ON, OFF, parameter content / increase, parameter / content / decrease, parameter / content. ☑ 04 Displays - 7 segment LEDs ☑ Permits access / changing of all parameters ☑ Display accuracy - Current: ± 10% at full scale - Power: ± 5% at full scale ☑ Types for extern mounting: - HMI-3P.1 - 1 m (3.28ft) cable - HMI-3P.2 - 2 m (6.56ft) cable - HMI-3P.3 - 3 m (9.84ft) cable
Fulfilled Standards	UL 508 EN60947-4-2	☑ Industrial Control Equipment. ☑ Low voltage switchgear - AC. motor controllers

9 APPENDIX

9.1 CONFORMITY

The SSW-03 line, the models 120...580A with 200V to 400 rated voltage were tested too meet the following.

9.1.1 EMC AND LVD DIRECTIVES

EMC Directive 89/336/EEC (Electromagnetic Compatibility), using a Technical Construction File and the following standards:

EN60947-4-2: Low-voltage switchgear and controlgear Part 4, contactors and motor-starters Section 2. AC semiconductor motor controllers and starters.

Low Voltage Directive (LVD) 73/23/EEC

ATTENTION!
The SSW-03 line has been designed for class A equipment. Use of the products in domestic environments may cause radio interference, in which case the user may be required to employ additional mitigation methods.

NOTE!
The conformity of the Soft-Starter to any standard does not guarantee that the entire installation will conform.
Many other factors can influence the total installation. Only direct measurements can verify total conformity.

9.1.2 REQUIREMENTS FOR CONFORMING INSTALLATIONS

9.1.2.1 EMC DIRECTIVE

The following items are required for CE conformance:

1. The Soft-Starters must be installed into closed metallic boxes or panels that have a door only able to be opened with a tool. A suitable cooling must be provided to ensure that the temperature will be within the allowed range. See item 3.1.1.
2. Output cables (motor cables) must be armored, flexible armored or installed inside a metallic conduit or trunking with equivalent attenuation.
3. Control (I/O) and signal wiring must be shielded or installed inside a metallic conduit or trunking with equivalent attenuation.
4. The remote keypad (External HMI-3P) cable must be shielded or installed inside a metallic conduit or trunking with equivalent attenuation.
5. Grounding as stated in this Manual item 3.2.1.

9.1.2.2 Low Voltage Directive (LVD)

The following items are required for CE conformance:

1. The same as item 1 above.
2. The installation must provide a supply disconnecting (isolation) device. A hand-operated supply disconnecting device must be provided for each income supply and be near to the equipment. This device must disconnect the Soft-Starter from the supply when required (e. g. during work on the electrical equipment). See EN60204-1, 5.3. Specify the current and voltage of this disconnecting device according to the data given in the item 8.1 and 8.2.

DANGER!
This equipment must not be used as an emergency stop mechanism (See EN60204, 9.2.5.4).

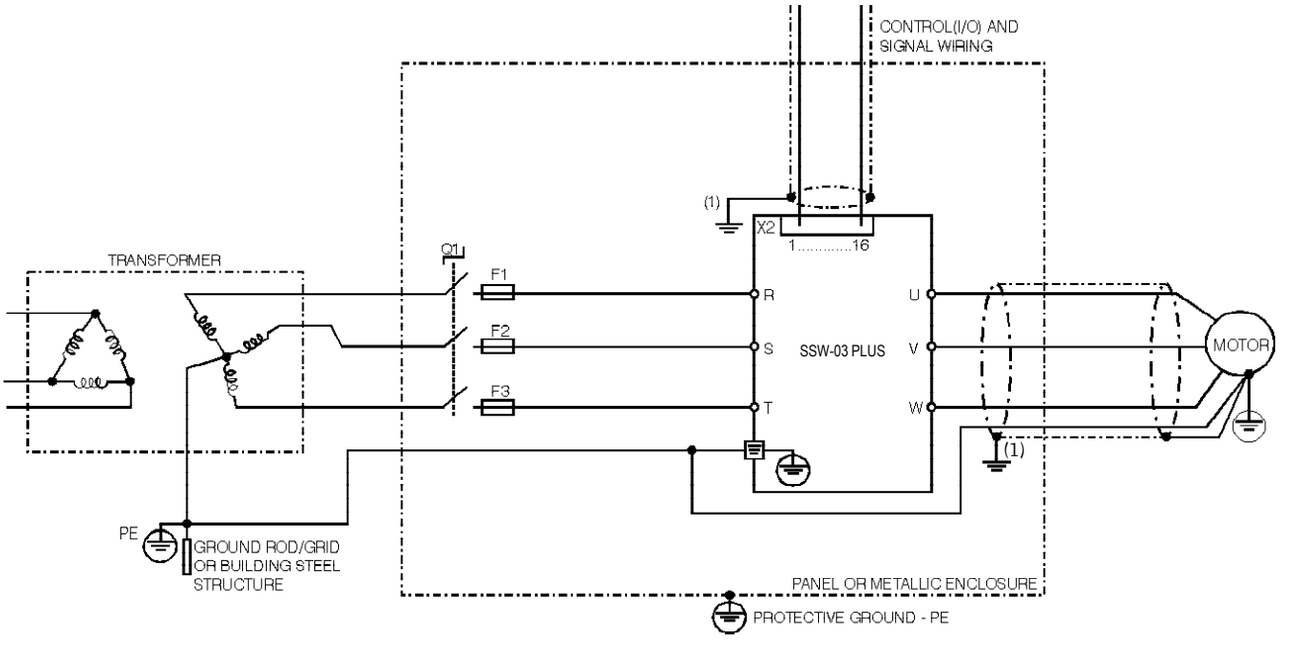
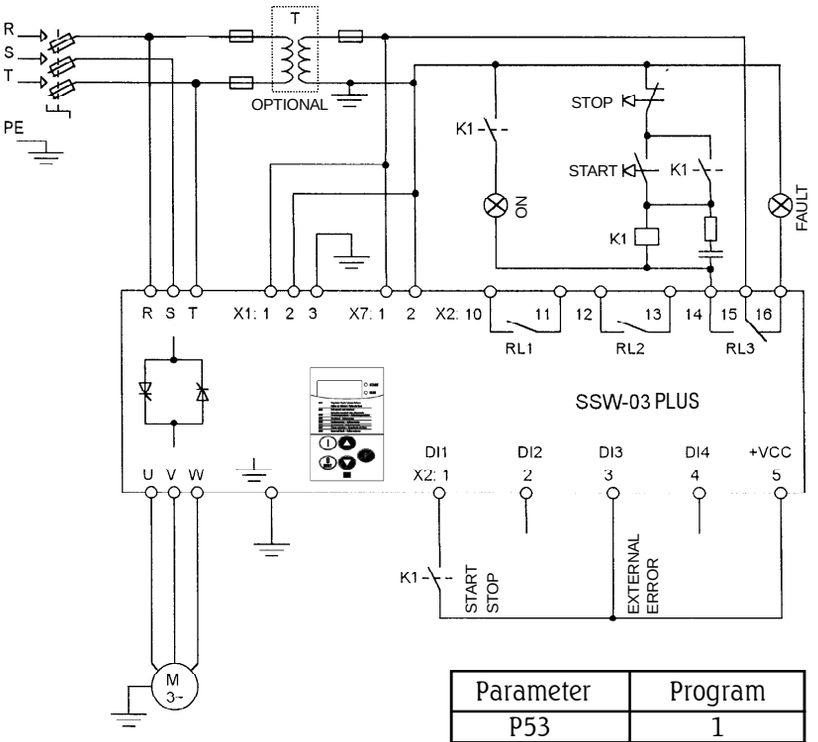


