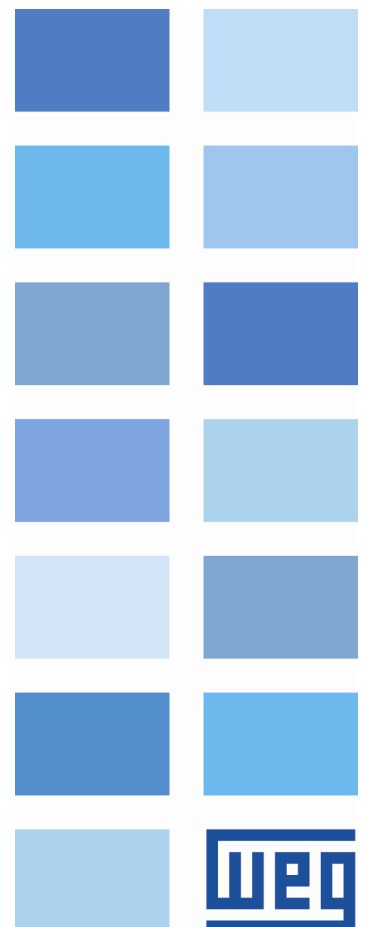


Pump Cleaning

SSW900

Application Manual





Pump Cleaning Application Manual

Series: SSW900

Language: English

Document: 10008639547 / 00

Publication Date: 05/2021

The information below describes the revisions made to this manual.

Version	Revision	Description
-	R00	First edition

1	PARAMETER STRUCTURE	1
2	FAULTS AND ALARMS	2
3	GENERAL INFORMATION	3
3.1.	ABOUT THE MANUAL	3
3.2.	ABOUT THE PUMP CLEANING APPLICATION	3
4	RECOMMENDED SET-UP	4
4.1.	COMMANDS BY DI VIA SOFTPLC	4
5	PARAMETER DESCRIPTION	5
5.1.	STATUS	5
5.1.1.	S6 SOFTPLC	5
5.2.	SETTINGS	5
5.2.1.	C11 SOFTPLC	5
6	OPERATION	10
6.1.	UNCLOGGING WITH COMMAND TO START THE PUMP (C11.3.2 = 1)	10
6.2.	UNCLOGGING WITH COMMAND VIA DIGITAL INPUT DI3 (C11.3.2 = 2)	11
6.3.	UNCLOGGING WHEN DETECTING PUMP CLOGGING (C11.3.2 = 3)	12
7	TROUBLESHOOTING	14
7.1.	FREQUENT PROBLEMS	14

1 PARAMETER STRUCTURE

Level 1	Level 2	Level 3	Page
S Status	S6 SoftPLC	S6.1 SoftPLC Status S6.2 Scan Cycle Time S6.2 Output Value S6.4 Parameters	5
C Settings	C11 SoftPLC	C11.3 Parameters	5

2 FAULTS AND ALARMS

Fault/Alarm	Description	Possible Causes
F708/A708: SoftPLC Application Stopped	SoftPLC application is not running.	<ul style="list-style-type: none"> - SoftPLC application is stopped (C11.1 = Stop Applications). - SoftPLC status (S6.1.1) indicates that the application is incompatible with the SSW900 firmware version.
A750	Clogging Detected	It indicates that clogging has been detected through the pump motor high current.
F751	Excessive Clogging Events Detected	It indicates that the pump has been switched off due to an excessive number of clogging events.

3 GENERAL INFORMATION

3.1. ABOUT THE MANUAL

This manual contains the necessary information to configure the Pump Cleaning application, developed with the SoftPLC function of the SSW900 Soft-Starter.

This application manual must be used together with the SSW900 Programming Manual, SSW900 User Manual, SoftPLC Function Manual and WPS Software Manual.

ABBREVIATIONS AND DEFINITIONS

PLC Programmable Logic Controller
CRC Cycling Redundancy Check
RAM Random Access Memory
USB Universal Serial Bus
WPS Programming Software in Ladder Language

Copying the content of this manual, in whole or in part, is prohibited without the written permission of the manufacturer.