Figure 9.1 *- Soft-Starter SSW-03 Plus connections*

(1) The cables shielding must be solidly connected to the common backplane, using preferably a bracket.
The backplane must be electrically conductive (have no paint).

9 APPENDIX

9.2 - RECOMMENDED APPLICATION WITH TERMINALS FOR TWO WIRE CONTROL



Parameter	Program
P53	1
P54	2
P55	OFF
P61	OFF

Obs.: It's necessary to use normal fuses or breaker to protect the installation. Ultra-Fast fuses are not necessary for the SSW-03 Plus operation, but they are recommended for SCR protection.

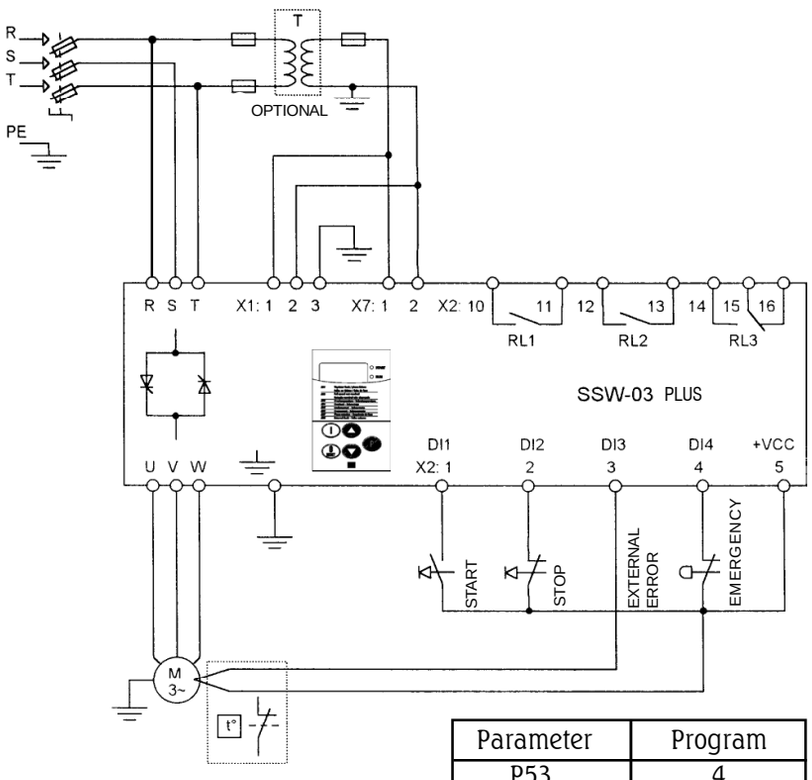
The transformer "T" is optional and must be utilized when the line voltage is different than the electronics and fan voltage.

For the integral motor protection it's recommended to install one or more thermostats in the motor. If the thermostat is not used, the external input error (DI3) from SSW-03 Plus must be connected to +Vdc.

NOTE!

A contactor in the mains input (see 9.4) is necessary to protect the motor in case there is a phase failure which is caused by damage in the SSW-03 Plus power circuit with the application of the power isolation contactor.