3.2. ABOUT THE PUMP CLEANING APPLICATION

The Pump Cleaning application, developed for the SoftPLC function of the SSW900 Soft-Starter and based on the existing Pump Genius Simplex of the CFW-11, allows unclogging the pump in order to prevent it from reaching the complete clogging, which would prevent the pump operation.

Its basic principle is to start the pump in the reverse pumping direction to remove the accumulated residues and, thus, enable the pump to go into operation again.

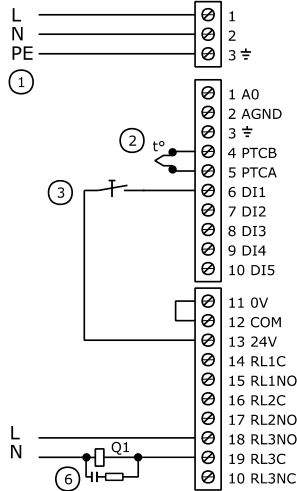
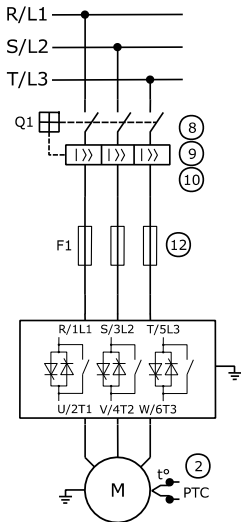
**NOTE!**

This function should only be enabled on a pump that can operate in the reverse pumping direction; otherwise, it may damage it.

4 RECOMMENDED SET-UP

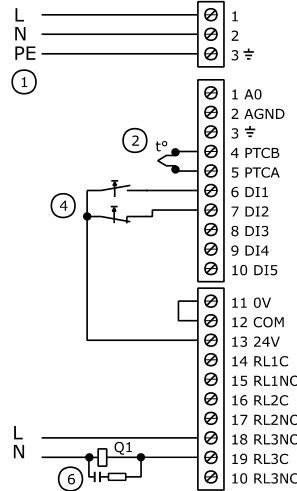
This chapter presents a recommended set-up, which can be used in whole or in part to assemble the desired drive.

4.1. COMMANDS BY DI VIA SOFTPLC



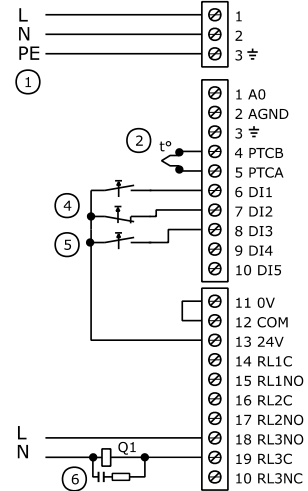
2-wire commands

- C3 - LOC/REM Selection
- C3.1 = 8 (Mode = SoftPLC REM)
- C3.3 = 3 (REM command = SoftPLC)
- C4 - I/O
- C4.2.3 = 14 (DO3 = Circuit Breaker Trip)
- C11 - SoftPLC
- C11.3.2 = 1 (Mode 1) or 3 (Mode 3)
- C11.3.12 = 0 (2-wire Run/Stop)



3-wire commands

- C3 - LOC/REM Selection
- C3.1 = 8 (Mode = SoftPLC REM)
- C3.3 = 3 (REM command = SoftPLC)
- C4 - I/O
- C4.2.3 = 14 (DO3 = Circuit Breaker Trip)
- C11 - SoftPLC
- C11.3.2 = 1 (Mode 1) or 3 (Mode 3)
- C11.3.12 = 1 (3-wire Run/Stop)



3-wire command and unlogging via DI

- C3 - LOC/REM Selection
- C3.1 = 8 (Mode = SoftPLC REM)
- C3.3 = 3 (REM command = SoftPLC)
- C4 - I/O
- C4.2.3 = 14 (DO3 = Circuit Breaker Trip)
- C11 - SoftPLC
- C11.3.2 = 2 (Mode 2)
- C11.3.12 = 1 (3-wire Run/Stop)

NOTES!