9.3 - RECOMMENDED APPLICATION WITH TERMINALS FOR THREE WIRE CONTROL



Parameter	Program
P53	4
P54	2
P55	3
P61	OFF

Obs.: It's necessary to use normal fuses or breaker to protect the installation. Ultra-Fast fuses are not necessary for the SSW-03 Plus operation, but they are recommended for SCR protection.

The transformer "T" is optional and must be utilized when the line voltage is different than the electronics and fan voltage.

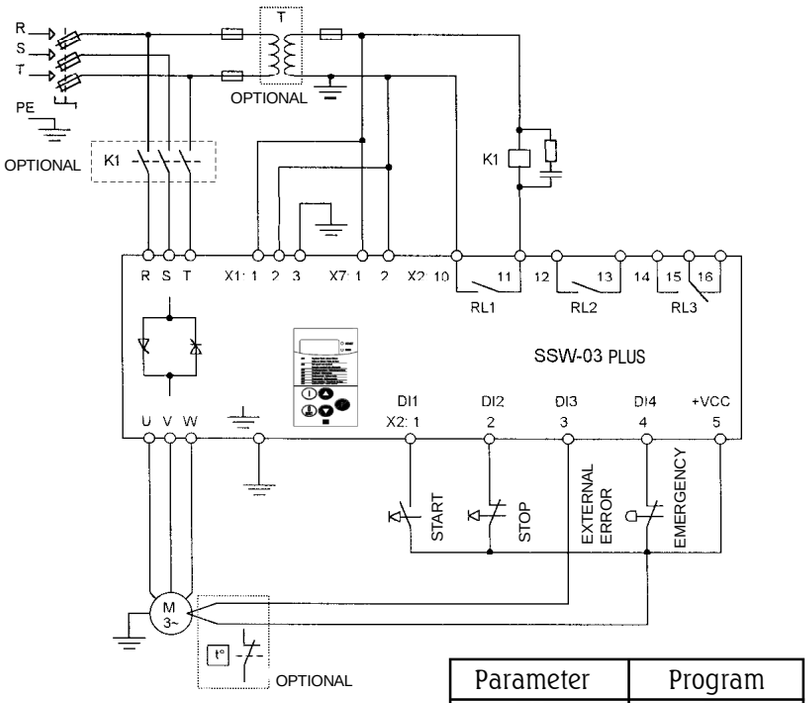
For the integral motor protection it's recommended to install one or more thermostats in the motor. If the thermostat is not used, the external input error (DI3) from SSW-03 Plus must be connected to +Vdc.

NOTE!

A contactor in the mains input (see 9.4) is necessary to protect the motor in case there is a phase failure which is caused by damage in the SSW-03 Plus power circuit with the application of the power isolation contactor.

9 APPENDIX

9.4 - RECOMMENDED APPLICATION WITH TERMINALS FOR THREE WIRE CONTROL AND POWER ISOLATION CONTACTOR



Parameter	Program
P43	OFF
P51	1
P53	4
P54	2
P55	3
P61	OFF

Obs.: It's necessary to use normal fuses or breaker to protect the installation. Ultra-Fast fuses are not necessary for the SSW-03 operation, but they are recommended for SCR protection.

The transformer "T" is optional and must be utilized when the line voltage is different than the electronics and fan voltage.

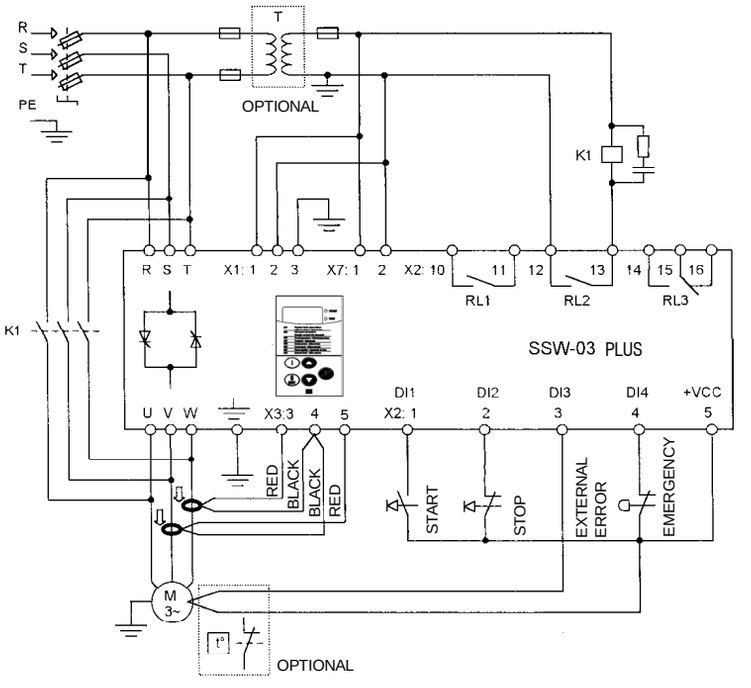
The isolation contactor "K1" is optional, and is not necessary for the SSW-03 Plus operation. However due to protection and safety reasons it's recommended. In case of maintenance the input fuses must be removed for a complete disconnection of the SSW-03 Plus from the line.

For the integral motor protection it's recommended to install one or more thermostats in the motor. If the thermostat is not used, the external input error (DI3) from SSW-03 Plus must be connected to +Vdc.

NOTE!

Contactor "K1" is necessary to protect the motor in case there is a phase failure which is caused by damage in the SSW-03 Plus power circuit with the application of the power isolation contactor.

9.5 - RECOMMENDED APPLICATION WITH TERMINALS FOR THREE WIRE CONTROL AND BY-PASS CONTACTOR



Parameter	Program
P43	ON
P52	2
P53	4
P54	2
P55	3
P61	OFF

Obs.: It's necessary to use normal fuses or breaker to protect the installation. Ultra-Fast fuses are not necessary for the SSW-03 Plus operation, but they are recommended for SCR protection.

The transformer "T" is optional and must be utilized when the line voltage is different than the electronics and fan voltage.

For the integral motor protection it's recommended to install one or more thermostats in the motor. If the thermostat is not used, the external input error (DI3) from SSW-03 Plus must be connected to +Vdc.

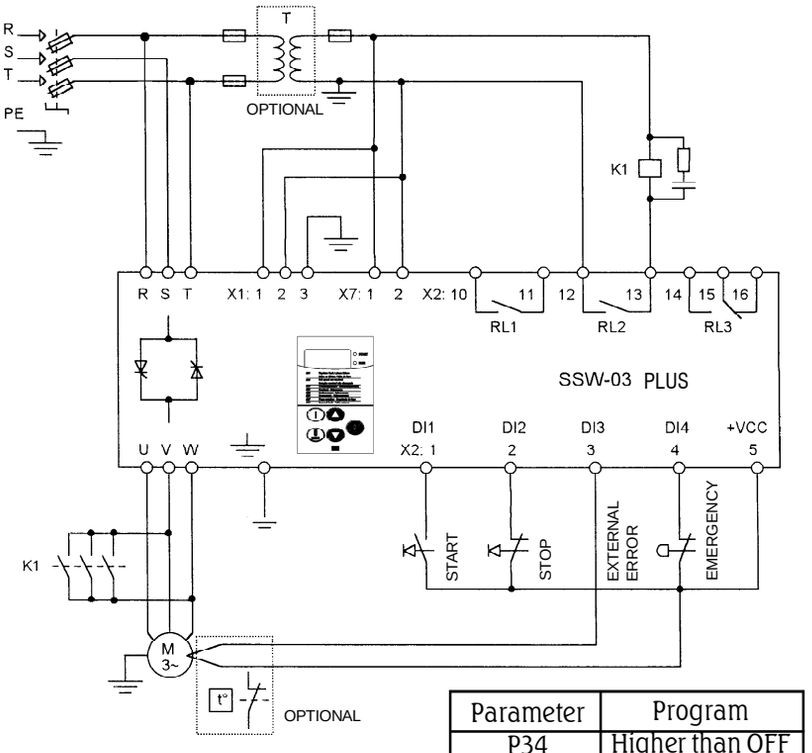
NOTE!

A contactor in the mains input (see 9.4) is necessary to protect the motor in case there is a phase failure which is caused by damage in the SSW-03 Plus power circuit.

To maintain motor thermal protection after the Soft-Starter is by-passed, the Current Transformers (CT) must be connected in conformity with the diagram above.

9 APPENDIX

9.6 - RECOMMENDED APPLICATION WITH TERMINALS FOR THREE WIRE CONTROL AND DC BRAKING



Parameter	Program
P34	Higher than OFF
P35	Load set
P52	3
P53	4
P54	2
P55	3
P61	OFF

Obs.: It's necessary to use normal fuses or breaker to protect the installation. Ultra-Fast fuses are not necessary for the SSW-03 Plus operation, but they are recommended for SCR protection.

The transformer "T" is optional and must be utilized when the line voltage is different than the electronics and fan voltage.

For the integral motor protection it's recommended to install one or more thermostats in the motor. If the thermostat is not used, the external input error (DI3) from SSW-03 Plus must be connected to +Vdc.

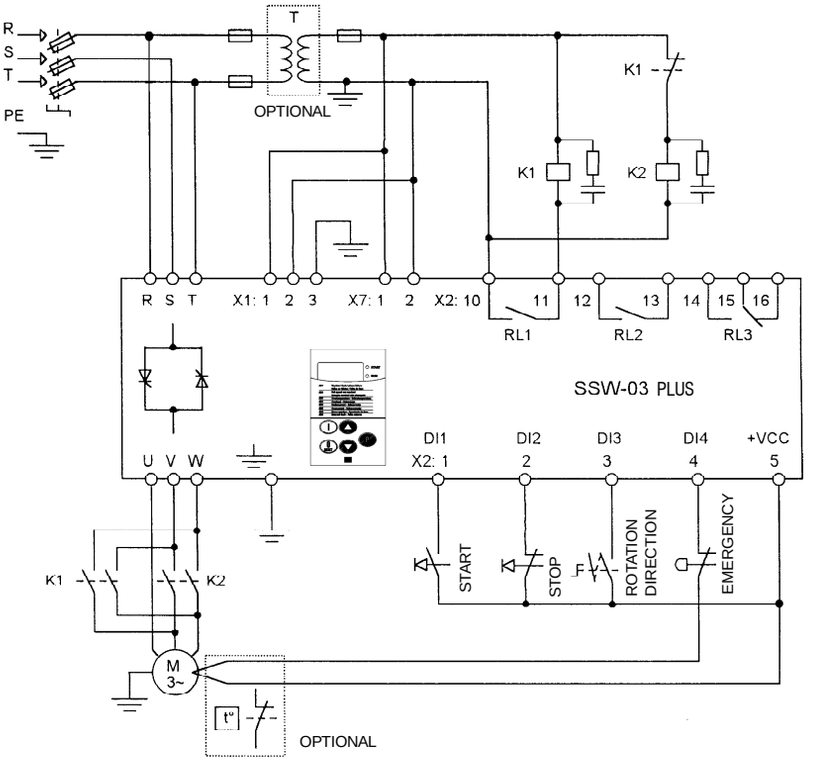
NOTE!