- ① Check the electronics power supply. "Control Supply" connector.
- ② Optional. It is recommended to use a PTC, thermostat connected to a digital input programmed for external fault or PT100 accessory.
- ③ Run/Stop command via digital input DI1 with 2 wires via SoftPLC.
- ④ Run/Stop command via digital input DI with 3 wires via SoftPLC. Run DI1 and Stop DI2.
- ⑤ Activation of the pump unlogging via pulse at digital input DI3.
- ⑥ Use a digital output programmed for "Circuit Breaker Trip" fault to open the circuit breaker when a fault occurs on the SSW power circuit.
- ⑧ In case of maintenance on the SSW or on the motor, it is necessary to disconnect the power supply input so as to ensure the full disconnection of the equipment from the supply line.
- ⑨ In case of damages on the SSW power circuit which keep the motor running by short circuit, the motor protection is obtained by using the power isolation contactor (K1) or circuit breaker (Q1) controlled by the SSW.
- ⑩ Coordination Type 1 – use a circuit breaker for short circuit protection on the input circuit. Use a shunt trip on the circuit breaker to open the circuit breaker via digital output of the SSW.
- ⑪ Optional. Coordination Type 2 – use aR high speed fuses for semiconductor protection.

5 PARAMETER DESCRIPTION

Only the user parameters of the SoftPLC Application will be described here. For more details on the other parameters of the SSW900, see the SSW900 Programming Manual.

5.1. STATUS

5.1.1. S6 SOFTPLC

Status parameters related to the SoftPLC.

S6.1 SoftPLC Status

.1 Current 0 ... 4

Description

Status in which the SoftPLC is. If no application is installed, the other parameters will not be shown on the HMI.

.1 Current Status in which the SoftPLC is.

If this parameter shows option 2 ("Incomp. Applic."), it indicates that the version that has been loaded into the memory is not compatible with the current SSW firmware.

In this case, the users need to recompile their project in the WPS considering the new SSW version and download it again.

Indication	Description
0 = Without Application	No application recorded.
1 = Install. Applic.	Installing application.
2 = Incomp. Applic.	Application version loaded into the memory is not compatible with the current SSW firmware.
3 = Applic. Stopped	Application is not running.
4 = Applic. Running	Application is running.

S6.2 Scan Cycle Time

.1 Current 0 ... 65535 ms

Description:

Runtime of the application software.

.1 Current It is the runtime of the application software. The larger the application, the longer the runtime is likely to be.

S6.4 Parameters

.1 Software Version 0 ... 9.99

Description:

It indicates the software version of the SoftPLC application.

5.2. SETTINGS

5.2.1. C11 SOFTPLC

Setting parameters related to the SoftPLC.

C11 SoftPLC		
C11.1 Mode		
Adjustable Range:	0 ... 1	Factory Setting: 0
Properties:	Stopped	

Description:

It allows stopping or running an application installed, but the motor must be disabled in order to do that.

Indication	Description
0 = Stop Application	It stops the application
1 = Run Application	It runs the application

C11 SoftPLC		
C11.2 App Not Running Action		
Adjustable Range:	0 ... 2	Factory Setting: 0
Properties:		

Description:

It defines the action to be taken by the product in case the SoftPLC not running condition is detected, and it may generate alarm A708, fault F709 or neither of the previous actions, remaining inactive.

Indication	Description
0 = Disable	There is no actuation.
1 = Alarm A708	It acts as an alarm. It is only indicated.
2 = Fault F708	It acts as a fault. It disables the motor.

C11.3 Parameters

They consist of use parameters defined by the user via WPS software. The user can also configure these parameters.

C11.3 Parameters		
C11.3.2 Mode		
Adjustable Range:	0 ... 3	Factory Setting: 0
Properties:	Stopped	

Description:

This parameter defines the logic execution mode for unclogging the pump driven by the SSW900.