A contactor in the mains input (see 9.4) is necessary to protect the motor in case there is a phase failure which is caused by damage in the SSW-03 Plus power circuit with the application of the power isolation contactor.

For DC braking you can select the contactor "K1" to use the three contacts in parallel.

9 APPENDIX

9.7 - RECOMMENDED APPLICATION WITH TERMINALS FOR THREE WIRE CONTROL AND MOTOR SPEED REVERSAL



Parameter	Program
P04	OFF
P51	3
P53	4
P54	4
P55	3
P61	OFF

Obs.: It's necessary to use normal fuses or breaker to protect the installation. Ultra-Fast fuses are not necessary for the SSW-03 Plus operation, but they are recommended for SCR protection.

The transformer "T" is optional and must be utilized when the line voltage is different than the electronics and fan voltage.

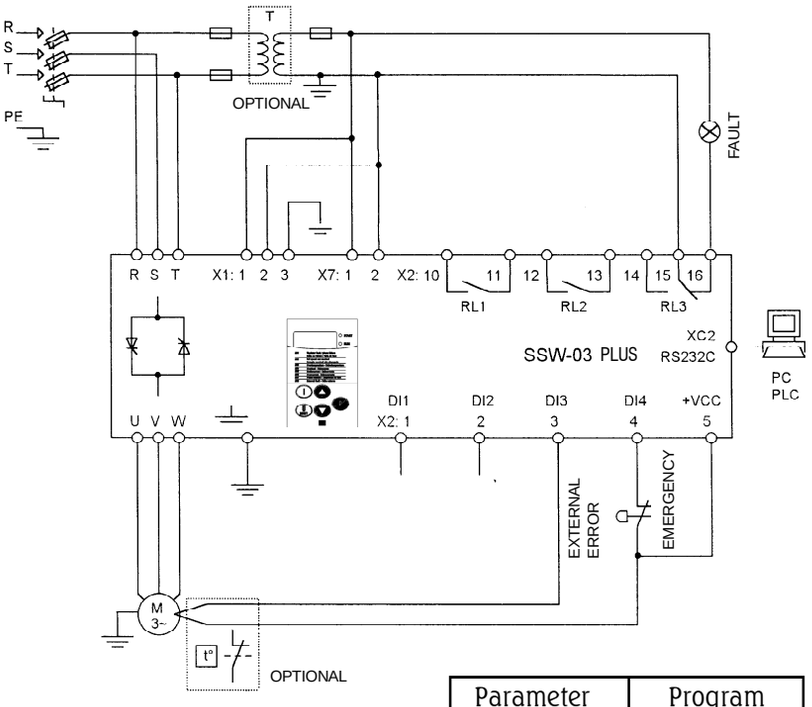
For the integral motor protection it's recommended to install one or more thermostats in the motor. If the thermostat is not used, the external input error (DI3) from SSW-03 Plus must be connected to +Vdc.

NOTE!

A contactor in the mains input (see 9.4) is necessary to protect the motor in case there is a phase failure which is caused by damage in the SSW-03 Plus power circuit with the applications of the power isolation contactor.

9 APPENDIX

9.8 - RECOMMENDED APPLICATION WITH PC OR PLC COMMAND



Parameter	Program
P54	2
P55	3
P61	ON
P62	ADDRESS

Obs.: It's necessary to use normal fuses or breaker to protect the installation. Ultra-Fast fuses are not necessary for the SSW-03 Plus operation, but they are recommended for SCR protection.

The transformer "T" is optional and must be utilized when the line voltage is different than the electronics and fan voltage.

For the integral motor protection it's recommended to install one or more thermostats in the motor. If the thermostat is not used, the external input error (DI3) from SSW-03 Plus must be connected to +Vdc.

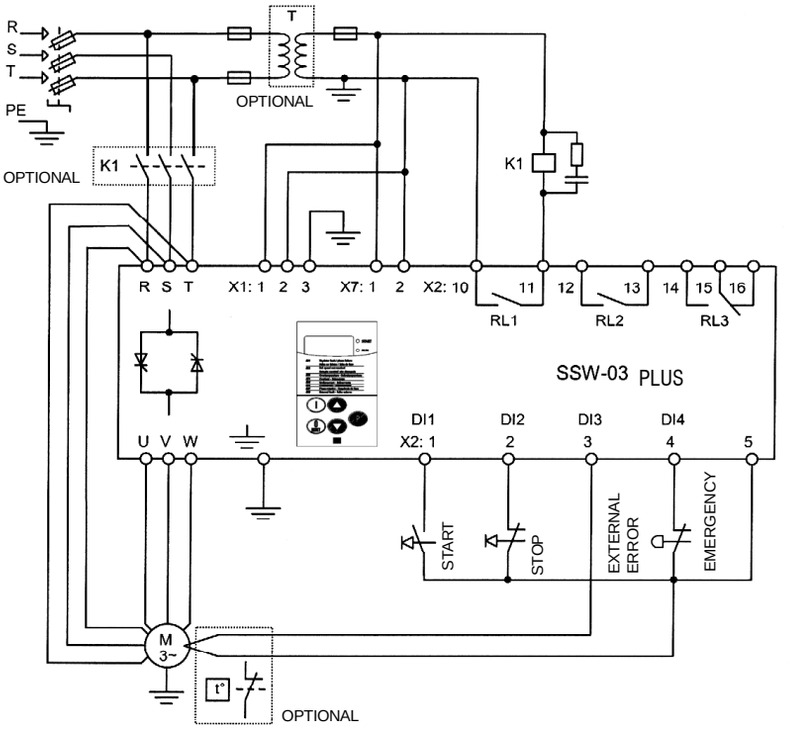
NOTE!

A contactor in the mains input (see 9.4) is necessary to protect the motor in case there is a phase failure which is caused by damage in the SSW-03 Plus power circuit.

Connect the PC or PLC to control board via connector XC2 (RS 232C).

9 APPENDIX

9.9 - RECOMMENDED APPLICATION WITH CONTROL BY THREE WIRE DIGITAL INPUTS AND POWER ISOLATION CONTACTOR AND CONNECTION WITHIN THE MOTOR DELTA CONNECTION OF THE 6 CABLE MOTOR



Parameter	Programming
P28	ON
P51	1
P53	4
P54	2
P55	3
P61	OFF

Obs.: It's necessary to use normal fuses or breaker to protect the installation. Ultra-Fast fuses are not necessary for the SSW-03 operation, but they are recommended for SCR protection.

The transformer "T" is optional and must be utilized when the line voltage is different than the electronics and fan voltage.

The isolation contactor "K1" is optional, and is not necessary for the SSW-03 Plus operation. However due to protection and safety reasons it's recommended. In case of maintenance the input fuses must be removed for a complete disconnection of the SSW-03 Plus from the line.

For the integral motor protection it's recommended to install one or more thermostats in the motor. If the thermostat is not used, the external input error (DI3) from SSW-03 Plus must be connected to +Vdc.

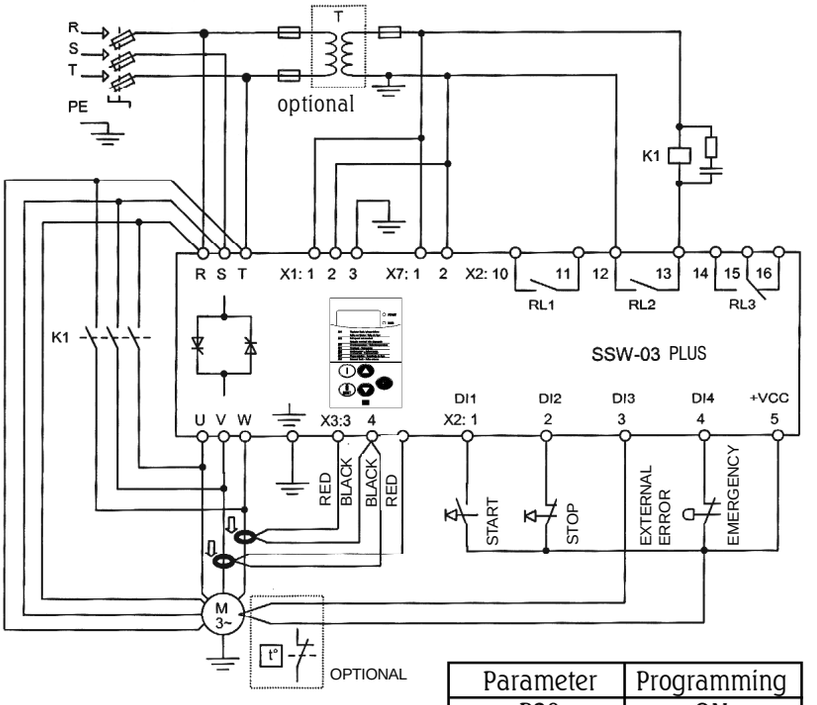
9 APPENDIX

NOTE!

Contactor "K1" is necessary to protect the motor in case there is a phase failure which is caused by damage in the SSW-03 Plus power circuit with the application of the power isolation contactor. For motor connection, see Item 6.4.1.

9 APPENDIX

9.10 - RECOMMENDED DRIVE WITH CONTROL BY THREE-WIRE DIGITAL INPUTS, WITH BY-PASS CONTACTOR AND CONNECTION WITHIN THE MOTOR DELTA CONNECTION OF THE MOTOR WITH 6 CABLES



Parameter	Programming
P28	ON
P43	ON
P52	1
P53	4
P54	2
P55	3
P61	OFF

Obs.: It's necessary to use normal fuses or breaker to protect the installation. Ultra-Fast fuses are not necessary for the SSW-03 Plus operation, but they are recommended for SCR protection.

The transformer "T" is optional and must be utilized when the line voltage is different than the electronics and fan voltage.

For the integral motor protection it's recommended to install one or more thermostats in the motor. If the thermostat is not used, the external input error (DI3) from SSW-03 Plus must be connected to +Vdc.