Indication	Description
0 = OFF	It defines that the pump unclogging will not be executed, that is, it is disabled.
1 = Execute with Command to Start the Pump	It defines that the pump unclogging will be enabled and executed whenever there is a command to start the pump. This command can come from the HMI, a digital input, communication networks, etc.
2 = Execute with Command via Digital Input DI3	It defines that the pump unclogging will be enabled and executed whenever the digital input DI3 receives a command, that is, it changes from logic state "0" to logic state "1".
3 = Execute when Pump Clogging is Detected	It defines that the pump unclogging will be enabled and executed whenever pump clogging is detected via high motor current.


NOTE!

To perform the pump unclogging, it is necessary that the SoftPLC function control the motor drive and direction of rotation to make the pump run in the reverse pumping direction. Therefore, it was defined that the pump unclogging will only work with the SSW900 operating in REMOTE mode and with the SoftPLC as command source.

The pump will be driven by digital inputs, controlled by the SoftPLC, with the possibility of 2 or 3-wire activation.

When starting the application, parameters C3.1, C3.3, C7.1.1, C5.7.1, C5.7.3, C7.3.1 and C7.3.2 will automatically change. Do not change the content of those parameters; otherwise, the application will stop working.

C11.3 Parameters
C11.3.3 Number of Cycles

Adjustable Range:	1 ... 5	Factory Setting: 3 x
Properties:	Stopped	

Description:

This parameter defines the number of times (cycles) that the pump will run in the reverse pumping direction to unclog the pump driven by the SSW900.

C11.3 Parameters
C11.3.4 Reverse Torque Level

Adjustable Range:	20 ... 100	Factory Setting: 30 %
Properties:	Stopped	

Description:

Motor torque level in the reverse direction.

C11.3 Parameters
C11.3.5 Reverse Torque Time

Adjustable Range:	2 ... 60	Factory Setting: 10 s
Properties:	Stopped	

Description:

Time of the pump running in the reverse direction.

C11.3 Parameters
C11.3.6 Direct Current Limit

Adjustable Range:	150 ... 500	Factory Setting: 150 %
Properties:	Stopped	

Description:

Current limit level of the pump running forward.

C11.3 Parameters
C11.3.7 Direct Current Time

Adjustable Range:	2 ... 60	Factory Setting: 10 s
Properties:	Stopped	

Description:

Time of the pump running forward.

C11.3 Parameters

C11.3.8 Pump Stopped Time

Adjustable Range:	2 ... 60	Factory Setting:	3 s
Properties:	Stopped		

Description:

Time with the pump stopped in the cycle to unclog the pump.

C11.3 Parameters

C11.3.9 Overcurrent Detection

Adjustable Range:	0 ... 99	Factory Setting:	30 %
Properties:	Stopped		

Description:

Motor overcurrent level to detect pump clogging. It means the percentage above which the function must be activated. E.g.: 10% = motor rated current + 10%.

C11.3 Parameters

C11.3.10 Time for Detecting Overcurrent

Adjustable Range:	0 ... 999	Factory Setting:	60 s
Properties:	Stopped		

Description:

Time to detect pump clogging via motor overcurrent. This parameter defines the time the pump must remain in the motor high current condition to determine that the pump is in a clogging process, thus generating the alarm message "A750: Clogging Detected".

C11.3 Parameters

C11.3.11 Number for Fault

Adjustable Range:	0 ... 100	Factory Setting:	5
Properties:	Stopped		

Description:

Number of consecutive clogging events to generate fault F751: Excessive Clogging Events Detected



NOTE!

Setting it to "0" disables the excessive clogging events detected fault. Every time the Pump Cleaning is disabled, or the pump is turned off, the clogging event counter is reset.

C11.3 Parameters

C11.3.12 Run/Stop DI Mode

Adjustable Range:	0 ... 1	Factory Setting:	0
Properties:	Stopped		

Description:

It configures whether the Run/Stop command via DI is a 2-wires or 3-wire command.