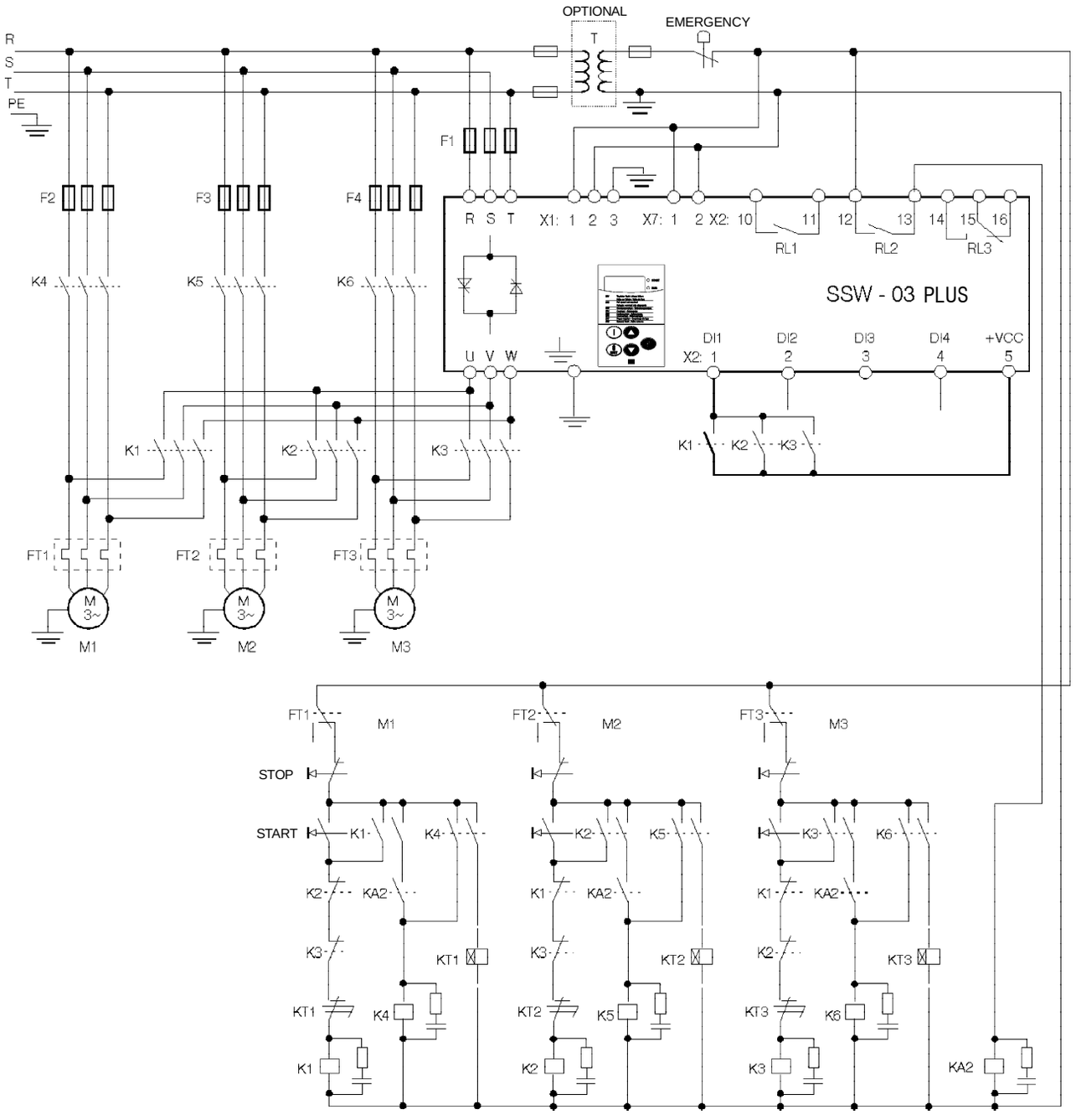
NOTE!

A contactor in the mains input (see 9.4) is necessary to protect the motor in case there is a phase failure which is caused by damage in the SSW-03 Plus power circuit.

To maintain motor thermal protection after the Soft-Starter is by-passed, the Current Transformers (CT) must be connected in conformity with the diagram above. For motor connection, see Item 6.4.1.

9 APPENDIX

9.11 - RECOMMENDED APPLICATION WITH TERMINALS FOR THREE WIRE CONTROL FOR SEVERAL MOTORS



Obs.: It's necessary to use normal fuses or breaker to protect the installation. Ultra-Fast fuses are not necessary for the SSW-03 operation, but they are recommended for SCR protection.

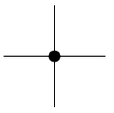
The transformer "T" is optional and must be utilized when the line voltage is different than the electronics and fan voltage.

For the integral motor protection it's recommended to install one or more thermostats in the motor. If the thermostat is not used, the external input error (DI3) from SSW-03 Plus must be connected to +Vdc.

Motor fuses are normal.
Install one overload relay to each motor.
The Soft-Starter must be selected for a complete start cycle.

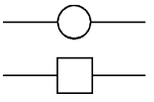
9 APPENDIX

9.12 - SYMBOLS

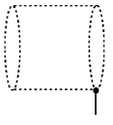


Electrical Connection between two signals

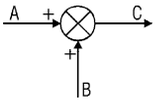
Boundary Equipment



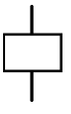
Terminals for Connection



Signal Shielding



A + B = C



Coil - relay, contactor

Normally Open Contact (NO)

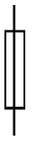
Normally Closed Contact (NC)