Indication	Description
0 = 2-wire	Run/Stops (2-wire) DI1.
1 = 3-wire	1 = Start (3-wire) DI1 and Stop (3-wire) DI2 ..


NOTE!

The setting user parameters are always retentive.

C11 SoftPLC
C11.4. SoftPLC Application

Adjustable Range: 0 ... 2 Factory Setting:
0

Properties: Stopped

Description:

It allows the user to select which application to run.

Indication	Description
0 = User	It defines that the application downloaded by the user through the WPS is the one that will run on the SoftPLC.
1 = Timer Control	It defines that the Timer Control is the application that will run on the SoftPLC.
2 = Pump Cleaning	It defines that the Pump Cleaning is the application that will run on the SoftPLC.

6 OPERATION

6.1. UNCLOGGING WITH COMMAND TO START THE PUMP (C11.3.2 = 1)

Setting the execution mode of the pump unclogging (C11.3.2) to 1 defines that the pump unclogging will be enabled and executed whenever there is a command to start the pump via DI.

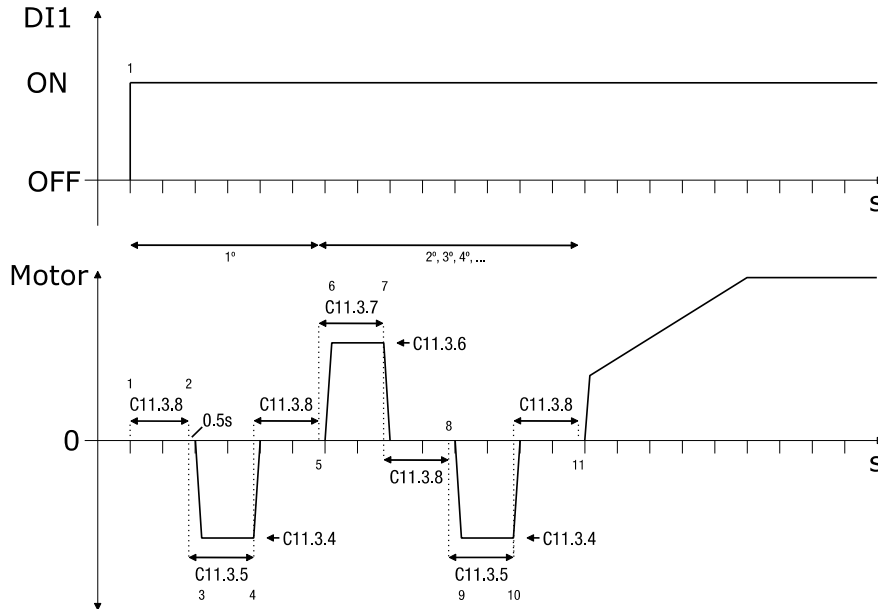


Figure 6.1 - Pump unclogging execution with command to start the pump

- 1 – The Run/Stop command via digital input DI1 starts the motor and enables the operation of the Pump Cleaning. At this moment, the counting of the first unclogging cycle begins;
- 2 – The time with the pump stopped (C11.3.8) elapses and the command to start the pump in the reverse pumping direction with torque level in the reverse direction (C11.3.4) is triggered. At this moment, the counting of the time with the pump running in the reverse direction (C11.3.5) starts;
- 3 – The pump accelerates to the speed imposed by the level of reverse torque (C11.3.4);
- 4 – The time with the pump running in the reverse direction (C11.3.5) elapses and the command to switch off the pump is triggered. At this moment, the counting of the time with the pump stopped (C11.3.8) starts;
- 5 – The time with the pump stopped (C11.3.8) elapses, and it is checked whether the number of cycles (C11.3.3) is greater than 1x. If so, the command to start the pump in the pumping direction with current limit (C11.3.6) is triggered, thus starting the 2nd cycle. At this moment, the counting of the time with the pump running in the forward direction (C11.3.5) starts;
- 6 – The pump accelerates to the speed imposed by the current limit (C11.3.6);
- 7 – The time with the pump running in the forward direction (C11.3.7) elapses and the command to switch off the pump is triggered. At this moment, the counting of the time with the pump stopped (C11.3.8) starts;
- 8 – The time with the pump stopped (C11.3.8) elapses and the command to start the pump in the reverse pumping direction with torque level in the reverse direction (C11.3.4) is triggered. At this moment, the counting of the time with the pump running in the reverse direction (C11.3.5) starts;
- 9 – The pump accelerates to the speed imposed by the level of reverse torque (C11.3.4);
- 10 – The time with the pump running in the reverse direction (C11.3.5) elapses and the command to switch off the pump is triggered. At this moment, the counting of the time with the pump stopped (C11.3.8) starts;

11 – The time with the pump stopped (C11.3.8) elapses, and it is checked whether the number of cycles (C11.3.3) has reached the end, or if one more cycle should be repeated. If it has reached the end, the command to start the pump normally is triggered. Otherwise, steps 6 to 11 are repeated.

6.2. UNCLOGGING WITH COMMAND VIA DIGITAL INPUT DI3 (C11.3.2 = 2)

Setting the execution mode of the pump unclogging (P1052) to 2 defines that the pump unclogging will be enabled and executed whenever digital input DI3 receives a command, that is, it changes from logic state "0" to logic state "1".

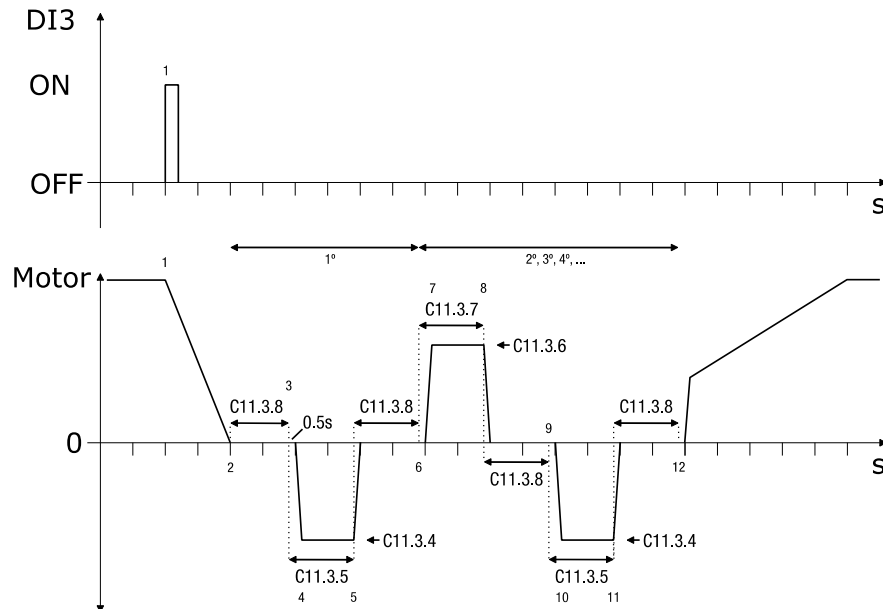


Figure 6.2– Pump unclogging operation with command via digital input DI3

1 – The pump is being driven by the SSW900. At a given moment, digital input DI3 sends a command to execute the pump unclogging, that is, digital input DI3 goes from logic state "0" to logic state "1". Then, the command to stop the pump is executed so that the process to unclog the pump starts. The DI3 command to unclog the pump must be pulsed;

2 – The pump is decelerated following the deceleration ramp defined in parameter C1.13 until it stops. At this moment, the counting of the first cycle for pump unclogging and the counting of the time with the pump stopped (C11.3.8) begins;