Indicator light

Resistor

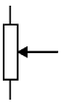
Capacitor

9 APPENDIX

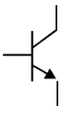


Fuse

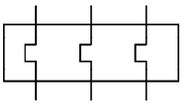
Thyristor/SCR



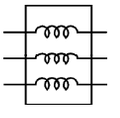
Potentiometer



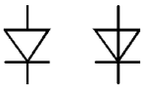
Bipolar Transistor



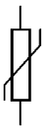
Thermal Relay



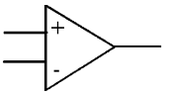
Three-Phase Reactor



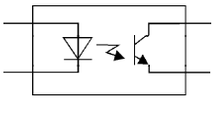
Diode



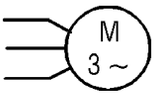
Varistor (MOV)



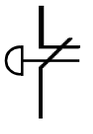
Operational Amplifier



Optocoupler



Three-Phase Motor



Emergency button

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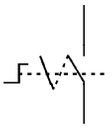
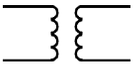


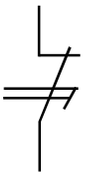
Reversible switch



Transformer

Normally closed pushbutton

Normally open pushbutton

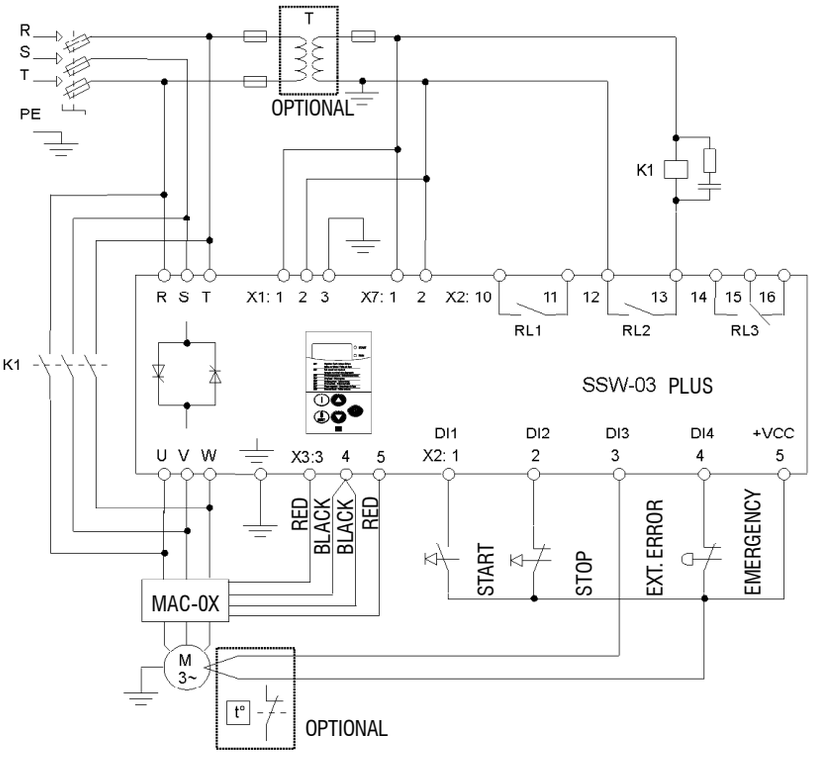


Delay time contact

10 OPTINAL DEVICES

10.1 - RECOMMENDED DRIVE WITH CONTROL BY DIGITAL INPUTS WITH THREE WIRES AND BYPASS CONTACTOR + MAC-0X.

Type SSW-03 Plus	Item Weg
120A 170A 205A 255A 290A 340A	MAC-01 417112127
410A	MAC-02 417112128
670A 800A	MAC-03 417112129



Regarding the use of the Current Acquisition Module (MAC-0x).
This optional device must be used to maintain the motor protections when the SSW-03 Plus is used with bypass contactor.
To maintain the protections proceed as follows:

1. Remove the cables of the secondary winding of the SSW-03 Plus current transformer from the connectors X3:3, X3:4 and X3:5 of the CCS3.0x board. These cables must be short-circuited in order to avoid damage of the current transformers incorporated in the SSW-03. Use the connector, wich is delivered with the MAC-0x. One end of this connector has already a jumper that connects the two contacts and the other end must be connected to the cables removed from X3:3, X3:4 and X3:5.
2. Loose the thermostat cables that are connected to the X3:1 and X3:2 connector and connect the two free ends of the plug-in connector that is delivered with the MAC-0x.
3. Connect this connector supplied with the MAC-0x to the control board (CCS3.0x) in the place intended for the X3 connector.
4. Make the power connector as shown up.

10 OPTINAL DEVICES

10.2 - FIELDBUS COMMUNICATION

Optionally the SSW-03 Plus can operate in serial communication "FieldBus", with the following protocols:

Model Type	Protocol	WEG Item
MFW-01/PD	Profibus DP	417100540
MFW-01/DN	DeviceNet	417100541
MFW-01/MR	ModBus RTU	417100542

NOTE!
With the MFW-01/xx is necessary to use the MIW-02 (WEG Item 417100543).
For more details see MFW-01 manual (0899.4429) and MIW-02 manual (0899.4430).

10.3 - SUPERDRIVE

Programming software for microcomputer PC, for windows environment. Permits parameter programming, command and monitoring of the Soft-Starter SSW-03 Plus.

It edits parameters "on-line", directly to the Soft-Starter or it edits parameters files "off-line", saving in the microcomputer. The communication between Soft-Starter and microcomputer is via serial interface RS232 (Point to Point) or RS485 (Network Line).

For details see help function in the software SuperDrive.

Weg Item of SuperDrive (417102505).