3 – The time with the pump stopped (C11.3.8) elapses and the command is triggered to start the pump in the reverse pumping direction with torque level in the reverse direction (C11.3.4). At this moment, the counting of the time with the pump running in the reverse direction (C11.3.5) starts;

4 – The pump accelerates to the speed imposed by the level of reverse torque (C11.3.4);

5 – The time with the pump running in the reverse direction (C11.3.5) elapses and the command to switch off the pump is triggered. At this moment, the counting of the time with the pump stopped (C11.3.8) starts;

6 – The time with the pump stopped (C11.3.8) elapses, and it is checked whether the number of cycles (C11.3.3) is greater than 1x. If so, the command to start the pump in the pumping direction with current limit (C11.3.6) is triggered, thus starting the 2nd cycle. At this moment, the counting of the time with the pump running in the forward direction (C11.3.5) starts;

7 – The pump accelerates to the speed imposed by the current limit (C11.3.6);

8 – The time with the pump running in the forward direction (C11.3.7) elapses and the command to switch off the pump is triggered. At this moment, the counting of the time with the pump stopped (C11.3.8) starts;

- 9 – The time with the pump stopped (C11.3.8) elapses and the command to start the pump in the reverse pumping direction with torque level in the reverse direction (C11.3.4) is triggered. At this moment, the counting of the time with the pump running in the reverse direction (C11.3.5) starts;
- 10 – The pump accelerates to the speed imposed by the level of reverse torque (C11.3.4);
- 11 – The time with the pump running in the reverse direction (C11.3.5) elapses and the command to switch off the pump is triggered. At this moment, the counting of the time with the pump stopped (C11.3.8) starts;
- 12 – The time with the pump stopped (C11.3.8) elapses, and it is checked whether the number of cycles (C11.3.3) has reached the end, or if one more cycle should be repeated. If it has reached the end, the command to start the pump normally is triggered. Otherwise, steps 6 to 11 are repeated.

6.3. UNCLOGGING WHEN DETECTING PUMP CLOGGING (C11.3.2 = 3)

Setting the execution mode of the pump unclogging (C11.3.2) to 3 defines that the pump unclogging will be enabled and executed when pump clogging is detected.

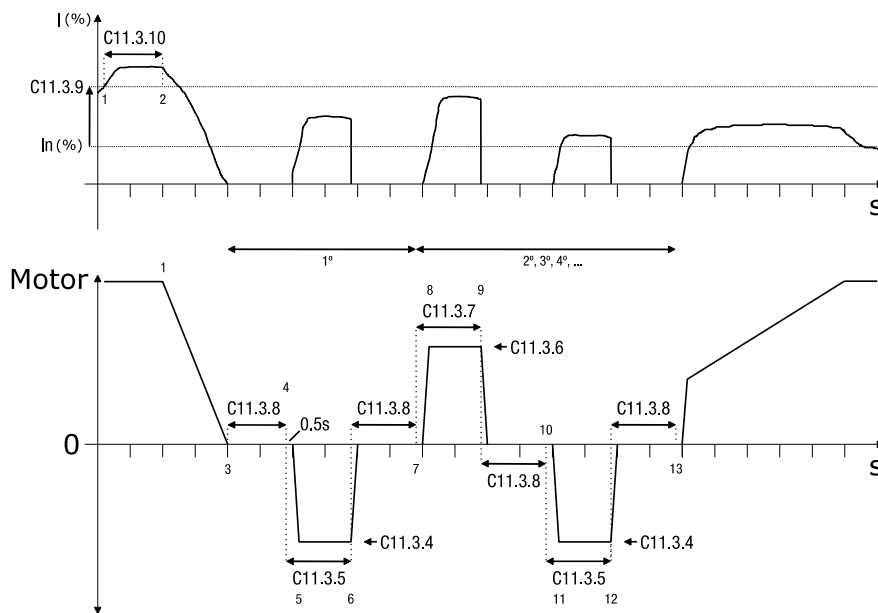


Figure 6.3 - Pump unclogging operation when pump clogging is detected

- 1 – The pump is being driven by the SSW900. At any moment, the motor current exceeds the motor overcurrent value set to detect the pump clogging (C11.3.9), and the time to detect the pump clogging (C11.3.10) begins to count;
- 2 – The motor current remains above the overcurrent value set to detect the pump clogging (C11.3.9), and the time to detect the pump clogging (C11.3.10) elapses. At this moment, the command to stop the pump, start the pump unclogging and indicate alarm A750 (Clog Detected) is triggered;
- 3 – The pump is decelerated following the deceleration ramp defined in parameter C1.13 until it stops. At this moment, the counting of the first cycle for pump unclogging and the counting of the time with the pump stopped (C11.3.8) begins;
- 4 – The time with the pump stopped (C11.3.8) elapses and the command to start the pump in the reverse pumping direction with torque level in the reverse direction (C11.3.4) is triggered. At this moment, the counting of the time with the pump running in the reverse direction (C11.3.5) starts;
- 5 – The pump accelerates to the speed imposed by the level of reverse torque (C11.3.4);
- 6 – The time with the pump running in the reverse direction (C11.3.5) elapses and the command to switch off the pump is triggered. At this moment, the counting of the time with the pump stopped (C11.3.8) starts;

- 7 – The time with the pump stopped (C11.3.8) elapses, and it is checked whether the number of cycles (C11.3.3) is greater than 1x. If so, the command to start the pump in the pumping direction with current limit (C11.3.6) is triggered, thus starting the 2nd cycle. At this moment, the counting of the time with the pump running in the forward direction (C11.3.5) starts;
- 8 – The pump accelerates to the speed imposed by the current limit (C11.3.6);
- 9 – The time with the pump running in the forward direction (C11.3.7) elapses and the command to switch off the pump is triggered. At this moment, the counting of the time with the pump stopped (C11.3.8) starts;
- 10 – The time with the pump stopped (C11.3.8) elapses and the command to start the pump in the reverse pumping direction with torque level in the reverse direction (C11.3.4) is triggered. At this moment, the counting of the time with the pump running in the reverse direction (C11.3.5) starts;
- 11 – The pump accelerates to the speed imposed by the level of reverse torque (C11.3.4);
- 12 – The time with the pump running in the reverse direction (C11.3.5) elapses and the command to switch off the pump is triggered. At this moment, the counting of the time with the pump stopped (C11.3.8) starts;
- 13 – The time with the pump stopped (C11.3.8) elapses, and it is checked whether the number of cycles (C11.3.3) has reached the end, or if one more cycle should be repeated. If it has reached the end, the command to start the pump normally is triggered. Otherwise, steps 6 to 11 are repeated.

7 TROUBLESHOOTING

7.1. FREQUENT PROBLEMS

Table 7:1 Frequent problems

Problem	Probable Cause	Cause Description
Application will not run	S6.1.1 ≠ 4	Observed in S6.1 SoftPLC Status/Current ≠ 4 (Application Running). C11.1 SoftPLC/Mode - set to: 0 = Stop Application. Or check S6.1 to see the other reasons.
Motor will not start	Setting error	C11.3.2 SoftPLC/Parameters/Mode - set to: 0 = Will Not Execute.
	Digital Inputs	Check the digital inputs C11.3.12 = 0 (2-wire Run/Stop) C11.3.12 = 1 (3-wire Run/Stop)
	LOC/REM command source	Check if the active command source is in Local or Remote. Indication in S3.1.2. Refer to the Chapter Local/Remote Configuration of the Programming Manual. The suggestion is to set: C3 - LOC/REM Selection C3.1 = 8 (Mode = SoftPLC REM) C3.3 = 3 (REM command = SoftPLC) C4 - I/O C4.2.3 = 14 (DO3 = Circuit Breaker Trip) C11.3.2 = 1, 2 or 3 (Mode) C11.3.12 = 0 (Run/Stop 2-wire), 1 (Run/Stop 3 wires) Check via HMI if it is in "Rem".